



# Infusing Technology into Science 2007

## Self-Study Guide

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*Infusing Technology into Science 2007*

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# Introduction

Infusing Technology into Science is an exciting professional development resource for middle and high school teachers. Whether used as a self-study guide or as part of an integration course, this innovative approach enables teachers to integrate technology into their curriculum after working through the process.

This guide leads science teachers through the design, creation and implementation of a technology-infused lesson that is based on teachers' existing instructional plans. As a first step, the teacher works through one or several of the 10 included classroom-ready sample projects. After review of the samples, a step-by-step guide for the creation of an original integrated project follows and includes suggestions for considering teaching style, classroom needs, available technology tools, curriculum requirements and relevant standards. The organization of the course is flexible, adaptable and builds on teachers' strengths and content knowledge.

*Infusing Technology into Science* includes:

- ❑ Practical advice for maximizing the benefits from every session
- ❑ Ten standards-based projects for use as both samples and as actual classroom projects
- ❑ Suggestions for adapting the project-creation process to individual teacher needs and styles
- ❑ A range of Internet resources for science and professional development
- ❑ A sample student assessment rubric
- ❑ Reference and resource material for the software applications used to create projects
- ❑ A glossary of technology terms

Teachers who are interested in integrating technology into their curriculum will find no better resource than *Infusing Technology into Science*.

## Required Materials

PC with at least 128 MB of RAM and Internet access

Floppy, Zip or CD-R/W drive

*Infusing Technology into Science 2007* course book and CD

*Microsoft Office 2007 Professional (includes Access, Excel, PowerPoint, Publisher and Word)*

*Microsoft SharePoint Designer*

*Internet Explorer or Netscape Navigator*

Printer (color, if available)

## Organization of the Course Materials

### Course Book

The course book is divided into an introduction and four sections containing practical advice and simple techniques.

The **Introduction** presents an overview of the course and introduces the software applications used in each sample project.

The **Sample Projects** section includes 10 fully developed technology projects that are ready for immediate use in the classroom. The model projects are practical, clearly outlined and adaptable to different grade levels. They present a range of technology skills and software applications. Each project includes a teacher guide and a student handout. The teacher guide includes specific project preparation, evaluation, extension activities and enrichment activities. In addition each guide cites relevant standards from the National Science Teachers Association (NSTA) and technology standards established by the International Society for Technology in Education (ISTE). Projects requiring Internet resources include useful Web sites. In addition, a *Project Analysis Form* provides a series of evaluative questions to gauge the effectiveness and usefulness of technology-infused lessons.

The **Project Creation** section is a step-by-step guide through the process of creating, developing and implementing original technology projects. It also provides assessment tools for evaluating projects.

The **Internet** section contains a broad range of excellent professional development and science resources found on the World Wide Web.

The **Appendices** consist of reference material for the software applications on which the projects are based, as well as a glossary of useful technology terms.

### CD Contents

Electronic templates and lesson samples in *Office 2007*

Hyperlinks included in the course book

File-based versions of rubrics and evaluation models

## Software Applications

<b>Microsoft Access 2007*</b>	A relational database program, <i>Microsoft Access</i> integrates and organizes data so that information can be found quickly and easily. Users can modify and explore existing templates to build an understanding of database functions and importance.
<b>Microsoft Excel 2007*</b>	This comprehensive spreadsheet program enables users to analyze, report and share data. <i>Microsoft Excel</i> can be used to manipulate and analyze data within a spreadsheet, as well as create tables, charts and graphs to display information.
<b>Microsoft SharePoint Designer 2007</b>	<i>Microsoft SharePoint Designer</i> allows users to create and manage Web pages and sites in an easy-to-learn format.
<b>Internet Explorer 7.0<sup>†</sup></b>	This Web browser allows users to connect to the Internet and access a wide variety of information. <i>Internet Explorer 7.0</i> enables users to access search engines and directories, view Web sites and gain a thorough understanding of the Internet. <i>Netscape Navigator</i> may be substituted.
<b>Microsoft PowerPoint 2007*</b>	With <i>Microsoft PowerPoint</i> , users can create multimedia presentations to illustrate and deliver ideas.
<b>Microsoft Publisher 2007*</b>	This desktop publishing program incorporates a grid system that splits parts of the page, providing users with a canvas for placing words and pictures. Functions allow for manipulation of images, text and graphics.
<b>Microsoft Word 2007*</b>	With this wordprocessing application, users may edit and format text, create tables, insert graphics, design headers and footers and link information between documents. The program features automatic Grammar spelling and grammar functions as well as Internet capabilities.

\*These programs are bundled as part of *Microsoft Office 2007 Professional*.

<sup>†</sup>*Internet Explorer* is bundled as part of *Windows 2007*. It is also available for download at [www.microsoft.com](http://www.microsoft.com).

*Microsoft Office 2007 Professional* is available in the following languages: Arabic, Basque, Brazilian, Chinese-Simplified, Chinese-Traditional, Croatian, Czech, Danish, Dutch, English, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Slovak, Slovenian, Spanish, Swedish, Thai, Turkish and Vietnamese.

### For Further Information:

Microsoft Corporation  
One Microsoft Way  
Redmond, WA 98052-6399, USA  
Sales: (800) 426-9400  
Technical Support: (800) 936-4900  
<http://www.microsoft.com>



## Course of Self-Study

The first step of this course is to review the book. Glance through the sections and skim any projects that seem particularly applicable or interesting.

Set aside approximately two hours for the first session. The experience with the technology (and project sampling) during the first session will help gauge the time needed for future sessions. The session schedule suggested here should be considered only as a guide. Adapt it as needed.

1. Work through one of the model projects from Module 1 and use the Project Analysis Form to note any response. If time permits, sample additional projects that require different software applications.
2. Design a project using the guidelines found in Module 2. Make an electronic template if applicable, then create a student handout using those found in the sample projects as models. Check the steps by following the directions outlined on the student handout. Make any necessary adjustments to the project or the handout, then finalize the documentation.
3. Prepare the project for use in the classroom. Set up the network and prepare floppy disks as needed. Make copies of the materials, such as handouts and assessment tools.
4. Implement the project in a classroom setting and have the students work through it. Encourage them to work on their own or collaboratively, as appropriate.
5. When the students have finished the project, evaluate its effectiveness by using the provided Project Evaluation Rubric, then modify and revise the project as necessary.

## **Course Support**

The Futurekids Web site provides further information about the **Infusing Technology** Self-study series. Log on to **www.futurekids.com** and on the Products page under Teacher Curriculum, choose the Infusing Technology link.

The Customer Service Desk can be reached during the hours of 9 a.m. to 5 p.m. PST at (800)-765-8000.

For e-mail assistance, please direct questions to **products@futurekids.com**

# Module 1: Sample Projects

This section includes ten fully developed technology projects that introduce one or more software applications. Glance over the brief descriptions below as well as the *Organizational Approaches* section on pages 10-11 to decide which project to sample first. Set aside approximately two hours for the first self-study session.

## Project Descriptions

### ***Project 1: Natural Hazards***

- *Microsoft Word 2007*
- *Microsoft PowerPoint 2007*
- Web browser

Using the Internet, select and research a natural hazard. Write a speech on the findings or develop a detailed *PowerPoint* presentation. Act as a science “expert” who informs the local chamber of commerce about potential risks to life and property and make recommendations for the future safety of the community.

### ***Project 2: Heat Island***

- *Microsoft Word 2007*
- *Microsoft Excel 2007*

Design and perform an experiment that tests the temperatures on various surfaces in different conditions. Create data tables and charts in *Excel* and prepare a lab report using *Word*.

### ***Project 3: The Setting Sun***

- *Microsoft Word 2007*

Perform a lab to replicate the color of the setting sun. React sodium thiosulfate solution with dilute hydrochloric acid in a test tube. Then shine a beam of light through the test tube onto a piece of white paper and observe the color changes. Finally, create a lab report in *Word*, employing the color palette to simulate the colors produced in the lab.

**Project 4: Charles' Law**

- *Microsoft Excel 2007*
- *Microsoft Word 2007*

Perform a lab and use *Excel* and *Word* to create a detailed report. The lab relates the volume of a gas to temperature. Data in the lab is used to produce a linear graph of temperature vs. volume. An extension of the data leads to the concept of absolute zero.

**Project 5: Variation and Inheritance – Eye Color**

- *Microsoft Excel 2007*
- *Microsoft Word 2007*
- Web browser

Carry out a group survey on the occurrence of different eye colors and enter the data on a spreadsheet and create a chart or graph. A word processing document will complete the report. An Internet research component may be used as an extension.

**Project 6: Human Genome**

- *Microsoft Access 2007*
- *Microsoft Word 2007*
- Web browser

Select one of 23 pairs of human chromosomes. Using the Internet, research the chromosome for the associated genetic diseases. Write a report using *Word* and develop a database using *Access*. Ultimately the tables can be combined into a class database containing information on all 23 pairs of human chromosomes.

**Project 7: Pendulum Experiment - Oscillations**

- *Microsoft Excel 2007*
- *Microsoft Word 2007*
- Web browser

Carry out a number of experiments to see what factors affect the period of oscillation of a pendulum. Enter the data on a spreadsheet and create a chart or graph. The gradient of the slope obtained is calculated from which a value for  $g$  is determined. ( $g = 4\pi^2 \div \text{slope}$ ). Use the data to determine the formula for the period of oscillation ( $T = 2\pi\sqrt{l/g}$ ). A word processing document is used to complete the report. Internet data and search can be used as extension work.

**Project 8: Radon and Radioactivity**

- *Microsoft Excel 2007*
- *Microsoft Word 2007*
- Web browser

Perform a simulation of the decay of a radioactive element. Systematically eliminate some M&M candy pieces in each trial until there are no more left to count. Create data tables and graphs of the results using *Microsoft Excel*, in addition to producing a lab report using *Microsoft Word*.

**Project 9: Rates of Reaction**

- *Microsoft Excel 2007*
- *Microsoft Word 2007*
- Web browser

Conduct an experiment to see how changing the concentration of a reactant affects the rate of a chemical change. Enter data on a spreadsheet and create graphs from the experimental results. Select from a variety of methods to analyze the order of the reaction before completing a detailed report.

**Project 10: Remote Sensing**

- Web browser

Analyze a LANDSAT Thematic Mapper (TM) of a 225km<sup>2</sup> area around Beverly, Massachusetts. Download imaging software called MultiSPEC and analyze an image of the city in three channels to distinguish between urban areas, bodies of water and different types of vegetation. Perform further analysis on a color copy of one section of the map.

## Personalizing the Course of Study

Optimize the self-study sessions by organizing the examination of the projects to fit specific needs. It is possible to focus the study by software application, project type or personal interests.

### **Possible Organizational Approaches:**

#### ***Software Application***

Explore one application at a time by sampling several projects that require the same software.

##### ***Microsoft Word***

- Project 1 Natural Hazards
- Project 2 Heat Island
- Project 3 The Setting Sun
- Project 4 Charles' Law
- Project 5 Variation and Inheritance – Eye Color
- Project 6 Human Genome
- Project 7 Pendulum Experiment
- Project 8 Radon and Radioactivity
- Project 9 Rates of Reaction

##### ***Access***

- Project 6 Human Genome

##### ***Excel***

- Project 2 Heat Island
- Project 4 Charles' Law
- Project 5 Variation and Inheritance – Eye Color
- Project 7 Pendulum Experiment
- Project 8 Radon and Radioactivity
- Project 9 Rates of Reaction

##### ***PowerPoint***

- Project 1 Natural Hazards

## ***Project Type***

Another strategy is to choose practice projects that reflect teaching style or curriculum requirements. Classes studying the mechanics of science will benefit from the lab-based projects below, while classes focusing on scientific investigation will benefit from the research-based projects.

### ***Lab-based projects***

- Project 2 Heat Island
- Project 3 The Setting Sun
- Project 4 Charles' Law
- Project 7 Pendulum Experiment – Oscillations
- Project 8 Radon and Radioactivity
- Project 9 Rates of Reaction

### ***Research-based projects***

- Project 1 Natural Hazards
- Project 5 Variation and Inheritance – Eye Color
- Project 6 Human Genome
- Project 10 Remote Sensing





## Project 1: Natural Hazards

### Teacher Guide

**Description:**

Using the Internet, the students will select and research a natural hazard. They will have the option of writing a speech on their findings or developing a detailed *PowerPoint* presentation. The students will act as science “experts” who inform the local chamber of commerce about potential risks to life and property and make recommendations for the future safety of the community.

**Grades:** 7-12

**Science Fields:** Earth science with applications in physics

**PA Academic Standards:****Grade 7:**

**3.5.7A Earth Sciences:** Describe earth features and processes.

- Distinguish between examples of rapid surface changes (e.g., landslides, earthquakes) and slow surface changes (e.g., weathering).

**3.5.7C Earth Sciences:** Describe basic elements of meteorology.

- Identify different air masses and global wind patterns and how they relate to the weather patterns in different regions of the U.S.

**3.6.7B Technology Education:** Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply the appropriate method of communications technology to communicate a thought.

**Grade 10:**

**3.5.10A Earth Sciences:** Relate earth features and processes that change the earth.

- Illustrate and explain plate tectonics as the mechanism of continental movement and sea floor changes.

**3.5.10B Earth Sciences:** Explain sources and uses of earth resources.

- Evaluate the impact of geologic activities/hazards (e.g., earthquakes, sinkholes, landslides).

**3.5.10C Earth Sciences:** Interpret meteorological data.

- Analyze information from meteorological instruments and online sources to predict weather patterns.

- Describe weather and climate patterns on global levels.

**3.6.10B Technology Education:** Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply and analyze advanced information techniques to produce a complex image that effectively conveys a message (e.g., desktop publishing, audio and/or video production).

**Grade 12:**

**3.5.12A Earth Science:** Analyze and evaluate earth features and processes that change the earth.

- Apply knowledge of geophysical processes to explain the formation and degradation of earth structures (e.g., mineral deposition, cave formations, soil composition).

**3.5.12C Earth Science:** Analyze atmospheric energy transfers.

- Explain how unequal heating of the air, ocean and land produces wind and ocean currents.
- Analyze the energy transformations that occur during the greenhouse effect and predict the long-term effects of increased pollutant levels in the atmosphere.
- Analyze the mechanisms that drive a weather phenomena (e.g., El Nino, hurricane, tornado) using the correlation of three methods of heat energy transfer.

**3.6.12B Technology Education:** Analyze knowledge of information technologies of processes encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply and analyze advanced information techniques to produce a complex image that effectively conveys a message (e.g., desktop publishing, audio and/or video production).
- Analyze and evaluate a message designed and produced using still, motion and animated communication techniques.
- Apply various graphic and electronic information techniques to solve real world problems (e.g., data organization and analysis, forecasting, interpolation)

***NSE Content Standards, National Research Council (Grades 7-12):***

- B. Physical Science: Structure of earth system, energy, geochemical cycles
- E. Science and Technology: Technological design, science and society

**NETS Performance Indicators (Grades 6-8):**

3. Exhibit legal and ethical behaviors when using information and technology and discuss consequences of misuse.
4. Use content-specific tools, software and simulations (environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
5. Apply productivity and multimedia tools to support personal productivity, group collaboration and learning throughout the curriculum.
7. Collaborate with peers, experts, and others using telecommunication and collaborative tools to investigate curriculum-related issues and information and to develop solutions.

**NETS Performance Indicators (Grades 9-12):**

1. Identify the capabilities and limitations of technology and assess its potential to address personal, lifelong learning and workplace needs.
2. Make informed choices among technology systems, resources and services.
4. Demonstrate and advocate for legal and ethical behaviors among peers, family and community regarding the use of technology and information.

**Internet Applications:**

Students will refine their skills by performing Internet-based research.

**Materials:**

Web browser

*Microsoft Word 2007 and Microsoft PowerPoint 2007*

**Prerequisite Skills:**

Students should have a working knowledge of *Word*, *PowerPoint* and the Internet.

**Suggested Time Allotment:** Four classes plus homework time

**Process:**

Provide an example of a natural hazard, such as a hurricane, and explain some basic concepts: What causes hurricanes? Where are hurricanes likely to strike? What danger exists as a result? What can be done to prevent loss of life and property damage? How can local chambers of commerce lessen the possible destruction? Suggest that the students copy

and paste any useful information from the Internet into separate *Word* documents. Remind them to consider the audience when writing their speeches or designing their presentations.

***Evaluation:***

Evaluate the students on the data they find on the Internet. Assess the scientific content of the speech or presentation, in addition to the overall quality of their delivery or design.


***Extensions:***

Have the students investigate the cause of the selected natural hazard. Encourage them to use the Internet as well as the library for further research. Suggest that they explore remote sensing as a tool for scientific research. (See Lesson 10)

***Technology Enrichment:***

Ask the students to plan and design a Web page based on the risk of one of the natural hazards covered in this lesson. They should include hyperlinks to educational institutions and government sites to provide more information.

## Natural Hazards Student Handout

- Choose a natural hazard from the following list:
  - earthquakes: <http://www.consrv.ca.gov/cgs/index.htm>
  - volcanoes: <http://volcano.und.nodak.edu/>
  - floods:  
<http://www.pbs.org/newshour/infocus/floods/science.html>
  - tornadoes: <http://www.noaa.gov/tornadoes.html>
  - hurricanes: <http://hurricanes.noaa.gov/>
  - tsunami: <http://www.geophys.washington.edu/tsunami/intro.html>
  - wildfires:  
[http://www.sciencedaily.com/news/earth\\_climate/wildfires/](http://www.sciencedaily.com/news/earth_climate/wildfires/)
- Launch the Web browser and access one of the above Web sites for information to present to the local chamber of commerce. Remember to search all of the following concepts in preparation for the project:
  - scientific description of the problem
  - degree of local risk
  - map of risk area (if available)
  - increased risk due to larger human population
  - predictability
  - community preparedness: acute and long term
  - business preparedness
  - household preparedness
  - mitigation techniques
- Launch *Microsoft Word 2007*. Task-switch between the Web browser and *Word* by holding down the ALT key and pressing ESCAPE or by selecting the desired application in the Quick Launch toolbar at the bottom of the window.
- Copy and paste useful information from the Internet into the *Word* document to use in preparing the speech or presentation. Highlight pertinent information on a Web page, then choose EDIT → COPY. Return to the *Word* document and select PASTE from the CLIPBOARD GROUP on the HOME TAB. Notice the PASTE OPTIONS Smart Tag that appears just below the pasted section . Click the button and note the available options.

**Note:** Please make sure to cite all sources when copying and pasting information.

- ❑ Select one of two projects: a carefully written speech or a detailed *PowerPoint* slide presentation. Either project should both inform and persuade the chamber of commerce about the consequences of the selected hazard. Be sure to thoroughly address the bulleted points listed above and be mindful of the intended audience.

### **Speechwriters:**

- ❑ After collecting sufficient data, use *Word* to write a three-page speech to “present” to the chamber of commerce. Open a blank page by clicking on the MICROSOFT OFFICE button and choosing NEW. Notice that the NEW DOCUMENT Task Pane will open. Select Blank Document → CREATE.
  - ❑ When writing the speech, be sure to address each of the bulleted points on the preceding page. Copy and paste the Internet research from the previous *Word* document, making certain to credit the facts and ideas of others as necessary.
  - ❑ Save the file by clicking on the MICROSOFT OFFICE button and choosing SAVE. Print the speech and exit *Word*.
- 

### **Slideshow Presenters:**

- ❑ Begin by launching *Microsoft PowerPoint 2007*. From the HOME TAB, click on LAYOUT under the SLIDES GROUP select one of these layouts to allow space for text and graphics.
- ❑ Be creative with the title slide by selecting different fonts, text styles and colors from the FONT GROUP on the HOME TAB. Next, click on the DESIGN TAB to explore other options.
- ❑ Create subsequent slides by clicking on the NEW SLIDE drop down arrow from the SLIDES GROUP on the HOME TAB and choosing the desired layout from the OFFICE THEME GROUP. Make a detailed slide for each of the concepts researched on the Internet. Copy and paste data as needed from the *Word* document, making sure to give credit to the ideas and facts of others as appropriate. Remember to address each of the bulleted points on the previous page.

## Project 2: Heat Island Teacher Guide

**Description:**

The students will collaborate in small groups to design and perform an experiment that tests the temperatures on various surfaces in different conditions. They will design data tables and charts in *Microsoft Excel 2007* and prepare a lab report using *Microsoft Word 2007*.

**Grades:** 7-9**Science Fields:** Earth science**PA Academic Standards:****Grade 7:**

**3.2.7B Inquiry and Design:** Apply process knowledge to make and interpret observations.

- Describe relationships by making inferences and predictions.
- Interpret data, formulate models, design models, and produce solutions.

**3.6.7B Technology Education:** Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply the appropriate method of communications technology to communicate a thought.

**3.7.7B Technological Devices:** Use appropriate instruments and apparatus to study materials.

- Select appropriate instruments to measure the size, weight, shape and temperature of living and non-living objects.

**3.7.7D Technological Devices:** Apply computer software to solve specific problems.

- Apply intermediate skills in utilizing word processing, database and spreadsheet software.

**3.7.7E Technological Devices:** Explain basic computer communications systems.

- Apply basic on-line research techniques to solve a specific problem.

**Grade 10:**

**3.2.10B Inquiry and Design:** Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.

**3.6.10B Technology Education:** Apply knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply and analyze advanced communication techniques to produce an image that effectively conveys a message (e.g., desktop publishing, audio and/or video production).

**3.7.10B Technological Devices:** Apply appropriate instruments and apparatus to examine a variety of objects and processes.

- Describe and use appropriate instruments to gather and analyze data.
- Apply accurate measurement knowledge to solve everyday problems.

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**3.7.10E Technological Devices:** Apply basic computer communications systems.

- Identify, describe and complete advanced on-line research.

***NSE Content Standards, National Research Council (Grades 6-8):***

- A. Science as Inquiry – Understanding and performing scientific inquiry
- B. Physical Science – Properties of matter
- C. Life Science – Structure and function of living systems
- D. Earth Science – History and structure of the earth system
- E. Science and Technology – Technological design, science and society
- F. Personal and Social Perspectives: Personal health, natural hazards, risks and benefits

***NETS Performance Indicators (Grades 6-8):***

2. Understand changes in information technologies and the effects on society.
3. Use content-specific tools, software and simulations (environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
4. Apply productivity and multimedia tools to support personal productivity, group collaboration, and learning throughout the curriculum.



**Internet Applications:**

The students research several sources and associate the data with their lab designs.

**Materials:**

Web browser

*Microsoft Excel 2007*

*Microsoft Word 2007*

HEAT ISLAND.XLTX template

One lab-grade alcohol thermometer (digital preferred) for every two students.

HEAT ISLAND SAMPLE.XLSX

HEAT ISLAND SAMPLE.DOCX

**Prerequisite Skills:**

Students should be familiar with reading a thermometer and have knowledge of *Word* and *Excel*.

**Suggested Time Allotment:** Four to five class periods

**Process:**

Direct the students to design a lab to test temperatures at different levels over various ground covers. Encourage them to formulate their own ideas in a class discussion. Distances that will provide varied data include 2mm, 30cm, and 1.5m above the surface. The students should allow a minute for the thermometer to reach thermal equilibrium with its surroundings, then read it as accurately as possible. The students should take the temperatures at the same time each day. In addition, they may want to take several data sets: in direct sunlight, in the shade and on both sunny and cloudy days. This lab is designed to encourage them to think about the “heat island” effect of large cities in the summer. Foster class discussion by asking what kind of building material exacerbates the effect. Can planting trees make a difference?

**Evaluation:**

Assess the students on the quality of their data and overall chart presentation. Evaluate the analysis and conclusion of the lab report, especially connections between the experiment and the larger picture of the urban heat island.

**Extensions:**

Suggest that the students use *Microsoft Access 2007* to make an extensive database. The data can be pooled into a single database representing the work of the entire class.

***Technology Enrichment:***

Assign a *PowerPoint* presentation depicting the information discovered on the Internet about the urban heat island effect.

## Heat Island Student Handout

- ❑ Design an experiment to measure above-ground temperatures in various settings. Remember that the goal of this lab is to discover the impact of different kinds of ground cover on the temperature. Measure the temperature over asphalt, concrete, gravel, dirt and grass, both at the surface and at several heights above the surface.
- ❑ Take temperatures under different weather conditions: on a sunny day, in the direct sunlight and in the shade. Consider whether the experiment should be conducted on a cloudy day as well. Is time of day important? Should the date and wind conditions (i.e., calm, slightly breezy or windy) be recorded?
- ❑ Launch *Microsoft Excel 2007* and open the HEAT ISLAND.XLTX template. Note that various surfaces are listed in the top row. Now change this list as needed to reflect the specific conditions of the experiment. After gathering sufficient data, open the *Excel* file and prepare a 3-D chart of one the data sets. The X axis notes the type of ground cover, the Y axis shows the distance from the ground, and the Z axis lists the temperature.
- ❑ Select the data by clicking in cell A1, holding down the mouse button and dragging the cursor to the final row and column of data on the lower right. Click on the INSERT TAB and COLUMN CHART from the CHARTS GROUP. Select 3D COLUMN chart, the fourth chart in the second row. Enter a name for the chart and the X, Y and Z axis names as listed above. To enter a chart title, with the chart selected, click on the LAYOUT TAB and under the LABELS GROUP, click on CHART TITLE and AXIS TITLES to enter the names.
- ❑ Edit the chart as desired. From the CHART TOOLS TAB, select FORMAT or double-click any portion of the chart to edit specific areas, such as the legend or plot area. Be sure that any stylistic choices do not make the chart difficult to read.
- ❑ Follow the steps above to produce two more charts, one for each data set created in the lab. If necessary, resize a chart by positioning the cursor on one of the handles located around its frame. When the cursor appears as a double-sided arrow, hold down the mouse button and drag until the chart is the desired size. Save the file and close, but do not exit *Excel*. Launch *Microsoft Word 2007* and prepare a lab report for the gathered data. Include the dates of the experiment, a title, an objective, a list of materials and a brief summary of procedure.
- ❑ To import the data table created in *Excel*, position the cursor in the desired position within the *Word* document and click the INSERT TAB and under the TEXT GROUP, click OBJECT. The OBJECT Dialog Box will open, select CREATE FROM FILE, click the

BROWSE button to locate the file → INSERT → OK. Reposition the table and resize as necessary.

- ❑ To include a chart, task-switch between *Word* and *Excel* by holding down the ALT key and pressing ESCAPE or by clicking the desired application in the Quick Launch toolbar at the bottom of the window. Return to *Excel* and open the spreadsheet file, which contains the study. Right-click the desired chart and select COPY. Switch back to the *Word* document, then from the HOME TAB, select PASTE from the CLIPBOARD GROUP. Repeat the process as needed to include other charts.
- ❑ To reposition a chart, select the chart and click the FORMAT TAB. From the ARRANGE GROUP, click on POSITION and select the desired horizontal alignment layout. Resize any chart by positioning the cursor on one of the resizing handles surrounding its frame. Hold down the mouse button and drag until the chart is the appropriate size.
- ❑ Consider the following questions, then write an analysis of the data.
  1. Which land cover was the coolest? Why?
  2. Was there more difference in temperatures closer to the ground or those one meter away from the ground? Why?
  3. Did more significant differences in temperatures exist between different kinds of ground cover in the sun or in the shade and on a sunny day or a cloudy one? Explain.
  4. Which is the best ground cover? Why?
- ❑ Make a strong conclusion at the end of the report. Relate the experiment to what some scientists call the “heat island” effect of large cities. Consider what can be done locally to reduce summertime temperatures. Access the following Web sites for further information:

**<http://eetd.lbl.gov/HeatIsland/>**  
**<http://www.eere.energy.gov/>**  
**<http://www.climatechangesolutions.com/>**
- ❑ Predict what would happen if a piece of thick white poster board were placed on asphalt and the temperature measured after 20 minutes. Design an experiment to accomplish this and include the results with the final draft of the report.

## Project 3: The Setting Sun

### Teacher Guide

**Description:**

The students will perform a lab in which they replicate the color of the setting sun. They will react sodium thiosulfate solution with diluted hydrochloric acid in a test tube. Then they will shine a beam of light through the test tube onto a piece of white paper and observe the color changes. Finally, the students will create a lab report in *Microsoft Word 2007*, employing the color palette to simulate the colors produced in the lab.

**Grades:** 7-12

**Science Fields:** Chemistry, with applications in physics and earth science

**PA Academic Standards:****Grade 7:**

**3.2.7B Inquiry and Design:** Apply process knowledge to make and interpret observations.

- Design controlled experiments, recognize variables, and manipulate variables.
- Interpret data, formulate models, design models, and produce solutions.

**3.4.7A Physical Science, Chemistry and Physics:** Describe concepts about the structure and properties of matter.

- Describe and conduct experiments that identify chemical and physical properties.
- Describe reactants and products of simple chemical reactions.

**3.7.7D Technological Devices:** Apply computer software to solve specific problems.

- Apply intermediate skills in utilizing word processing, database and spreadsheet software.
- Apply basic graphic manipulation techniques.

**Grade 10:**

**3.2.10B Inquiry and Design:** Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.

**3.4.10A Physical Science, Chemistry and Physics:** Explain concepts about the structure and properties of matter.

- Describe various types of chemical reactions by applying the laws of conservation of mass and energy.

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**Grade 12:**

**3.2.12B Inquiry and Design:** Evaluate experimental information for appropriateness and adherence to relevant science processes.

- Evaluate experimental data correctly within experimental limits.
- Judge that conclusions are consistent and logical with experimental conditions.

**3.4.12A Physical Science, Chemistry and Physics:** Apply concepts about the structure and properties of matter.

- Explain how the forces that bind solids, liquids and gases affect their properties.

**3.7.12D Technological Devices:** Evaluate the effectiveness of computer software to solve specific problems.

- Evaluate the effectiveness of software to produce an output and demonstrate the process.
- Analyze, select and apply the appropriate software to solve complex problems.

***NSE Content Standards, National Research Council (Grades 5-8):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Properties of matter as well as transfer of energy
- D. Earth Science: History and structure of the earth system

***NSE Content Standards, National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Structure and properties of matter, interactions of energy and matter and chemical reactions
- C. Earth and Space Science: Understanding of energy in the earth system
- D. Science and Technology: Technological design, science and society

***NETS Performance Indicators (Grades 6-8):***

1. Identify and solve routine hardware and software problems.
2. Understand current changes in information technologies and the effects society.
3. Exhibit legal and ethical behaviors when using information and technology and discuss consequences of misuse.
4. Use content-specific tools, software and simulations (environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
5. Apply productivity and multimedia tools to support personal productivity, group collaboration and learning throughout the curriculum.
8. Select and use appropriate tools and technology to accomplish a variety of tasks and solve problems.
10. Research and evaluate the accuracy, relevance, comprehensiveness and bias of electronic information sources.

***NETS Performance Indicators (Grades 9-12):***

2. Make informed choices among technology systems, resources and services.
5. Use technology for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence).
6. Evaluate technology-based options, including distance and distributed education, for lifelong learning.
8. Select and apply technology for research, information analysis, problem-solving and decision-making in content learning.
9. Investigate and apply expert systems, intelligent agents and simulations in real-world situations.
10. Use technology to compile, produce and disseminate information, models and other creative works in collaborative settings.

***Internet Applications:***

The students may want to search the Internet for an explanation of the following sets of letters: RGB, HLS, CMYK. They can learn more about the visible light spectrum and the physiology of color by visiting the following Web sites:

[http://www.thetech.org/exhibits\\_events/online/color/light/limited.html](http://www.thetech.org/exhibits_events/online/color/light/limited.html)

<http://bmrc.berkeley.edu/courseware/cs160/fall97/lectures/09-24-97/sld005.htm>

**Materials (For each group of students):***Microsoft Word 2007*

1mL of 0.5M hydrochloric acid

200mm test tube

Ring stand

Flashlight

Glass stirring rod

15g sodium thiosulfate pentahydrate

Stopwatch (optional)

Two pairs of safety goggles

60mL distilled or deionized water

Utility clamp

White paper

**Prerequisite Skills:**Basic *Word* skills are recommended.**Suggested Time Allotment:** Two class periods**Process:**

Allow the students sufficient time to set up the 30-minute lab. They must continually watch for the change in color of the test tube as well as the light shining on the white paper screen. The test tube will become faint blue, then turn white. The screen will first become yellow, then orange. The chemical reaction produces crystals of sulfur in this reaction:



When the sulfur crystals grow to about 5-10 cm in diameter, they deflect wavelengths of blue and violet light that are two components of white light. The blue light is scattered in all directions, making the test tube appear blue. The white light from the flashlight, however, continues through the test tube without blue light. The resulting color projected on the paper screen is yellow. As green light begins to be reflected away by the growing sulfur crystals, the resulting light on the paper screen is orange. The screen turns dark when all the light is reflected away by the sulfur crystals, and the contents of the test tube look white because the colors of visible light are reflected in all directions. The color palette will confirm the color combinations.

**Evaluation:**

Evaluate the students on their ability to relate the chemical processes taking place in the test tube with the color palette in *Word*.

**Extensions:**

The students may want to find out more about additive and subtractive primary colors. Refer them to the Web pages maintained by the National High Magnetic Field Laboratory:



<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/light/lightandcolor.html>


<http://micro.magnet.fsu.edu/primer/java/scienceopticsu/light/subtractive.html>

***Technology Enrichment:***

Have the students prepare a *Microsoft PowerPoint* presentation about one of these topics: the physiology of color, pigments, primary colors or the electromagnetic spectrum.

## The Setting Sun Student Handout

- ❑ Launch *Microsoft Word 2007*. Set up a lab report by clicking on the INSERT TAB and the TABLE button on the TABLES GROUP. On the Insert Table dialog box, click INSERT TABLE, specify “3” columns and “5” rows. Next, label the columns as follows: *Observations of test tube, Observations of screen, Time in seconds after mixing*.
- ❑ Format the font, style and size as desired. Select the first row by positioning the cursor over the first cell until it appears as a black arrow. Hold down the mouse button and drag to select the appropriate cells. Alternatively, use the TAB or the ARROW keys to navigate between individual cells.
- ❑ Divide into groups and collect materials as directed by the teacher. Carefully follow these procedures:
  1. Set up a ring stand and utility clamp to hold the large test tube and ***put on lab goggles***. Position the screen about 30 cm from the test tube so that it is vertical.
  2. Fill the test tube a little more than halfway with distilled or deionized water.
  3. Measure out 15g of sodium thiosulfate crystals and add them to the test tube. Mix the contents with a stirring rod to completely dissolve the crystals.
  4. Add five drops of hydrochloric acid and quickly stir it into the solution. Mix for approximately 15 seconds, lifting and lowering the stirring rod so that some acid reaches the bottom of the test tube. Remove the stirring rod and do not disturb the contents of the test tube.
  5. With the room lights dimmed or off, shine a flashlight through the contents of the test tube so that the light comes out the other side and shines on the paper screen.
  6. Watch the changes that take place both in the test tube and on the paper screen. Look for color changes. Record the results every 15 seconds. Write down the color for inclusion in the data table created in *Word*.
  7. Proceed with the observations until the test tube contents are white and the area on the screen that once received light through the test tube becomes dark (about 5 minutes). Carefully smell the contents of the test tube. Run a finger over the test tube, then quickly smell it. What is the odor?
  8. Dispose the contents of the test tube as the teacher directs. Clean up the test tube and lab bench.

- ❑ Return to the *Word* document and record the resulting observations in the data table.
- ❑ With the table selected, click on the DESIGN TAB and from the TABLE STYLES GROUP, click on SHADING → MORE COLORS. Verify that the STANDARD TAB is selected, then choose the large white hexagon on the lower left side of the window. Click the CUSTOM TAB. When the pointer is at the top of the palette, verify that the three colors — RED, GREEN and BLUE — each have a value of 255.
- ❑ Now simulate what happened to the white light inside the test tube. When the values of RED, GREEN and BLUE are each 255, the indicator to the right shows that the color produced by the three equal color values is white. If the intensity of one of the colors is decreased, the resulting color is something other than white. Refer back the lab and try to duplicate the colors of the paper screen as the reaction in the test tube progressed.
- ❑ To begin, decrease the value of one of the colors by clicking the DOWN arrow adjacent to red, green or blue. Take the value down to ZERO. What color is produced? Try reducing the value (perhaps not quite to zero) of another color. By manipulating the color values, try to approximate the color of the screen at various stages in the experiment. If the desired color is not reproduced on the first try, simply return all three colors to their original value of 255 and try again.
- ❑ When the color in the experiment is satisfactory, make a screen capture of the color palette by pressing ALT + PRINT SCREEN key on the keyboard. Click CANCEL to exit the Colors dialog box.
- ❑ Now position the cursor where the screen image is to appear. From the HOME TAB, click on PASTE on the CLIPBOARD GROUP. The image of the color palette screen now appears in the *Word* document. However, so does an image of the rest of the screen! Crop the image to include only the necessary parts. With the screen image selected, click the FORMAT TAB and in the SIZE GROUP, click CROP. Place the cursor on one of the corners and hold down the mouse button and drag inward as needed. Repeat on each side of the image until all unnecessary parts have been removed. If too much is removed accidentally, select the UNDO button  on the QUICK ACCESS TOOLBAR on the top left, or simply hold down the CTRL key and press the Z key to undo the previous action.
- ❑ Repeat these steps to provide color samples for at least three of the stages observed during the experiment.
- ❑ After the images are cropped, right-click one of them and click the PAGE LAYOUT TAB, click TEXT WRAPPING from the ARRANGE GROUP and choose TIGHT. Next, click on the POSITION button, click More Layout Options and select the desired horizontal

alignment: LEFT, CENTERED or RIGHT. This will allow text to be entered directly around the picture. Repeat this process for each image.

- ❑ The conclusion of the lab report should include a detailed description of what happened to the white light from the flashlight as it passed through the test tube. **Note:** One of the colors of visible light was being reflected away from the path of light exiting the test tube and shining on the paper screen. The color on the paper screen previewed the future color of the test tube contents. The color on the paper screen was a result of white light minus the color that was reflected away in the test tube.
- ❑ The second part of the conclusion should carefully explain what made the color in the palette change from white to another color. Conclude with a description of how the lab and the computer color palette exercise are related.
- ❑ Allow the written report to wrap freely around the screen images. One choice is to begin the report a few lines above the position of the first image. Any image can be repositioned by selecting it, then, when the cursor appears as a cross, hold down the mouse button and drag the image to the desired position. Note how the text reflows tightly around each image. Try various layouts until the best arrangement is found.
- ❑ Experiment with different text alignments. From the HOME TAB, click on SELECT from the EDITING GROUP and choose SELECT ALL to select the entire document, or hold down the CTRL key and press the A key. Another option is to highlight portions of the document and specify different text alignments. After selecting the desired text, click on the desired alignment button from the PARAGRAPH GROUP.
- ❑ When the report is complete, save and print the file, then exit *Word*.

## Project 4: Charles' Law

### Teacher Guide

**Description:**

The students will perform a lab and use *Microsoft Excel 2007* and *Microsoft Word 2007* to create a detailed report. The lab relates the volume of a gas to temperature. Data in the lab are used to produce a linear graph of temperature vs. volume. An extension of the data leads to the concept of absolute zero.

**Grade Level:** 8-12

**Science Fields:** Chemistry with applications in physics

**PA Academic Standards:****Grade 10**

**3.2.10B Inquiry and Design:** Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.

**3.2.10C Inquiry and Design:** Apply the elements of scientific inquiry to solve problems.

- Design an investigation with adequate control and limited variables to investigate a question.
- Conduct a multiple step experiment.
- Organize experimental information using a variety of analytic methods.

**3.4.10A Physical Science, Chemistry and Physics:** Explain concepts about the structure and properties of matter.

- Predict the behavior of gases through the use of Boyle's, Charles' or the ideal gas law, in everyday situations.

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**Grade 12**

**3.2.12B Inquiry and Design:** Evaluate experimental information for appropriateness and adherence to relevant science processes.

- Evaluate experimental data correctly within experimental limits.
- Judge that conclusions are consistent and logical with experimental conditions.

**3.2.12C Inquiry and Design:** Apply the elements of scientific inquiry to solve multi-step problems.

- Design an investigation with adequate control and limited variables to investigate a question.
- Organize experimental information using analytic and descriptive techniques.
- Evaluate the significance of experimental information in answering the question.

**3.4.12A Physical Science, Chemistry and Physics:** Apply concepts about the structure and properties of matter.

- Explain how the forces that bind solids, liquids and gases affect their properties.

**3.7.12D Technological Devices:** Evaluate the effectiveness of computer software to solve specific problems.

- Evaluate the effectiveness of software to produce an output and demonstrate the process.
- Analyze, select and apply the appropriate software to solve complex problems.

***NSE Content Standards, National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Structure and properties of matter, interactions of energy and matter, chemical reactions
- E. Science and Technology: Technological design, science and society

***NETS Performance Indicators (Grades 9-12):***

- 3. Analyze advantages and disadvantages of widespread reliance on technology in society.
- 4. Demonstrate and advocate for legal and ethical behaviors among peers, family and community regarding the use of technology and information.

5. Use technology for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence).
7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications and productivity.
8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.
10. Use technology to compile, produce and disseminate information, models and other creative works in collaborative settings.

**Materials (For each group of students):**

Jumbo Beral pipet	250mL beaker
Metric ruler and lab thermometer	Web browser
Electronic balance, accurate to 0.01g	<i>Microsoft Excel 2007</i>
or 8 centigram balances	<i>Microsoft Word 2007</i>
Three 1000mL beakers	
	CHARLES.XLTX template

**Prerequisite Skills:**

The students should have basic *Word* skills as well as the ability to build a graph and create simple formulas in *Excel*. They should also be able to read a thermometer and a metric ruler correctly.

**Suggested Time Allotment:** Two to three class periods

**Process:**

Introduce the concept of Charles' Law, which states that the volume of a gas is directly proportional to the temperature of a gas in Kelvin. Using *Excel*, the students develop the tables to record data. Then they perform the lab and analyze the results. Finally, the students make a graph that reflects their data and extrapolate it to the X axis and the concept of absolute zero.

**Evaluation:**

Assess the students on the quality of the graphs they produce. (This lab is subject to many variables not considered in the calculations, e.g., varying vapor pressures of water. Therefore, a student may not produce an X axis intercept of  $-273$  degrees Celsius.)

***Extensions:***

To learn about cryogenics and cryogenic research, have the students visit the following Web site: <http://www.unidata.ucar.edu/staff/blynds/tmp.html>.

Use a search engine to locate more information. Also see the related field known as cryonics or cryogenic human suspension.

***Technology Enrichment:***

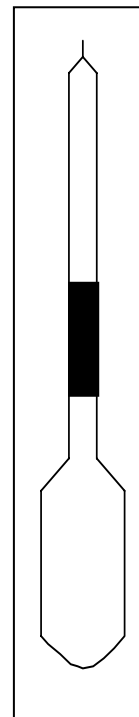
Have students find the class average of the X axis intercept. Does the class average approach  $-273^{\circ}\text{C}$ ? If not, there could be an internal error in the procedure and the students must find it.




## Charles' Law Student Handout

- Launch *Microsoft Excel 2007* and open the template CHARLES.XLTX. Gather the equipment needed for the lab and follow the procedure below:

1. Find the mass in grams of the empty Beral pipet and record the results in Table 1. Add just enough water to the Beral pipet to fill the bulb and find the mass of the pipet and water. Record the results in Table 1.
2. Completely fill the Beral pipet with water to the tip of the stem where it narrows, and find the mass of the pipet and water. Record the results in Table 1. Also measure the stem of the pipet from the place where the bulb and stem join to the tip of the pipet where the stem narrows. Record the results in Table 1.
3. Empty the pipet and add just enough water so that it will contain a “plug” of water in the stem about 2 centimeters long and about 2 centimeters away from the bulb to the water plug. Always keep the pipet in this vertical position. See the diagram on the right.
4. Place the pipet in a beaker of water at a 20 degree temperature. Take the temperature of the water to  $\pm 0.1$  degrees. Place a metric ruler alongside the stem of the pipet and measure the distance from the bulb of the pipet to the bottom of the plug of water while it is still immersed in the water. Record the temperature and length in Table 2 as *Trial 1*.
5. Add some warm water to the beaker so that the temperature of the water inside it increases anywhere from five to eight degrees. Find the exact temperature of the water and remeasure the length of the air column from the top of the bulb to the bottom of the water plug. Record the results in Table 2 as *Trial 2*.
6. Add some more warm water to the beaker (spill some water out of the beaker first) to increase the temperature five to eight degrees more. Find the exact temperature of the water and remeasure the length of the air column from the top of the bulb to the bottom of the water plug. Record the results in Table 2 as *Trial 3*.
7. Now find the total volume of the air trapped between the bottom of the pipet bulb and the bottom of the water plug for each of the three experimental trials. This will require the separate calculation of two volumes, that is, the volume of the pipet bulb and the volume of the interior of the pipet stem.



8. In *Excel*, derive a formula using the data found in Table 2 to find the volume of the pipet bulb alone. (**Note:** the volume of 1.0g of water is 1.0mL.) Insert the formula in a designated cell.
  9. Derive a formula using the data found in Table 2 to find the volume per milliliter of the interior of the stem of the pipet. Execute the formula in a designated cell in *Excel*. In Table 3, derive a formula that figures the volume of the bulb with the volume of the air in the stem for each trial. In Table 4, record temperature in Celsius degrees and volume of trapped air in milliliters for each trial.
- ❑ Highlight the pertinent data and, on the INSERT TAB, select SCATTER from the CHARTS GROUP. Scatter with Only Markers, the first option in the first row, is a good choice. Title the chart *Charles' Law Data*. The graph will consist of the temperature as the independent variable (X axis) and the volume of air trapped (Y axis). The scale of the X axis will be from -350 degrees to +1000 degrees. Use a trend line to connect the data points by selecting the chart and choosing TRENDLINE from the ANALYSIS GROUP on the LAYOUT TAB. Choose LINEAR TRENDLINE and click OK. Extend the trend line to the X axis.
  - ❑ Close the *Excel* document and minimize the window without exiting the application. Launch *Microsoft Word 2007* and write a lab report incorporating the following sections: Title of the Lab, Objective, List of Materials, Procedure, Data Tables (import from *Excel*), Analysis (import from *Excel*) and Conclusion.
  - ❑ To import the data tables from *Excel*, position the cursor in the desired position within the *Word* document and click the INSERT TAB and under the TEXT GROUP, click OBJECT. The OBJECT Dialog Box will open, select CREATE FROM FILE, click the BROWSE button to locate the file → OK. Reposition the table and resize as necessary.
  - ❑ To include the chart or graph created in *Excel*, exit *Word* by holding down the ALT key and pressing ESCAPE or by selecting the desired application in the Quick Launch toolbar at the bottom of the window. Open the appropriate file, click the chart and then from the HOME TAB, click on the COPY button  in the CLIPBOARD GROUP. Minimize *Excel*, and the *Word* document should automatically appear. Position the cursor in the desired position, click on the HOME TAB, click on PASTE → PASTE SPECIAL and click on the PASTE LINK radio button and select the MICROSOFT OFFICE EXCEL CHART OBJECT from the list. Click OK.
  - ❑ To reposition the chart, right-click it, click the PAGE LAYOUT TAB, click TEXT WRAPPING from the ARRANGE GROUP and choose SQUARE. Next, click on the POSITION button, click More Layout Options and select the desired horizontal alignment: LEFT, CENTERED or RIGHT. Resize the chart by positioning the cursor on one of the resizing handles surrounding its frame. Hold down the mouse button and drag until the chart is the appropriate size.

- ❑ In the conclusion, discuss the significance of the point at which the line crosses the X axis, and a description of how this lab relates to Charles' Law. Save and print the file. Exit *Word* and *Excel*.

## Project 5: Variation and Inheritance – Eye Color Teacher Guide

### **Description:**

The students will carry out a group survey on the occurrence of different eye colors. The data are recorded on the board (or collated by the teacher and provided as a handout). The students will enter the data on a spreadsheet and create their own chart or graph. Then they will use a wordprocessing document to complete the report. An Internet research component may be used as an extension.

**Grade Levels:** 7–10

**Science Field:** Biology

### **PA Academic Standards:**

#### **Grade 7:**

**3.3.7C Biological Sciences:** Know that every organism has a set of genetic instructions that determines its inherited traits.

- Identify and explain inheritable characteristics.
- Identify that the gene is the basic unit of inheritance.
- Identify basic patterns of inheritance (e.g., dominance, recessive, co-dominance).
- Describe how traits are inherited.

**3.6.7B Technology Education:** Explain information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply the appropriate method of communications technology to communicate a thought.

**3.7.7D Technological Devices:** Apply computer software to solve specific problems.

- Apply intermediate skills in utilizing word processing, database and spreadsheet software.

#### **Grade 10:**

**3.3.10C Biological Sciences:** Describe how genetic information is inherited and expressed.

- Explain the relationship among DNA, genes and chromosomes.
- Explain different types of inheritance (e.g., multiple allele, sex-influenced traits).

**3.6.10B Technology Education:** Analyze knowledge of information technologies of encoding, transmitting, receiving, storing, retrieving and decoding.

- Apply and analyze advanced information techniques to produce an image that effectively conveys a message (e.g., desktop publishing, audio and/or video production).

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

***NSE Content Standards, National Research Council (Grades 5-8):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- C. Life Science: Reproduction, heredity and diversity of organisms
- E. Science and Technology: Technological design, science and society

***NETS Performance Indicators (Grades 6-8):***

1. Identify and solve routine hardware and software problems.
4. Use content-specific tools, software and simulations (environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
6. Design, develop, publish and present multimedia products using technology that demonstrates curriculum concepts.
7. Collaborate with peers, experts and others using telecommunications and collaborative tools to investigate curriculum-related issues and information, and to develop solutions.
8. Select and use appropriate tools and technology to accomplish a variety of tasks and solve problems.

***NETS Performance Indicators (Grades 9-12):***

8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.

***Materials:***

*Microsoft Excel 2007 and Microsoft Word 2007*

Variation and Inheritance – EYE COLOR SAMPLE.XLSX

Variation and Inheritance – EYE COLOR SAMPLE.DOCX

**Prerequisite Skills:**

Students need to have basic proficiency in *Word* and *Excel*.

**Suggested Time Allotment:** One or two class periods

**Process:**

This section leads to a discussion on genetics, human characteristics and inheritance. Eye color is probably best dealt with after discussing other genetic characteristics, such as tongue rolling, ear lobes and widow's peaks. (**Note:** This exercise could be applied equally to each of these criteria; if so, only two columns of data would be obtained.) Most student data in the lesson will provide evidence that brown eyes are dominant. Exercise some care when following this up, as using alleles for dominant and recessive genes such as eye color is now considered to be polygenic. (See Web site addresses in student handout.)

**Evaluation:**

Assess the students on the quality of their charts and the quality of the data representation. Base further assessment on their genetic interpretation of eye color, including dominant/recessive and polygenic alleles.

**Extensions:**

Discuss the Human Genome project and specialization among other species. Further information is available at

[http://www.ornl.gov/sci/techresources/Human\\_Genome/home.shtml](http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml)


**Technology Enrichment:**

Students can convert their reports into *Microsoft PowerPoint* presentations. More advanced students can use the same process to create and represent data in Punnett squares and discuss probability factors in genetics.

## Variation and Inheritance – Eye Color

### Student Handout

- ❑ Launch *Microsoft Excel 2007* and begin a new workbook.
- ❑ Enter *Eye Color* as the title in cell C1 and *Number of Students* in cell D1. Adjust the cells to accommodate the data by selecting the column heading, then from the HOME TAB, under the CELLS GROUP, click FORMAT → AUTOFIT COLUMN WIDTH.
- ❑ Enter the data (i.e., brown, blue, hazel, etc.) in column C until every eye color in the class is included in the table. In column D, enter the number of students who have each eye color.
- ❑ To plot a chart or graph of the data, click cell C2. Hold down the left mouse button and drag the pointer to the last data entry in column D. Release the mouse button and the cells will be selected.
- ❑ Click the INSERT TAB, select COLUMN from the CHARTS GROUP. CLUSTERED COLUMN, the first option in the first row, is a good choice. The eye colors should be displayed as columns.
- ❑ With the chart selected, click the LAYOUT TAB and under the LABELS GROUP, click on CHART TITLE and AXIS TITLES to enter titles for the chart. Title the chart *Variation in Eye Color*. Label the X axis category *Eye color* and the Y axis category *Number of students*.
- ❑ The chart should be displayed in the *Excel* workbook. Select the legend and delete it. Click the first eye color column. Click the FORMAT TAB and under the SHAPE STYLES GROUP, click shape fill. Choose the appropriate color and verify that the column now contains the correct color. Repeat this procedure for the other columns.
- ❑ Select the chart, then position the cursor over one of the resizing handles that appear around its edges. Hold down the mouse button and drag to increase or decrease the size of the chart.
- ❑ Experiment with different charts and graphs, then select the style that seems to best represent the data. Right-click and select FORMAT CHART AREA to experiment with different patterns and properties. Save and close the file, but do not exit the program. Minimize *Excel*.

- ❑ Launch *Microsoft Word 2007* to begin writing the report. Enter a title such as *Variation and Inheritance – Eye Color*. Format the text by highlighting it and then choosing a FONT from the HOME TAB. Select the desired type style, size and color. Highlight the text again and set the text alignment by making the appropriate selection from the PARAGRAPH GROUP. Press ENTER twice and begin writing a report on this exercise. Repeat the above steps to format the body of the report as desired.
- ❑ To import the data tables from *Excel*, position the cursor in the desired position within the *Word* document and click the INSERT TAB and under the TEXT GROUP, click OBJECT. The OBJECT Dialog Box will open, select CREATE FROM FILE, click the BROWSE button to locate the file → INSERT → OK. Reposition the table and resize as necessary.
- ❑ To include the chart or graph created in *Excel*, exit *Word* by selecting *Excel* in the Quick Launch toolbar at the bottom of the screen. Open the appropriate file, click the chart and then from the HOME TAB, click on the COPY button  in the CLIPBOARD GROUP. Minimize *Excel*, and the *Word* document should automatically appear. Position the cursor in the desired position, click on the HOME TAB, click on PASTE → PASTE SPECIAL and click on the PASTE LINK radio button and select the MICROSOFT OFFICE EXCEL CHART OBJECT from the list. Click OK.
- ❑ To reposition the chart, right-click it, click the PAGE LAYOUT TAB, click TEXT WRAPPING from the ARRANGE GROUP and choose SQUARE. Next, click on the POSITION button, click More Layout Options and select the desired horizontal alignment: LEFT, CENTERED or RIGHT. Resize the chart by positioning the cursor on one of the resizing handles surrounding its frame. Hold down the mouse button and drag until the chart is the appropriate size.
- ❑ While writing the analysis section of the report, the following Web sites may be useful:  

**<http://www3.ncbi.nlm.nih.gov/entrez/dispomim.cgi?id=227240>**

**[www.fi.edu/tfi/units/life/forums/anatomy/eyes.html](http://www.fi.edu/tfi/units/life/forums/anatomy/eyes.html)**
- ❑ Save and print the report. Exit *Word* and *Excel*.



## Project 6: Human Genome Teacher Guide

**Description:**

The students will be assigned one of 23 pairs of human chromosomes. Using the Internet, they will research the chromosome for the specific genetic diseases that are associated with it. They will write a report using *Microsoft Word 2007* and develop a database using *Microsoft Access 2007*. Because all students will use the same format for their databases, ultimately the tables can be combined into a class database containing information on all 23 pairs of human chromosomes.

**Grades:** 9-12**Science Fields:** Biology**PA Academic Standards:****Grade 10:**

**3.3.10C Biological Sciences:** Describe how genetic information is inherited and expressed.

- Describe mutations' effects on a trait's expression.
- Explain the relationship among DNA, genes and chromosomes.
- Explain different types of inheritance (e.g., multiple allele, sex-influenced traits).

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**3.7.10E Technological Devices:** Apply basic computer communications systems.

- Identify, describe and complete advanced on-line research.

**Grade 12:**

**3.3.12C Biological Sciences:** Explain gene inheritance and expression at the molecular level.

- Explain birth defects from the standpoint of embryological development and/or changes in genetic makeup.

**3.7.12D Technological Devices:** Evaluate the effectiveness of computer software to solve specific problems.

- Analyze, select and apply the appropriate software to solve complex problems.

**3.7.12E Technological Devices:** Assess the effectiveness of computer communications systems.

- Analyze the effectiveness of on-line information resources to meet the needs for collaboration, research, publications, communications and productivity.

***NSE Content Standards, National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- E. Life Science: Heredity, biological evolution and organization of living systems
- F. Science and Technology: Technological design, science and society
- G. Science in Personal and Social Perspectives: Personal and community health

***NETS Performance Indicators (Grades 9-12):***

1. Identify the capabilities and limitations of technology and assess its potential to address personal, lifelong learning and workplace needs.
3. Analyze advantages and disadvantages of widespread reliance on technology in society.
4. Demonstrate and advocate for legal and ethical behaviors among peers, family and community regarding the use of technology and information.
5. Use technology for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence).
7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications and productivity.
8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.
9. Investigate and apply expert systems, intelligent agents, and simulations in real-world situations.

***Internet Applications:***

The students will use the Internet to find recent advances in decoding the human genome. Then they will apply this knowledge to genetic medicine in building a database of human genetic diseases.

**Materials:**

Web browser

Floppy, Zip or CD-R/W disks or file-sharing network

*Microsoft Access 2007*

*Microsoft Word 2007*

CLASS DATA.ACCDB template, GENOME.ACCDB template, EXAMPLE.ACCDB template

**Prerequisite Skills:**

Students should have some basic Internet skills to be able to search several sites for information relevant to the human genome project. They also need to be proficient in using *Word* and *Access*.

**Suggested Time Allotment:** Three to four class periods

**Process:**

- ❑ Assign different students (or small groups of students) to one of the 23 pairs of human chromosomes. They will locate pertinent information on the Internet and write a report in *Word*. The report should include a related image. Most students will have to learn some new terms and explore the meaning of chromosome configurations such as bands.
- ❑ After the students complete their databases, create a master database. To do so, open the CLASS DATA.ACCDB template. Two steps will be required to create this class database, and the process will take about one hour. (**Note:** refer to EXAMPLE.ACCDB to view a sample database.) The first step is to insert all of the individual tables from every student or group into the database. Create the CLASS DATA.ACCDB database and click the CREATE TAB and then the TABLE button from the TABLES GROUP. Click the EXTERNAL DATA TAB and under the IMPORT GROUP, click the ACCESS button. Locate the first student database, GENOME.MDB and click OK. Next, select the student table named CHROMOSOME\_\_ from the Import Objects dialog box, TABLES TAB, and click OK. The database window should appear automatically. Repeat this process until all the student tables have been incorporated into the Class Data database.
- ❑ The second step is to copy each student table into one table named All Chromosomes. While in the Database window, select the student table to be incorporated. Right-click the table and select copy. Select the all chromosomes table but don't open it. Now right-click and select paste. The Paste Table As window will appear. Enter All Chromosomes for the Table Name, then choose append data to existing table and click ok. Repeat this process until every student table is incorporated into the all chromosomes table. Next, save the table as all chromosomes.mdb. If the class is not operating on a network, make copies of all chromosomes.mdb and class data.mdb on floppy, zip or CD-R/W disks and return them to the students for analysis.

***Evaluation:***

Evaluate the students on the details of their final reports. The reports should cover all of the points from the Student Handout, including concluding remarks about symptoms and genetic diseases. In addition, evaluate students on their contributions to the class database.

***Extensions:***

Some students may find it interesting to learn how geneticists are acquiring information about the human genome so quickly. Diverse tools such as computers and bacteria have made such rapid advances possible. Background on the human genome project may be found at the following U. S. Department of Energy Web site:

**<http://www.sc.doe.gov/>**

***Technology Enrichment:***

Internet-based video files provide a rich source of information on the human genome. A particularly interesting site, The Gene Media Forum at **<http://www.genemedia.org/>**, offers a forum to promote “public dialogue of genome research and its impact on science and society.” Some of the topics of discussion include: DNA and Justice – How is Science Changing Crime and Punishment?, Race to Sequence the Human Genome, Genetic Testing: Help, Hope or Hype, and Genetically Modified Foods. To access the videos on this site, fast Internet access is recommended, such as a T1 line, DSL or cable modem. If the classroom has dialup access, download the videos in advance by right-clicking the link and selecting SAVE TARGET AS, then choosing SAVE.

## The Human Genome Student Handout

- ❑ The teacher will assign one of 23 different pairs of human chromosomes.
- ❑ Launch the Web browser and carefully read the home page of the National Center for Biotechnology Information: <http://www.ncbi.nlm.nih.gov/disease/>.
- ❑ Locate a picture of the assigned chromosome and save it to the hard disk drive. Next, right-click the image and choose SAVE IMAGE AS. Select the appropriate folder location and click SAVE.
- ❑ Launch *Microsoft Word 2007* and prepare a report for the assigned chromosome that includes these items:
  - An image of the chromosome
  - An explanation of the bands in the chromosome
  - The size of the chromosome in base pair units
  - The number of contigs in the chromosome
  - A list of five contigs and their physical positions in the chromosome. Find the contig map by opening the site: <http://www.ncbi.nlm.nih.gov/> and clicking on MAP VIEWER and selecting the specific chromosome. Change the maps of the chromosome by making adjustments in DISPLAY SETTINGS.
  - The definitions of the following words: genome, sequencing, contigs, gene, chromosome and genetic disease.
- ❑ Save the file as a *Word* document.
- ❑ Return to the site: <http://www.ncbi.nlm.nih.gov/disease/>. Select the chromosome and pick two genetic diseases associated with it. (Choose familiar diseases.) If the assigned chromosome lists only one disease, choose one disorder rather than two.
- ❑ Launch *Microsoft Access 2007* and prepare a database for both diseases. Open the GENOME.ACCDB template and click the CREATE TAB, then TABLE DESIGN in the TABLES GROUP. Refer to the Web site listed above to fill in the database fields. Be sure to fill in the fields in the same sequence as the information appears on the Web site.
- ❑ The teacher will build a database for all human chromosomes by combining the individual student databases. This class database will be returned to you for analysis later in the lesson.

- ❑ Continue to add the researched information as described above. A field may be left blank, but data for the Gene Symbol must be entered since it is the primary key field. Add any interesting notes about the disease in the field called Description. Separate ideas in the Description field with a semicolon.
- ❑ When all data are entered, save the file as a table called *Chromosome\_\_*. (The blank space should be the number or letter of the chromosome.) If saving the file to disk, be certain to label it properly for inclusion in the class database.
- ❑ One of the reasons for building a database is to search the data for common fields. If physicians detect symptoms in patients that remind them of a certain disorder, they can look in a database to compare symptoms with various disorders. If suspect disorders are found, physicians can refer the patient to specialists who can make accurate diagnoses and prescribe treatment.
- ❑ Launch the class database, ALL CHROMOSOMES.ACCDB and position the cursor in the first field of the first record. Look for a symptom, for example, “shortness of breath.” Select the FIND button on the HOME TAB. Enter the word *shortness*, in the Find and Replace window. Select the appropriate table in the Look In drop-down menu and choose ANY PART OF FIELD in the Match drop-down menu, then click FIND NEXT. The next instance of the word will be highlighted.
- ❑ Continue this process until the prompt “Microsoft Access finished searching the Records” appears. In how many disorders did this symptom appear?
- ❑ Exit *Access*, then retrieve the *Word* document created at the beginning of this lesson. Write a report of the findings about symptoms and the overall class database.
- ❑ Save and print the file. Exit *Word*.

## Project 7: Pendulum Experiment – Oscillations

### Teacher Guide

**Description:**

The students will carry out a number of experiments to see what factors affect the period of oscillation of a pendulum. They enter the data on a spreadsheet and create their own charts or graphs. The gradient of the slope obtained is calculated and a value for  $g$  is determined ( $g = 4\pi^2 \div \text{slope}$ ). More experienced students can use their data to determine the formula for the period of oscillation ( $T=2\pi\sqrt{l/g}$ ). Then they will create a word processing document to complete the report. Extension work could include Internet data and search.

**Grade Levels:** 10-12

**Science Field:** Physics

**PA Academic Standards:****Grade 10:**

**3.2.10C Inquiry and Design:** Apply the elements of scientific inquiry to solve problems.

- Design an investigation with adequate control and limited variables to investigate a question.
- Organize experimental information using a variety of analytic methods.

**3.4.10C Physical Science, Chemistry and Physics:** Distinguish among the principles of force and motion

- Know Newton's laws of motion (including inertia, action and reaction) and gravity and apply them to solve problems related to forces and mass.
- Determine the efficiency of mechanical systems by applying mathematical formulas.

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**Grade 12:**

**3.2.12C Inquiry and Design:** Apply the elements of scientific inquiry to solve multi-step problems.

- Design an investigation with adequate control and limited variables to investigate a question.

- Organize experimental information using analytic and descriptive techniques.

**3.4.12C Physical Science, Chemistry and Physics:** Apply the principles of motion and force.

- Describe inertia, motion, equilibrium, and action/reaction concepts through words, models and mathematical symbols.

**3.7.12D Technological Devices:** Evaluate the effectiveness of computer software to solve specific problems.

- Evaluate the effectiveness of software to produce an output and demonstrate the process.
- Analyze, select and apply the appropriate software to solve complex problems.

***NSE Content Standards, National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Understanding of motion and forces
- E. Science and Technology: Understanding of the relationship between science and technological design

***NETS Performance Indicators (Grades 9-12):***

- 7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications and productivity.
- 8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.

***Materials:***

*Microsoft Excel 2007*

*Microsoft Word 2007*

0.51.2m string

various masses, (such as, 10025g, 200g, 250g, 500g)

stop watch

swing stand and horizontal bar

***Prerequisite Skills:***

Students should have basic skills in using *Word* and *Excel*, and advanced skills in working with formulas and taking the square root of numbers.



***Suggested Time Allotment:*** One to two class periods

***Process:***

This experiment is a good introduction to the properties of vibrations and waves. It can be carried out with little or no prior work or can be suitable for following up previous lessons on vibrating springs. Some students may need to review how to determine the slope of a graph, but most should be able to complete the exercise by following the student handout.

***Evaluation:***

Assess students on the amount and variety of their experimental data, as well as on the accuracy of their results. Evaluate their ability to use those results to determine a value for G. Assess more advanced students on their ability to discover that the provided formula only holds up for small amplitudes, and on their attempts to determine a formula for T.

***Extensions:***

Extend the discussion to include the use of pendulums in clocks and the problems of material expansion in time pieces in addition to children's swings and resonance. Look at the Web site <http://www.howstuffworks.com> for an interesting section on "How Pendulum Clocks Work."

***Technology Enrichment:***

The students can perform simulated experiments using the following Web sites. These sites will allow students to perform experiments quickly, retrieve accurate results and observe the limitations of derived formulae.

<http://physics.mercer.edu/pendulum/> or

<http://www.sciencejoywagon.com/physicszone/lesson/otherpub/wfendt/pendulum.htm>

## Pendulum Experiment – Oscillations

### Student Handout

- ❑ This experiment examines the various factors that affect the time it takes for a pendulum to swing (oscillate). Data will be recorded and analyzed in *Microsoft Excel 2007* and then incorporated into a report written in *Microsoft Word 2007*.
- ❑ Set up a stand on a bench. Add a clamp (or a ring) to the stand, so that the clamp/ring overhangs the edge of the bench. Add a large weight to the base of the stand or use a small C-clamp to hold the base of the stand to the bench. This will prevent the stand from toppling over during the experiment.
- ❑ Attach a 1.2m piece of string to the clamp. Add a 500g mass (the bob) to the end of the string, then wind the string around the clamp until the length (to the center of the bob) measures 1m.
- ❑ Swing the pendulum through an arc of about 30 degrees and time how long it takes to complete 10 oscillations. One complete to-and-fro movement of the pendulum equals one oscillation. This is called the “period of the pendulum.”
- ❑ Repeat the experiment with a different amplitude (arc) of swing. For this experiment, it is best to limit the amplitude of the oscillations to 30 degrees or less.
- ❑ Launch *Word*, and set up a lab report by clicking the INSERT TAB and the TABLE button on the TABLES GROUP. On the Insert Table dialog box, click INSERT TABLE, specify “5” columns and “9” rows. Label the columns as shown below. Complete the experiment by collecting the appropriate data as indicated. Record the data for each category, using


Length of string (m)	Mass of bob (g)	Amplitude of Oscillation <sup>o</sup>	Time for 10 Oscillations (s)	Period (s)
1	500	30		
1	500	Your data		
1	250	30		
1	250	15		
0.5	500	30		
0.5	500	15		
0.5	250	30		
0.5	125	30		
0.25	500	30		
0.25	500	15		
0.25	250	30		

the TAB or ARROW keys to navigate between cells. Save the file, then minimize *Word*.

- ❑ The results from the experiment should support the conclusion that it is the length of the pendulum and not the amplitude (so long as it is small), or mass of the bob that determines the period.
- ❑ Use this information in another experiment, in which the changing length and period of a pendulum is used to calculate a value for the acceleration due to gravity (g).
- ❑ Launch *Microsoft Excel 2007*. Enter the following headings in the cells as shown. After each entry, adjust the size of the cells to fit the data by selecting the appropriate column heading, then from the HOME TAB, under the CELLS GROUP, click FORMAT → AUTOFIT COLUMN WIDTH. **Note:** To create the “squared” symbol (<sup>2</sup>), highlight the number 2, right-click and select FORMAT CELLS and click the SUPERSCRPT check box.

Column C	Column D	Column E	Column F	Column G	Column H
Length l (m)	Time for 30 oscillations Exp. One(s)	Time for 30 oscillations Exp. Two	Periodic time T(s)	T <sup>2</sup> s <sup>(2)</sup>	T <sup>2</sup> /l

- ❑ Repeat the experiment. Choose at least six different lengths of string and record the results in the table in *Excel*. Select all of the cells in column C that contain data, then hold down the CTRL key, and select column G.
- ❑ Click the INSERT TAB and from the CHARTS GROUP, select SCATTER. Scatter with Only Markers, the first option in the first row, is a good choice. Click the LAYOUT TAB and select GRIDLINES from the AXES GROUP. Click Primary Horizontal Gridlines → none. The lines should disappear from the graph. Next, still on the LAYOUT TAB, select LEGEND from the LABELS GROUP. Click NONE. The legend should disappear from the graph. Finally, still on the layout TAB, select CHART TITLE from the LABELS GROUP, and enter a title for the graph.
- ❑ Click on AXIS TITLES → PRIMARY VERTICAL AXIS TITLE → ROTATED TITLE and enter  $T^2 \text{ s}^2$ . Click on AXIS TITLES → PRIMARY HORIZONTAL AXIS TITLE and enter  $l \text{ (m)}$ . Save the chart as CHART1. Click  $T^2 \text{ s}^2$  on the chart and change the number 2 to squared by right-clicking, selecting FONT and clicking the SUPERSCRPT checkbox.
- ❑ To analyze the data, click the chart. On the LAYOUT TAB, select TRENDLINE from the analysis GROUP. Click LINEAR TRENDLINE and click OK. A straight line will appear on the graph. Take the gradient of this line. How does this value compare with on the values given in column H?

- ❑ The pendulum experiment is a good way of calculating the acceleration because of gravity ( $g$ ). To determine gravity from this experiment, use the following formula:  $g = 4\pi^2 \div \text{slope}$ . The slope is the gradient of the graph. From this formula try to determine a formula for the period of a pendulum. Hint: Use  $T$ ,  $\pi$   $l$  and  $g$ .
- ❑ Save and close the file, but do not exit *Excel*. Minimize the window.
- ❑ Maximize *Word* and leave the results table from the first experiment as is. Enter a title for the report, such as *Pendulum Experiments*. Format the title. Press ENTER twice and begin typing the report. Afterwards, format the body of the report.
- ❑ For the results section of the report, select the initial results table in *Word* by positioning the cursor in the table and clicking the small crosshair symbol that appears just outside the upper left corner. Hold down the mouse button and drag to reposition the table.
- ❑ To include the chart, task-switch to *Excel* by selecting *Excel* in the Quick Launch toolbar at the bottom of the screen. Open the appropriate file, click the chart and from the HOME TAB, click on the COPY button  in the CLIPBOARD GROUP. Minimize *Excel*, and the *Word* document should automatically appear. Position the cursor in the desired position, click on the HOME TAB, click on PASTE → PASTE SPECIAL and click on the PASTE LINK radio button and select the MICROSOFT OFFICE EXCEL CHART OBJECT from the list. Click OK.
- ❑ To reposition the chart, right-click it, click the PAGE LAYOUT TAB, click TEXT WRAPPING from the ARRANGE GROUP and choose SQUARE. Next, click on the POSITION button, click More Layout Options and select the desired horizontal alignment: LEFT, CENTERED or RIGHT. Resize the chart by positioning the cursor on one of the resizing handles surrounding its frame. Hold down the mouse button and drag until the chart is the appropriate size.
- ❑ In the analysis section of the report, discuss the calculation of  $g$  and provide a proposed formula for  $T$ . Include a detailed explanation, commenting on the accuracy of the data and the possible limitations of this experimental method for determining  $g$ .
- ❑ Save and print the report. Exit *Excel* and *Word*.

## Project 8: Radon and Radioactivity

### Teacher Guide

**Description:**

The students will perform a simulation of the decay of a radioactive element. They systematically eliminate some M&M candy pieces in each trial until there are no more left to count. The students then create data tables and graphs of the results using *Microsoft Excel 2007*, in addition to producing a lab report using *Microsoft Word 2007*.

**Grades:** 7-11

**Science Fields:** Chemistry and physics with applications in earth science and biology

**PA Academic Standards:****Grade 7:**

**3.2.7B Inquiry and Design:** Apply process knowledge to make and interpret observations.

- Design controlled experiments, recognize variables, and manipulate variables.

**3.4.7A Physical Science, Chemistry and Physics:** Describe concepts about the structure and properties of matter.

- Identify elements as basic building blocks of matter that cannot be broken down chemically.
- Describe and conduct experiments that identify chemical and physical properties

**3.7.7D Technological Devices:** Apply computer software to solve specific problems.

- Apply intermediate skills in utilizing word processing, database and spreadsheet software.

**Grade 10:**

**3.2.10B Inquiry and Design:** Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.

**3.4.10B Physical Science, Chemistry and Physics:** Explain concepts about the structure and properties of matter.

- Know that atoms are composed of even smaller sub-atomic structures whose properties are measurable.
- Describe various types of chemical reactions by applying the laws of conservation of mass and energy.

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**Grade 12:**

**3.2.12B Inquiry and Design:** Evaluate experimental information for appropriateness and adherence to relevant science processes.

- Evaluate experimental data correctly within experimental limits.
- Judge that conclusions are consistent and logical with experimental conditions.

**3.4.12A Physical Science, Chemistry and Physics:** Apply concepts about the structure and properties of matter.

- Explain how radioactive isotopes that are subject to decay can be used to estimate the age of materials.
- Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes.
- Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas.

**3.7.12D Technological Devices:** Evaluate the effectiveness of computer software to solve specific problems.

- Evaluate the effectiveness of software to produce an output and demonstrate the process.
- Analyze, select and apply the appropriate software to solve complex problems.

***NSE Content Standards, National Research Council (Grades 5-8):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Structure and properties of matter
- D. Earth and Space Science: Earth history
- E. Science and Technology: Technological design, science and society
- F. Science in Personal and Social Perspectives: Personal health

***NSE Content Standards, National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Structure and properties of matter, interactions of energy and matter and chemical reactions
- E. Earth and Space Science: Energy in the earth system, geochemical cycles and evolution
- F. Science and Technology: Technological design, science and society
- G. Science in Personal and Social Perspectives: Personal and community health, environmental quality

***NETS Performance Indicators (Grades 6-8):***

- 2. Understand current changes in information technologies and the subsequent effects of society.
- 4. Use content-specific tools, software and simulations (environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
- 5. Apply productivity and multimedia tools to support personal productivity, group collaboration and learning throughout the curriculum.
- 8. Select and use appropriate tools and technology to accomplish a variety of tasks and solve problems.
- 9. Demonstrate an understanding of concepts underlying hardware, software and connectivity, and of practical applications to learning and problem solving.

***NETS Performance Indicators (Grades 9-12):***

- 2. Make informed choices among technology systems, resources and services.
- 5. Use technology for managing and communicating personal and professional information (e.g., finances, schedules, addresses, purchases, correspondence).
- 6. Evaluate technology-based options, including distance and distributed education, for lifelong learning.
- 8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.

**Internet Applications:**

Students search the Internet for information on the natural decay series of Uranium-238 and the significance of alpha and beta decay.

**Materials (For every pair of students):**

Plastic bag

5"x7" Index card

Paper cup

Sheet of notebook paper

50 M&M plain candy pieces

RADON AND RADIOACTIVITY SAMPLE.XLSX

RADON AND RADIOACTIVITY SAMPLE.DOCX

*Microsoft Word 2007*

*Microsoft Excel 2007*

**Prerequisite Skills:**

Students should be proficient in *Word* and *Excel*, especially in making tables and separating text and numbers.

**Suggested Time Allotment:** Two to three class periods

**Process:**

The students perform a simulation of radioactive decay. Using M&M candy, they simulate the half-life of Radon-222. The students graph the results using *Excel* and determine which function — linear, logarithmic or reciprocal — produces a linear graph of the results. Then they develop a lab report using *Word*, import information from *Excel* and use Internet-based research to make connections between this simulation and radioactivity. (**Note:** For an example of the spreadsheet, refer to the RADIO SAMPLES.XLTX template, but do not distribute it to the students.)

**Evaluation:**

Evaluate the students on the quality and accuracy of each graph. Assess the interpretation of the graphs and the relationship between the simulation and radioactivity.

**Extensions:**

Radon-222 is an environmental hazard. Its presence indoors is responsible for approximately 5 to 30,000 lung cancer deaths annually in the United States. The students can search the Internet for information on this hazard. Some suggested sites are listed below:

<http://www.stat.columbia.edu/radon>

<http://eande.lbl.gov/IEP/high-radon/hr.html>



**<http://www.epa.gov/iaq/radon/index.html>**

***Technology Enrichment:***

The students can download and import graphics from the Internet and place them in the *Word* lab report they produced for this project.




## Radon and Radioactivity

### Student Handout

- ❑ In this project, a lab simulation will be performed using M&M candies as a substitute for the atoms of a radioactive substance. The M&M pieces that land with the letter *m* facing up will be considered decayed. Those that land with the letter *m* facing down will not be considered as having decayed.
- ❑ Launch *Microsoft Excel 2007* and set up the spreadsheet as follows: Title the first column *Half-lives*, then enter the numbers 0-6 in cells A2 through A8. Title the second column *Number of M&Ms that did not decay*. Select the column and then from the HOME TAB, under the CELLS GROUP, click FORMAT → AUTOFIT COLUMN WIDTH to accommodate the entire title.
- ❑ Perform the simulation as instructed below:
  1. Count out exactly 50 M&M candy pieces and place them in a paper cup. Enter the number 50 in the cell B2.
  2. Place a file card over the cup and shake the contents, but not so hard that the candies split and crack. Spill the M&Ms out in a single layer onto a clean piece of paper.
  3. Count all of the pieces that do not have the letter *m* face up, and place them back into the cup. Enter this amount in cell B3. Put the M&M pieces that have the letter *m* facing up aside as directed by the teacher.
  4. Repeat steps 2 and 3, recording the number of M&M pieces placed back into the cup in the *Excel* table and discarding those M&M pieces that had the letter *m* facing up.
  5. Repeat this process until the last remaining M&M piece comes up with its letter *m* facing up. It may take one group five trials to finish and another group six or seven trials.
- ❑ Prepare a chart or graph of the data. Select the data in both columns, but do not select the title cells. Click the INSERT TAB and from the CHARTS GROUP, click on SCATTER. Scatter with only Markers, the first option in the first row, is a good choice.
- ❑ Label the X axis *Half-life* and the Y axis *M&Ms that did not decay*. Right-click the legend within the chart and select DELETE. Next, edit the chart's X axis values by clicking the LAYOUT TAB and clicking the AXES button from the AXES GROUP. Select Primary Horizontal Axis, then More Primary Horizontal Axis Options. On the Format Axis dialog box, make sure Axis Options is selected and change all four of the auto formatting options to fixed. Click CLOSE.

- ❑ Double-click a blank area of the chart to format text, color, shading and other properties. Be certain that the stylistic choices do not make the data difficult to read.
- ❑ Add another column to the data table. Enter *Reciprocal of M&Ms that did not decay* as the title in cell C1. Select cell C2 and enter an equal sign = to activate a formula.
- ❑ Next, enter  $1/$  then select the cell containing the corresponding number of M&Ms that did not decay.
- ❑ Use the FILL option by clicking the appropriate cell, then positioning the cursor in the lower right corner until a solid black plus sign + appears. Hold down the mouse button and drag to fill. After releasing the mouse button, verify that the column is filled.
- ❑ Use the data within the first and third columns to create another graph. To skip the second column, simply select the first column and hold down the control key while selecting the third column. Use the directions as shown on the previous page to make the second chart.
- ❑ Create a fourth column: *Log10 of the M&Ms that did not decay*. Click in cell D2 and click the FORMULAS TAB and from the FUNCTION LIBRARY GROUP, click INSERT FUNCTION. From the Insert Function dialog box, select Math & Trig as the category and Log10 as the function. Click ok.
- ❑ The Function Arguments dialog box will pop up. In the Number window, enter the value from cell B2 in the column labeled “M&Ms that did not decay” and click OK. The log of the corresponding value now appears in cell D2. Repeat this process for the remaining values in the second column. For cell D3, enter the value of cell B3 in the number window; for cell D4, enter the value of cell B4, and so on.
- ❑ Create a graph by following the directions on the preceding page for creating and formatting a new chart or graph. Save the spreadsheet and close the file without exiting the application. Minimize the window.
- ❑ Launch *Microsoft Word 2007* and make a lab report detailing this simulation. Include a title, an objective, a list of materials and a brief outline of procedure.
- ❑ To import the data tables from *Excel*, position the cursor in the desired position within the *Word* document and click the INSERT TAB and under the TEXT GROUP, click OBJECT. The OBJECT dialog box will open, select CREATE FROM FILE, click the BROWSE button to locate the file → OK. Reposition the table and resize as necessary.

- ❑ To include the chart or graph created in *Excel*, exit *Word* by selecting *Excel* in the Quick Launch toolbar at the bottom of the screen. Open the appropriate file, click the chart and then from the HOME TAB, click on the COPY button  in the CLIPBOARD GROUP. Minimize *Excel*, and the *Word* document should automatically appear. Position the cursor in the desired position, click on the HOME TAB, click on PASTE → PASTE SPECIAL and click on the PASTE LINK radio button and select the MICROSOFT OFFICE EXCEL CHART OBJECT from the list. Click OK. Repeat this procedure for the other two charts.
- ❑ To reposition the chart, right-click it, click the PAGE LAYOUT TAB, click TEXT WRAPPING from the ARRANGE GROUP and choose SQUARE. Next, click on the POSITION button, click More Layout Options and select the desired horizontal alignment: LEFT, CENTERED or RIGHT. Resize the chart by positioning the cursor on one of the resizing handles surrounding its frame. Hold down the mouse button and drag until the chart is the appropriate size.
- ❑ Answer the following question in the report: In which graph does the data seem to make a straight line? The appearance of a straight line indicates that function — either the number of M&Ms that did not decay, or its reciprocal or its log to the base 10 — is a linear relationship.
- ❑ In the conclusion, relate this simulation to the half-life of a radioactive substance such as Radon-222. Include the following details:
  1. A description of the U-238 decay series.
  2. An illustration of alpha decay and beta decay in two different nuclides.
  3. An explanation of what is meant by the half-life of a radioactive substance.
- ❑ Use the Internet to research these concepts. Some sites are listed below:

**<http://www.geo.cornell.edu/geology/classes/geochemdata/Udecayseries.html>**

**[http://www.ccnr.org/decay\\_U238.html](http://www.ccnr.org/decay_U238.html)**

**<http://hyperphysics.phy-astr.gsu.edu/hbase/nuclear/radact.html>**

## Project 9: Rates of Reaction

### Teacher Guide

**Description:**

The students will carry out an experiment to see how changing the concentration of a reactant affects the rate of a chemical change. They enter data on a spreadsheet and create graphs from their experimental results. The students then choose from a variety of methods to analyze the order of the reaction before completing a detailed report.

**Grade Levels:** 10-12

**Science Fields:** Physical science and chemistry

**PA Academic Standards:****Grade 10:**

**3.2.10B Inquiry and Design:** Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Describe materials using precise quantitative and qualitative skills based on observations.
- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.

**3.2.10C Inquiry and Design:** Apply the elements of scientific inquiry to solve problems.

- Design an investigation with adequate control and limited variables to investigate a question.
- Conduct a multiple step experiment.
- Organize experimental information using a variety of analytic methods.
- Judge the significance of experimental information in answering the question.

**3.4.10A Physical Science, Chemistry and Physics:** Explain concepts about the structure and properties of matter.

- Describe various types of chemical reactions by applying the laws of conservation of mass and energy.

- Apply knowledge of mixtures to appropriate separation techniques.

**3.7.10D Technological Devices:** Utilize computer software to solve specific problems.

- Apply advanced word processing, database and spreadsheet skills.

**Grade 12:**

**3.2.12B Inquiry and Design:** Evaluate experimental information for appropriateness and adherence to relevant science processes.

- Evaluate experimental data correctly within experimental limits.
- Judge that conclusions are consistent and logical with experimental conditions.
- Interpret results of experimental research to predict new information or improve a solution.

**3.2.12C Inquiry and Design:** Apply the elements of scientific inquiry to solve multi-step problems.

- Design an investigation with adequate control and limited variables to investigate a question.
- Organize experimental information using analytic and descriptive techniques.
- Evaluate the significance of experimental information in answering the question.

**3.4.12A Physical Science, Chemistry and Physics:** Apply concepts about the structure and properties of matter.

- Explain how the forces that bind solids, liquids and gases affect their properties.
- Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas.

**3.7.12D Technological Devices:** Evaluate the effectiveness of computer software to solve specific problems.

- Evaluate the effectiveness of software to produce an output and demonstrate the process.

***NSE Content Standards, National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Chemical reactions and interactions of energy and matter
- E. Science and technology: Technological design, science and society

**NETS Performance Indicators (Grades 9-12):**

2. Make informed choices among technology systems, resources and services.
5. Use technology for managing and communicating personal and professional information (e.g., finances, schedules, addresses, purchases, correspondence).
7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications and productivity.

**Materials (For each student or group):***Microsoft Excel 2007**Microsoft Word 2007*

10mL measuring cylinder

200mL of sodium thiosulfate solution

125 or 250mL Erlenmeyer flask

50mL hydrochloric acid

stopwatch (or your own watch)

50mL (or 100mL) measuring cylinder

**Note:** The sodium thiosulfate solution is produced by taking 80g (0.32m) of hydrated sodium thiosulfate ( $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ ) and making up to 1L with distilled water. The hydrochloric acid is 1M. Add 8.3mL concentrated HCl per 100mL of solution.

**Prerequisite Skills:**

Some experience with *Excel* and *Word* is recommended. Rudimentary lab skills are essential, particularly in measuring quantities of solutions.

**Suggested Time Allotment:** Two to three class periods

**Process:**

This experiment is a good starting point for an introduction to the rates of reaction. It can be carried out with minimal advance work, and discussed at a number of different levels. Depending upon skill levels, the students in physical science can use the worksheet in an elementary way and the students in chemistry can use it in an advanced way. **(Please Note:** To perform this experiment, the students will need to download a 1.7 MB application from this site: <http://www.modelscience.com/software.html>. To download during class time, fast Internet access is essential, (such as a T1 line, DSL or cable modem). If the classroom has regular 56K dialup access, be certain to download the program beforehand.

In the reaction given, sodium thiosulfate ( $\text{Na}_2\text{S}_2\text{O}_3$ ) and hydrochloric acid are mixed. The products include sulfur dioxide, sulfur, water and sodium chloride. The students will change the concentration of sodium thiosulfate, reacting it with an excess of hydrochloric acid (which becomes a constant in each experiment). As the reaction proceeds, sulfur is precipitated and the contents of the reaction vessel become cloudy.



The time it takes for the reaction vessel to become cloudy can be related to the rate of the reaction at that particular concentration of sodium thiosulfate.



- (1) In this reaction, the students are timing the rate of appearance of solid sulfur. When the sulfur obscures the cross from vision, the reaction is over. As it takes the same amount of sulfur to obscure the cross in each experiment, the time it takes for the cross to become obscured relates to the rate of reaction. The rate of appearance of sulfur equals the rate of disappearance of sodium thiosulfate and can therefore be used as a measure of the rate with respect to thiosulfate concentration.
- (2)  $\text{Rate} = \Delta[\text{Na}_2\text{S}_2\text{O}_3]/\Delta\text{time}$  or  $\text{Rate} = k[\text{Na}_2\text{S}_2\text{O}_3]^n$  where  $n = 0, 1$  or  $2$  depending upon how the sodium thiosulfate concentration effects the reaction rate. Zero, 1 and 2 are known as the order of the reaction.  $[\text{Na}_2\text{S}_2\text{O}_3]$  represents the concentration of sodium thiosulfate. Using  $\text{Rate} = \Delta[\text{Na}_2\text{S}_2\text{O}_3]/\Delta\text{time}$ , a plot of  $[\text{Na}_2\text{S}_2\text{O}_3]$  against time that gives a straight line indicates that the rate is constant and therefore independent of the  $[\text{Na}_2\text{S}_2\text{O}_3]$ . This would be a zero order reaction. A curve for the same graph indicates that rate is dependent upon  $[\text{Na}_2\text{S}_2\text{O}_3]$ .
- (3) Given that rate is inversely proportional to time, then a plot of rate (i.e.  $1/\text{time}$ ) against  $[\text{Na}_2\text{S}_2\text{O}_3]$  will give a straight line for a first order reaction and an exponential curve for a second order reaction.
- (4) Integration of  $\text{Rate} = k[\text{Na}_2\text{S}_2\text{O}_3]^n$  gives  $\text{LN}[\text{Na}_2\text{S}_2\text{O}_3] = -kt + \text{LN}[\text{Na}_2\text{S}_2\text{O}_3]_{t=0}$  for  $n = 1$ , i.e., a first order reaction, consequently a plot of  $\text{LN}[\text{Na}_2\text{S}_2\text{O}_3]$  against  $t$ , gives a straight line of slope  $= -k$ . When  $n = 2$ ,  $\text{Rate} = k[\text{Na}_2\text{S}_2\text{O}_3]^2$  and integration provides  $1/[\text{Na}_2\text{S}_2\text{O}_3] = kt + 1/[\text{Na}_2\text{S}_2\text{O}_3]_{t=0}$ , thus a plot of  $1/[\text{Na}_2\text{S}_2\text{O}_3]$  against  $t$  gives a straight line of slope  $= k$ .

**Evaluation:**

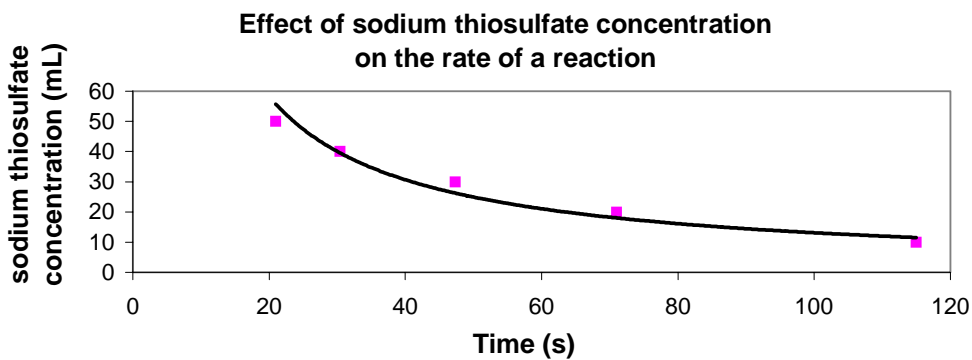
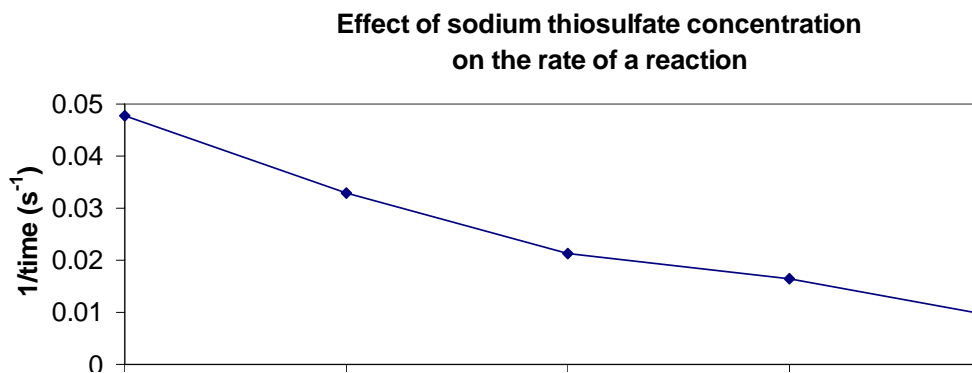
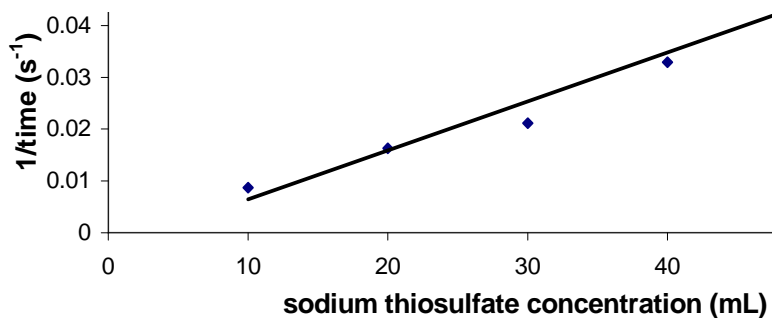
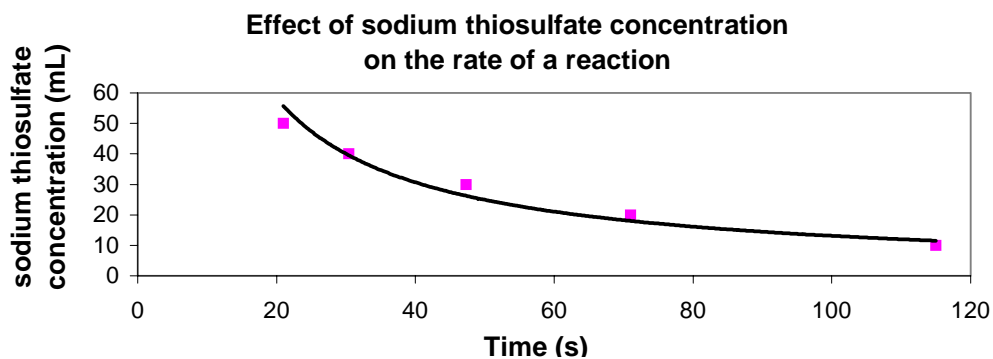
Assess students on the amount and variety of experimental data, the accuracy of their results and their ability to determine a value for the order of the reaction. This reaction should be first order.

**Extensions:**

The students can use the same experiment to see the effect of temperature on the rate of a reaction. In this case, keep the thiosulfate concentration at 20mL, and distilled water at 50mL. Change the temperature of the reaction mixture (20, 20, 40, 50, 60 degrees Celsius), add 5mL of acid and time the disappearance of the cross. A plot of rate (1/time) against temperature will show the exponential effect that increasing temperature has on the rate of a reaction. This can be expanded further by plotting  $\ln(k)$  against  $1/\text{temperature}$ . A straight line will result with a slope of  $-E_a/R$  and an intercept of  $\ln(A)$  where  $E_a$  is the activation energy for the reaction,  $R$  is the universal gas constant (8.314J/k.mol), and  $A$  is the Arrhenius constant for this reaction.

## Specimen Results:

Volume of sodium thiosulfate (mL)	Volume of water added (mL)	Volume of hydrochloric acid added (mL)	Reaction time (s)	1/time ( $s^{-1}$ )	$\ln [Na_2S_2O_3]$	$1/[Na_2S_2O_3]$
50	0	5	21	0.047619	3.912023	0.02
40	10	5	30.4	0.032895	3.688879	0.025
30	20	5	47.3	0.021142	3.401197	0.033333
20	30	5	71	0.0163	2.995732	0.05



## Rates of Reaction Student Handout

- ❑ This experiment examines how changing the concentration of a reactant affects the speed of a chemical reaction. Data will be recorded and analyzed in *Microsoft Excel 2007*, then incorporated into a report written in *Microsoft Word 2007*.
- ❑ The reaction between sodium thiosulfate ( $\text{Na}_2\text{S}_2\text{O}_3$ ) and hydrochloric acid will be studied in this project. The products include sulfur dioxide, sulfur, water, and sodium chloride. The first step is to change the concentration of sodium thiosulfate and react it with an excess of hydrochloric acid (a constant in each experiment). As the reaction proceeds, sulfur precipitates and the contents of the reaction vessel will become cloudy. The time it takes for the reaction vessel to become cloudy is a measure of the rate of the reaction at that particular concentration of sodium thiosulfate.
- ❑ Launch *Excel*. Enter the following data. After each entry, adjust the size of the cells to fit the data by selecting the cell, then from the HOME TAB, under the CELLS GROUP, click FORMAT → AUTOFIT COLUMN WIDTH.

	Column C	Column D	Column E	Column F
Row 1	Volume of sodium thiosulfate (mL)	Volume of water added (mL)	Volume of hydrochloric acid added (mL)	Reaction time (s)
	50	0	5	
	40	10	5	
	30	20	5	
	20	30	5	
	10	40	5	

### Experimental Procedure:

- ❑ **Put on lab goggles and keep them on until the lab is finished!** Collect the following materials at the lab station: 200mL of sodium thiosulfate, 50mL hydrochloric acid, 10mL measuring cylinder, 50mL (or 100mL) measuring cylinder, 125 or 250mL Erlenmeyer flask, stopwatch (or a wristwatch). Wash all glassware thoroughly with tap water, then rinse with distilled water. This is most important!
- ❑ Use the 100mL cylinder for measuring the sodium thiosulfate and water and the 10mL cylinder for the acid. After each experiment, wash the Erlenmeyer flask with plenty of tap water and then rinse with distilled water.
- ❑ Draw a cross in pencil on a white piece of paper. Add 50mL of sodium thiosulfate to the Erlenmeyer flask and place the flask over the cross. Add 5mL of hydrochloric acid to the flask, swirl the contents once and place back over the cross.

- ❑ Immediately start the stopwatch. Now, look down through the reaction mixture and time how long it takes for the cross to disappear. Record the reaction time in the results table. Wash out the flask thoroughly, then rinse with distilled water and repeat the experiment using the quantities given in the table above. Always add the acid last! Minimize *Excel*.
- ❑ Launch *Word*. Write a suitable title and purpose for the experiment, then enter the heading *Diagram*. Minimize *Word*. Unless otherwise instructed, launch the Web browser and access:  
**<http://www.modelscience.com/software.html?ref=home&link=nav>**. Download the file CL20 EVL.EXE, then exit the Web browser. Double-click the program to install it.
- ❑ Open *Chemlab* and select the apparatus for the experiment. Next, copy each piece of apparatus to be used in the diagram, then paste each into the *Word* document. Task-switch between the two programs by clicking on the appropriate task in the Quick Launch toolbar at the base of the window. Right-click the image, select TEXT WRAPPING → SQUARE. Right-click the image again and select MORE LAYOUT OPTIONS. The Advanced Layout dialog box will appear, select LEFT, CENTERED or RIGHT as the desired Horizontal alignment. Click OK. Click the image, hold down the mouse button and drag to the desired position. Repeat for all images as necessary.
- ❑ Write a procedure for the experiment and include the subtitle, *Results*. Create a detailed analysis of the results. Maximize *Excel*, highlight the table of results, click the COPY button from the CLIPBOARD GROUP ON THE HOME TAB, then minimize *Excel*. Click the PASTE button from the CLIPBOARD GROUP ON THE HOME TAB in the *Word* document. Save the file.
- ❑ Maximize *Excel*. Select cells C2 through C6, hold down the CTRL key, then select cells F2 through F6. Click the INSERT TAB and from the CHARTS GROUP, select SCATTER. Scatter with Only Markers, the first option in the first row, is a good choice.
- ❑ Click SELECT DATA from the DATA GROUP on the DESIGN TAB. The Select Data Source dialog box will appear. Click ADD under Legend Entries (Series). Click in the X Values box, then highlight the data in column F. This data will be transferred to the X axis. Delete the data in the Y Values box and highlight the data in column C. The Y axis should now represent the concentration data from column C and the X axis should represent the reaction time data from column F. Click OK.
- ❑ Click LEGEND from the LABELS GROUP on the LAYOUT TAB and click NONE. The legend should disappear from the graph. Click GRIDLINES from the AXES GROUP on the LAYOUT TAB, then select Primary Horizontal Gridlines and click NONE. The lines should disappear from the graph.

- ❑ Now click CHART TITLE from the LABELS GROUP on the LAYOUT TAB, select the desired format, and enter a title for the graph. Enter *time(s)* in the Value (X) Axis category and *Concentration of sodium thiosulfate (mL)* in the Value (Y) Axis category. Name the chart *Chart1*.
- ❑ To analyze the data, click the chart. Select TRENDLINE from the ANALYSIS GROUP on the LAYOUT TAB. Choose EXPONENTIAL TRENDLINE, then click OK. A Best Fit line will appear on the graph. If this line is straight, the reaction is zero order with respect to sodium thiosulfate. If the line is curved, it represents a first or second order reaction.
- ❑ If a first or second order reaction occurs, there are several ways to analyze the data to determine the specific order. Follow the teacher's directions for further analysis under Method 1 or Method 2 as detailed below.

### Method 1:

- ❑ In cell G2, enter  $=1/F2:F6$ . Now highlight cells G2 through G6, then click the FILL drop-down list from the EDITING GROUP on the HOME TAB and select DOWN. The data for  $1/\text{time (s)}$  should fill the column. Select cells C2 through C6, hold down the CTRL key and select cells G2 through G6.
- ❑ Click the INSERT TAB and from the CHARTS GROUP, select SCATTER. Scatter with Only Markers, the first option in the first row, is a good choice. Click SELECT DATA from the DATA GROUP on the DESIGN TAB. The Select Data Source dialog box will appear. Click ADD under Legend Entries (Series). Click in the X Values box, then highlight the data in column C. This data will be transferred to the X axis. Delete the value in the Y Values box and highlight the data in column G. The Y axis should now represent the  $1/\text{time}$  data from column G and the X axis should represent the concentration data from column C.
- ❑ Click LEGEND from the LABELS GROUP on the LAYOUT TAB and click NONE. The legend should disappear from the graph. Click GRIDLINES from the AXES GROUP on the LAYOUT TAB, then select Primary Horizontal Gridlines and click NONE. The lines should disappear from the graph. Now click CHART TITLE from the LABELS GROUP on the LAYOUT TAB, select the desired format, and enter a title for the graph. Enter *Concentration of sodium thiosulfate (mL)* in the Value (X) Axis category and *time(s)* in the Value (Y) Axis category. Name the chart *Chart2*.
- ❑ To analyze the data, click the chart. Select TRENDLINE from the ANALYSIS GROUP on the LAYOUT TAB. Choose EXPONENTIAL TRENDLINE, then click OK. A Best Fit line will appear on the graph. If this line proceeds straight through the data points, then the reaction is first order with respect to sodium thiosulfate. If a curved line would fit the points more accurately, then it is a second order reaction. This is only true if Chart1 also produced a curved line.

**Method 2:**

- ❑ In cell G2, enter  $=LN(C2:C6)$ . From the FORMULAS TAB, click on INSERT FUNCTION in the FUNCTION LIBRARY GROUP. Type *LN* in the Search For A Function box. Click GO. Click OK.
- ❑ Highlight G2 through G6, then click the FILL drop-down list from the EDITING GROUP on the HOME TAB and select DOWN. The data for LN concentration of sodium thiosulfate should fill the column. Select cells G2 through G6, hold down the CTRL key and select cells F2 through F6.
- ❑ Click the INSERT TAB and from the CHARTS GROUP, select SCATTER. Scatter with Only Markers, the first option in the first row, is a good choice.
- ❑ Click SELECT DATA from the DATA GROUP on the DESIGN TAB. The Select Data Source dialog box will appear. Click ADD under Legend Entries (Series). Click in the X Values box, then highlight the data in column F. This data will be transferred to the X axis. Delete the value in the Y values box and highlight the data in column G. The Y axis should now represent the LN concentration data from column G and the X axis should represent the reaction time data from column F.
- ❑ Click LEGEND from the LABELS GROUP on the LAYOUT TAB and click NONE. The legend should disappear from the graph. Click GRIDLINES from the AXES GROUP on the LAYOUT TAB, then select Primary Horizontal Gridlines and click NONE. The lines should disappear from the graph. Now click CHART TITLE from the LABELS GROUP on the LAYOUT TAB, select the desired format, and enter a title for the graph. Enter *time(s)* in the Value (X) Axis category and *LN concentration of sodium thiosulfate (mL)* in the Value (Y) Axis category. Name the chart *Chart2*.
- ❑ To analyze the data, click the chart. Select TRENDLINE from the ANALYSIS GROUP on the LAYOUT TAB. Choose LINEAR, then click OK. A Best Fit line will appear on the graph. If this line proceeds straight through the data points, then the reaction is first order with respect to sodium thiosulfate. If a curved line would fit the points more accurately, then the data needs to be analyzed further to determine a second order graph.
- ❑ To determine a second order graph, enter  $=1/C2:C6$  in cell H2. Highlight cell H2 through H6, then click the FILL drop-down list from the EDITING GROUP on the HOME TAB and select DOWN. The data for 1/concentration of sodium thiosulfate will fill the column. Select cells H2 through H6, hold down the CTRL key and select cells F2 through F6.
- ❑ Click the INSERT TAB and from the CHARTS GROUP, select SCATTER. Scatter with Only Markers, the first option in the first row, is a good choice.

- ❑ Click SELECT DATA from the DATA GROUP on the DESIGN TAB. The Select Data Source dialog box will appear. Click ADD under Legend Entries (Series). Click in the X Values box and highlight the data in column F. This data will be transferred to the X axis. Delete the data in the Y Values box and highlight the data in column H. The Y axis should now represent the  $1/\text{concentration}$  data from column H and the X axis should represent the reaction time data from column F.
- ❑ Click LEGEND from the LABELS GROUP on the LAYOUT TAB and click NONE. The legend should disappear from the graph. Click GRIDLINES from the AXES GROUP on the LAYOUT TAB, then select Primary Horizontal Gridlines and click NONE. The lines should disappear from the graph. Now click CHART TITLE from the LABELS GROUP on the LAYOUT TAB, select the desired format, and enter a title for the graph. Enter *category and time(s)* in the Value (X) Axis category and *1/ concentration of sodium thiosulfate (mL)* in the Value (Y) Axis. Name the chart *Chart3*.
- ❑ To analyze the data, click the chart. Select TRENDLINE from the ANALYSIS GROUP on the LAYOUT TAB. Choose LINEAR, then click OK. A best fit line will appear on the graph. If this line proceeds straight through the data points, then the reaction is second order with respect to sodium thiosulfate.

**Note: After completing the directions for either method, proceed as follows:**

- ❑ Save the *Excel* file, click the CHART1 tab, select the chart, and from the home tab, click on the COPY button in the CLIPBOARD GROUP. Minimize *Excel*. Maximize *Word*, position the cursor under the results table, press ENTER, then from the HOME TAB, click on the PASTE button in the CLIPBOARD GROUP. To reposition the chart, right-click it and click on TEXT WRAPPING → SQUARE in the ARRANGE GROUP on the FORMAT TAB. Right-click the chart once more and click on position in the arrange group on the format tab. Select the desired horizontal alignment layout. Resize the chart by positioning the cursor on one of the resizing handles surrounding its frame. Hold down the mouse button and drag until the chart is the appropriate size.
- ❑ Enter *Analysis* as a new heading. Regardless of the method of analysis, be certain to explain how the data were evaluated. Copy the *Excel* table by highlighting cells A1 through H6, click the COPY button in the CLIPBOARD GROUP. Minimize *Excel*. Position the cursor in the desired location within the report and from the HOME TAB, click on the PASTE button in the CLIPBOARD GROUP. Drag to fit the entire table on the page. Copy the remaining charts from *Excel* into the *Word* document. Task-switch between the two programs by clicking on the appropriate task in the Quick Launch toolbar at the base of the window.
- ❑ From the analysis, conclude whether the lab produced a first or second order reaction with respect to sodium thiosulfate. Provide a detailed explanation of the findings.
- ❑ Save the file and print the report. Exit *Word* and *Excel*.



## Project 10: Remote Sensing Teacher Guide

**Description:**

The class will analyze a LANDSAT Thematic Mapper (TM) of a 225km<sup>2</sup> area around Beverly, Massachusetts. The students download imaging software called MultiSPEC and analyze an image of the city in three channels to distinguish urban areas, bodies of water and different types of vegetation. Then the students perform further analysis on a color copy of one section of the map.

**Grades:** 7–12

**Science Field:** Earth/Space Science with applications in physics and biology

**PA Academic Standards:****Grade 7:**

**3.3.7A Biological Sciences:** Describe the similarities and differences that characterize diverse living things.

- Describe how the structures of living things help them function in unique ways.
- Explain how to use a dichotomous key to identify plants and animals.
- Account for adaptations among organisms that live in a particular environment.

**3.3.7D Biological Sciences:** Explain basic concepts of natural selection.

- Describe how an environmental change can affect the survival of organisms and entire species.

**3.5.7A Earth Sciences:** Describe earth features and processes

- Describe the processes involved in the creation of geologic features (e.g., folding, faulting, volcanism, sedimentation) and that these processes seen today (e.g., erosion, weathering crustal plate movement) are similar to those in the past.
- Distinguish between examples of rapid surface changes (e.g., landslides, earthquakes) and slow surface changes (e.g., weathering).

**3.5.7D Earth Sciences:** Explain the behavior and impact of the earth's water systems.

- Identify ocean and shoreline features, (e.g., bays, inlets, spit, tidal marshes).

**Grade 10:**

**3.3.10A Biological Sciences:** Explain the structural and functional similarities and differences found among living things.

- Identify and characterize major life forms according to their placement in existing classification groups.

**3.3.10D Biological Sciences:** Explain the mechanisms of the theory of evolution.

- Describe changes that illustrate major events in the earth's development based on a time line.

**3.5.10A Earth Sciences:** Relate earth features and processes that change the earth.

- Compare examples of change to the earth's surface over time as they related to continental movement and ocean basin formation (e.g., Delaware, Susquehanna, Ohio Rivers system formations, dynamics).
- Evaluate and interpret geologic history using geologic maps.

**3.5.10D Earth Sciences:** Assess the value of water as a resource.

- Assess the natural and man-made factors that affect the availability of clean water (e.g., rock and mineral deposits, man-made pollution).

**Grade 12:**

**3.3.12A Biological Sciences:** Explain the relationship between structure and function at all levels of organization.

- Identify and explain interactions among organisms (e.g., mutually beneficial, harmful relationships).
- Explain significant biological diversity found in each of the biomes.

**3.5.12A Earth Sciences:** Analyze and evaluate earth features and processes that change the earth.

- Apply knowledge of geophysical processes to explain the formation and degradation of earth structures (e.g., mineral deposition, cave formations, soil composition).
- Interpret geological evidence supporting evolution.

**3.5.12D: Earth Sciences:** Analyze the principles and history of hydrology.

- Compare the marine life and type of water found in the intertidal, neritic and bathyal zones.

***NSE Content Standards, National Research Council (Grades 5-8):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Properties of matter and transfer of energy
- C. Life Science: Structure of living systems, diversity and adaptations of organisms
- D. Earth and Space Science: Earth history and structure of the earth system
- E. Science and Technology: Technological designs, science and society

***NSE Content Standards: National Research Council (Grades 9-12):***

- A. Science as Inquiry: Understanding and performing scientific inquiry
- B. Physical Science: Structure and properties of matter and interactions with energy
- C. Life Science: Living systems and interdependence of organisms
- D. Earth and Space Science: Energy, geochemical cycles, origin and evolution
- E. Science and Technology: Technological designs, science and society

***NETS Performance Indicators (Grades 6-8):***

- 1. Identify and solve routine hardware and software problems.
- 2. Understand changes in information technologies and the effects on society.
- 3. Exhibit legal and ethical behaviors when using information and technology and discuss consequences of misuse.
- 4. Use content-specific tools, software and simulations (environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
- 5. Apply productivity and multimedia tools to support personal productivity, group collaboration and learning throughout the curriculum.
- 8. Select and use appropriate tools and technology to accomplish a variety of tasks and solve problems.

***NETS Performance Indicators (Grades 9-12):***

- 1. Identify the capabilities and limitations of technology and assess its potential to address personal, lifelong learning and workplace needs.
- 2. Make informed choices among technology systems, resources and services.
- 6. Evaluate technology-based options, including distance and distributed education, for lifelong learning.

7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications and productivity.

**Internet Applications:**

The students will rely on the Internet to download an imaging program and analyze images depicting environmental change.

**Materials:**

Web browser

overhead projector pens (various colors)

BEVERLY.SAT

overhead projector transparencies

BEVERLY.LAN

MultiSpec Imaging Program

MANCHESTER.JPG

**Prerequisite Skills:**

The students should be familiar with downloading software from the Internet. In addition, they need to understand the basic functions of a drawing program.

**Suggested Time Allotment:** Two to three class periods (or more if students participate in the extended activities)

**Process:**

Much of the material for this lesson is available on the Globe program Web site at <http://www.globe.gov>. After accessing the site, select TOOLKIT in the Teacher's Guide menu. This information is provided free of charge since it is federally funded. In addition, a full MUC protocol is available. Select the APPENDIX in the Landcover/Biology Investigation section of the Teacher's Guide. Instructions for using MUC in the classroom can be found in the Protocols section of the Landcover/Biology Investigation. Please refer to the Extension section below for an exploration of significant student research.

**Evaluation:**

Evaluate students on their ability to produce an accurate "perimeter" map with MUC codes of the Manchester region of Beverly, Massachusetts.

**Extensions:**

The students may be able to verify satellite images using ground observations of their own community. They will need to acquire a TM map much like the Beverly map. TM maps can be purchased from the Eros Data Center, a contractor of the USGS. The maps are expensive, so check the local university first; it may have a library of satellite images. Obtain a Landsat Thematic Mapper image in Bands 3, 2, 1 and Bands 4, 3, 2 covering

about 512 x 512 pixels. These images will fit onto a floppy disk or CD-R. Using the MUC protocol, students will be able verify landcover by comparing what they see in 30 x 30m sections (the size of a pixel) with patterns of colors they view on the map coupled with GPS information. A detailed explanation of the procedure is found on the Globe Web site in the Toolkit. Perhaps an area college or university would be interested in developing a research project with the students.

***Technology Enrichment:***

The students can become familiar with remote sensing using satellite images. They will understand that images are composed of homogeneous pixels and that resolution is dependent on the represented area of each pixel. They may also find interest in the related field of GIS (Geographical Information Systems).

## Remote Sensing Student Handout

- ❑ Launch the Web browser. Go to **[http://dynamo.ecn.purdue.edu/~biehl/ MultiSpec/](http://dynamo.ecn.purdue.edu/~biehl/MultiSpec/)**. Select the appropriate version of the MultiSpec program, then click to download it.
- ❑ The file is self-extracting, meaning that it will not have to be decompressed. Follow the installation directions. Then place the following files into the MultiSpec program: BEVERLY.LAN and BEVERLY.SAT.
- ❑ Launch the MultiSpec program and open the satellite image of the Beverly, Massachusetts area from the BEVERLY.LAN file by selecting OPEN IMAGE in the File menu. Resize the image by clicking on the bottom edge of the MultiSpec window and dragging the small rectangle in the lower-right corner. Two zoom buttons are located in the toolbar just above the image, one to zoom in (the button with the larger mountain range) and one to zoom out.
- ❑ The image, taken by LANSAT 5, depicts three Massachusetts cities in this order from lower left to middle right: Salem, Beverly and Manchester. Look at a street map of the area. (A map is available at **<http://www.mapblast.com>**.)
- ❑ Zoom in on the image and see that it is made up of small squares called pixels. The total image is composed of 512 lines and 512 columns of pixels. Each pixel represents 30 meters on a side. No detail smaller than 30 m long can be distinguished by this satellite image. Discuss the advantages of zooming in or out.
- ❑ Notice that cities, highways and bridges appear blue, water shows up in black (or dark blue), and vegetation is red. Change the appearance of the image by selecting display image from the Processor menu. Change the number of the red channel from 4 to 3 and select OK.
- ❑ Note that the image is what might be expected if one were looking down on the Earth from a satellite. Depending on what scientists are looking for, they will use different combinations of channels. This satellite takes an image of the Earth in 5 bands or channels: 1 is blue, 2 is green, 3 is red, 4 is near infrared and 5 is middle infrared.
- ❑ When the Red channel was 4, any area that reflected near infrared radiation back to the satellite showed up as red on the computer monitor. Since vegetation reflects and does not absorb much radiation in the near infrared region, it appears red in the false color image. Scientists can distinguish different kinds of vegetation by analyzing pixels of different shades of red.
- ❑ Scientists have devised a scheme that separates land cover into categories for analysis. One system is called the Modified UNESCO Classification, MUC for short. This scheme is based on four levels of classification. The first level is the most general and contains 10 different

classes. The second level is more specific than the first, and so on through the fourth level, the most specific level.

- The first level of classification is shown below:

MUC 1 <sup>st</sup> level code	Description
0	Closed Forest
1	Woodland
2	Shrubland
3	Dwarf-shrubland
4	Herbaceous Vegetation
5	Barren Land
6	Wetland
7	Open Water
8	Cultivated Land
9	Urban

- Replace the red channel with 4 by selecting DISPLAY IMAGE from the Processor menu. Select the COORDINATES BAR in the View menu, and use the pointer indicator to select an area with the following coordinates: Lines (vertical) 32–134, and columns (horizontal) 335–434.
- The town of Manchester is located in the lower portion of the selection and Highway 128 runs across the upper left of the map. While this area is selected, zoom in and out using the buttons located on the toolbar.
- The teacher will provide a color copy of the Manchester map. Cover this map with a piece of overhead transparency film and tape the edges with masking tape so that the image and film will not move. Trace around the perimeters of the different MUC classifications using different colors of transparency pens, if possible.
- Place the MUC classification code inside each perimeter until the total map is classified. It may be helpful to refer to a road map of the area or zoom out of the Manchester map to look at a larger area of the Beverly map.

<b>Description</b>	<b>MUC Code</b>	<b>Color on Map</b>
<i>Bodies of water</i>		
marine	72	black to blue black
tidal river	63	black to dark blue
lake	64	black to dark blue
<i>Urban/Transportation</i>		
highways and bridges	93	light blue to blue
commercial	92	light blue, yellow, white
residential	91	medium blue
golf course (grass)	94	tan, yellow or pink
<i>Forest Vegetation</i>		
evergreen forests	0192	black to dark red
hardwoods (deciduous)	0231	bright red

- Satellite images are useful for analyzing environmental change. Follow the growth of Garden City, Kansas by comparing vegetation changes in that area over time. Launch the Web browser and go to <http://edcwww.cr.usgs.gov/> to learn about the benefits of remote sensing.



## Project Analysis Form

Use this form to analyze the project and take notes as it is being created.

1. Do the *Teacher Guide* and *Student Handout* provide the information and instruction needed to understand the project? Are the required skills appropriate for the students?
  
  
  
  
  
  
  
  
  
  
2. Describe the online research portion of the project. Is it a practical way to gather the necessary data? Why or why not?
  
  
  
  
  
  
  
  
  
  
3. Is the template format clear and useful? Does it provide an appropriate foundation for the development of the presentation?
  
  
  
  
  
  
  
  
  
  
4. Does the project provide for student creativity? Will it engage student interest?
  
  
  
  
  
  
  
  
  
  
5. Other comments?

## Module 2 - Project Creation

Planning a science technology lesson is similar to planning a traditional science lesson. Common steps include identification of the purpose of the lesson, development of the appropriate approach and creation of an evaluation instrument. The technology lesson is supplemented by the integration of the applicable technology standards, software applications and, in many cases, Internet resources.

This course provides a variety of tools to enable users to create technology projects easily and efficiently. Two key aids are the Steps to Create a Science PowerPoint Presentation on pages 89-91, which demonstrates the thinking and development of a hypothetical project, and the Process Planning Questions found on pages 92-93. When planning a technology project, use the standards found on pages 94-95 to assess the level of technology performance in each lesson.

A Sample Rubric for Student Performance Review is included on pages 97-98.

The process provided is meant to point out the right direction of successful project development. Adapt it as necessary.

## Project Creation Process Guide

<b>Step-by-Step Guide</b>	<b>Model Project</b>
<b>Choose a central idea or focus for the project.</b>	Learning about human genomes
<b>Determine the goals of the project. What will the students learn? How will this knowledge address the overall goals of the unit or curriculum?</b>	Students will learn about the 23 pairs of human chromosomes. They will identify specific diseases associates with specific chromosomes, and demonstrate an understanding of chromosomes and their role in human development.
<b>Identify what science learning objectives and standards the students will achieve through the project.</b>	<b>NSE Standards</b> <ul style="list-style-type: none"> <li>A. Science as Inquiry: Understanding and performing scientific inquiry</li> <li>C. Life Science: Living systems and interdependence of organisms</li> <li>F. Science in Personal and Social Perspectives: Populations, resources and environments</li> </ul>
<b>Consider how these objectives have been achieved in previous years without the use of technology.</b>	In previous years the students have participated in class discussions, done library research and written essays on the topic.

## Selecting Software Applications

There are many ways to determine which software applications would best address the purpose and objectives of a project.

One approach is to first decide the objectives of the lesson and then brainstorm how to use each software application to achieve them.

The examples below were created in this manner. Some software applications lend themselves to certain types of projects naturally, while others are more difficult to adapt to the same objectives. Consider all the available software applications and the lesson objectives to create interesting and unusual projects.

Another way to decide which software applications to use is to consider which ones the students will need to learn or practice. Then create a project specifically designed to enhance skills in those applications. For example, if the students need to work with *Excel*, they might benefit from a project that involved the creation of graphs.

### **Possible Projects**

Use <b>Access</b> to build a database of the pairs of human chromosomes, entering data and characteristics about each pair. Create a class database for a more comprehensive overview.	Use <b>PowerPoint</b> to make presentations about human genomes and their importance in understanding life. The students might explore the Internet to discover useful sources. Presentations could combine information, schematics and illustrations of chromosomes.
Use <b>Excel</b> to create a spreadsheet of diseases and other individual characteristics associated with the chromosome pairs being studied.	Use <b>Publisher</b> to design a booklet featuring the pairs of human chromosomes, their connections with specific diseases and an explanation of how they impact the genetic make-up of individual human beings.
Use <b>SharePoint Designer</b> to build a Web site that explains simply how chromosomes are part of the genetic make-up of each individual. Include links to important other Web resources.	Use <b>Word</b> to create a table of the pairs of chromosomes and an explanation of the role they play in the genetic characteristics of people.

## Steps to Create a *PowerPoint* Presentation on Chromosomes

<b>Determine if Internet research is a necessary part of this project.</b>	Internet resources relevant to chromosomes would prove very helpful in any of the projects suggested
<b>Decide whether an electronic template is required based on the chosen software application and the structure of the project. Make a template if required.</b>	Example: Create an electronic template for an <i>Access</i> database project.
<b>Outline a logical progression of steps to create the project.</b>	<p><b>Steps to create a human genomes database in <i>Access</i></b></p> <ol style="list-style-type: none"> <li>1. Define the parameters of the presentation, such as: the minimum number of required pages and the amount of class time that will be dedicated to making and presenting the project.</li> <li>2. Identify the relevant data, the important symbols and their meanings, and determine the correlation between them.</li> <li>3. Sketch, outline or map the structure of the project. Decide what each page will contain. Consider using animation, sound, video, graphics, links and text as elements of the presentation.</li> <li>4. Create two working files to hold all the components of the presentation — a digital file on the computer and a physical file for notes and sketches of the project.</li> <li>5. Outline and store the text elements in the digital file.</li> <li>6. Search for resources on the Internet. Make necessary copies for the digital file, carefully noting their sources.</li> </ol>

<p><b>Sample steps for the student handout, continued</b></p>	<ol style="list-style-type: none"> <li>7. Gather other needed resources such as video clips, hard copies and clipart. File resources in the digital and physical files as needed.</li> <li>8. Create the presentation using the resources gathered. Find or write additional material as needed to complete the project.</li> <li>9. Test the presentation to ensure that all inserted media, links and other details work as anticipated. Make needed adjustments and corrections.</li> <li>10. Give presentation.</li> </ol>
<p><b>Create the project using your plan and keep detailed notes on each step. These notes will form the foundation for the student handout.</b></p>	<p>Using the Science Creation Process Guidelines, construct the <i>PowerPoint</i> presentation. Keep careful notes detailing the steps in the process.</p>
<p><b>Decide on a reasonable time frame for student completion of the project.</b></p>	<p>Two class computer lab sessions and two homework assignments will be dedicated to this <i>PowerPoint</i> presentation.</p>
<p><b>Finalize the student handout; be certain that the directions are sequential and easily understood.</b></p>	<p>Proof, test and revise the student handout as needed.</p>
<p><b>Consider what background information and activities should be presented in class before students embark on the project.</b></p>	<p>Examine appropriate and related topics by assigning reading and leading class discussions.</p>
<p><b>Develop an assessment rubric/instrument (sample on page 82) to evaluate student performance on the project.</b></p>	<p>Refer to the ISTE performance indicators that support the project's technology objectives, the provided project self-evaluation rubric (page 84) and other appropriate criteria to develop an evaluation instrument to assess the content and technology usage of the project.</p>

<p><b>Check performance indicators to ensure that the desired skills are met.</b></p>	<p><b>ISTE Performance Indicators (Grades 9-12)</b></p> <p>7. Routinely and efficiently use online resources to meet collaboration, research, publications, communications and productivity needs.</p> <p>10. Collaborate with peers, experts and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce and disseminate information, models and other creative works</p>
<p><b>Analyze whether additional technology applications will enhance the effectiveness of the project.</b></p>	<p>Students will be expected to turn in a hard copy of their resources in correct bibliographic form, prepared in <i>Microsoft Word</i>.</p>
<p><b>Present at least one technology enhancement of the project to foster further learning.</b></p>	<p>Have students create a timesheet in <i>Excel</i> to track how much time they spend on each step of the project. After all the projects have been presented, have students examine and compare their timesheets. Discuss the time spent, results achieved and methods students can use to improve their next projects.</p>
<p><b>Consider ways to extend the project by using related ideas for discussion or development.</b></p>	<p>Have students create their own <i>PowerPoint</i> projects with templates, a teacher guide and a student handout for another topic they will study. Students can exchange, develop, present and critique each other's projects.</p>
<p><b>Review and evaluate the effectiveness of the proposed project. Consider the questions listed on the right.</b></p>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Will the students be able to follow the handout successfully without the use of a template?</li> <li><input type="checkbox"/> Will the discussion suggested in the "Process" section of the Teacher Guide provide sufficient context for the students to understand the purpose of the project? How might the discussion be changed or expanded?</li> <li><input type="checkbox"/> Does the project allow for sufficient student creativity? Will it engage student interest?</li> <li><input type="checkbox"/> Other comments?</li> </ul>

## Science Project Process Planning Questions

**Directions:**

Before producing a technology project, consider and respond to each of the following questions. Use the information as a guide in the creation process.

1. What specifically is to be accomplished with this project?
  
  
  
  
  
  
  
  
  
  
2. What science learning objectives will the student achieve with this project?
  
  
  
  
  
  
  
  
  
  
3. Have these objectives been achieved in the past without using technology? If so, how?
  
  
  
  
  
  
  
  
  
  
4. Which software applications would enliven, enrich, simplify or promote these objectives?
  
  
  
  
  
  
  
  
  
  
5. How will the use of Internet resources impact this project?



6. Will an electronic template be required? How complete should it be?
  
  
  
  
  
  
  
  
  
  
7. What is the logical progression of steps to work through the project?
  
  
  
  
  
  
  
  
  
  
8. Approximately how long should the project take to complete?
  
  
  
  
  
  
  
  
  
  
9. How will the results be evaluated?
  
  
  
  
  
  
  
  
  
  
10. Are there ways to extend this project to foster further learning? Can other technology applications enhance its effectiveness?

# International Society for Technology Education (ISTE)

## National Educational Technology Standards

### Grades 6-8

All students should have opportunities to demonstrate the following:

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are as follows:

1. Basic operations and concepts
2. Social, ethical and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

#### **Prior to the completion of grade 8, students should be able to:**

1. Apply strategies for identifying and solving routine hardware and software problems that occur during everyday use. (1)
2. Demonstrate knowledge of current changes in information technologies and the effect those changes have on the workplace and society. (2)
3. Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse. (2)
4. Use content-specific tools, software and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration and learning throughout the curriculum. (3, 6)
6. Design, develop, publish and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
7. Collaborate with peers, experts and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
8. Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
9. Demonstrate an understanding of concepts underlying hardware, software and connectivity, and of practical applications to learning and problem solving. (1, 6)
10. Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness and bias of electronic information sources concerning real-world problems. (2, 5, 6)

## National Educational Technology Standards, continued

### Grades 9-12

All students should have opportunities to demonstrate the following:

Numbers in parentheses following each performance indicator refer to the standards category to which the performance is linked. The categories are as follows:

1. Basic operations and concepts
2. Social, ethical and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

#### **Prior to the completion of grade 12, students should be able to:**

1. Identify capabilities and limitations of contemporary and emerging technology resources and assess the potential of these systems and services to address personal, lifelong learning and workplace needs. (2)
2. Make informed choices among technology systems, resources and services. (1, 2)
3. Analyze advantages and disadvantages of widespread use and reliance on technology in the workplace and in society as a whole. (2)
4. Demonstrate and advocate for legal and ethical behaviors among peers, family and community regarding the use of technology and information. (2)
5. Use technology tools and resources for communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
6. Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
7. Routinely and efficiently use online information resources to meet needs for collaboration, research, publications, communications and productivity. (4, 5, 6)
8. Select and apply technology tools for research, information analysis, problem solving and decision making in content learning. (4, 5)
9. Investigate and apply expert systems, intelligent agents and simulations in real-world situations. (3, 5, 6)
10. Collaborate with peers, experts and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce and disseminate information, models and other creative works. (4, 5, 6)

## Electronic Templates

Use the selected software program to create the data file that students will need to begin their projects. When the template is complete, give the file a descriptive name and save it on the server or on disk(s) such as a floppy disk or a CD-R. In most *Microsoft* programs, such files can be saved as templates with extensions that describe them. To save the file as a template, click the MICROSOFT OFFICE BUTTON and choose SAVE AS. Then, add the file name and choose the correct extension from the drop-down button labeled *Save as type*.

The template extensions for each software program are as follows:

<i>Access</i>	(* .accdb)
<i>Excel</i>	(* .xltx)
<i>SharePoint Designer</i>	(* .tem)
<i>PowerPoint</i>	(* .potx)
<i>Publisher</i>	(* .pub)
<i>Word</i>	(* .dotx)

Project design, the software application selected and logistical considerations will dictate how students use the templates.

In general, expect students:

1. To copy the template, assign a name to the copy and use the copy.
2. To open their template, use it to complete the project and save it under a new filename.
3. To open the template, then immediately use the SAVE AS command to save the file with a new name. By following these instructions, they make and save a copy of the template simultaneously. This will avoid the overwriting of the original file.

Please note that *Access* only allows information to be saved in the format of a table, form or report, so the templates must be copied and renamed.

## A Sample Rubric for Student Performance Review

A rubric consists of two sections, the first of which is a performance-criteria checklist where the students are evaluated in several areas. The second section provides the teacher a space to make specific comments about the student's performance. When completing the rubric, teachers will need to reflect on classroom observations and experiences as well as review student work and the skills checklist. After doing so, they should make a determination and place an X in each of the appropriate cells. The checklist and comments should help the teacher to make a fair evaluation of the student's work.

### ***Unsatisfactory***

An “unsatisfactory” mark should be rare. This designation is reserved for the student who rarely completes assignments, participates in activities or complies with peers.

### ***Needs Practice***

A new student would fall into this category. The continuing student who acquires few of the course skills and requires significant assistance should also receive this designation.

### ***Satisfactory***

A “satisfactory” mark should be reserved for the student who attains most course skills and completes most projects. Some additional practice may be needed in a few areas, but overall progress is acceptable.

### ***Mastered***

“Mastered” indicates that a student has completed all of the projects and has attained all course skills and objectives. This student can perform tasks automatically.

### ***Superior***

Few students will attain the “superior” mark. This designation is for the pupil who exceeds expectations. For example, a superior student may apply multimedia skills to create innovative projects.

## Student Performance Review

Student: \_\_\_\_\_

Date: \_\_\_\_\_

Reviewer: \_\_\_\_\_

Grade: \_\_\_\_\_

<b>Performance Criteria</b>	<b>1</b> Unsatisfactory	<b>2</b> Needs Practice	<b>3</b> Satisfactory	<b>4</b> Mastered	<b>5</b> Superior
<b>Science Skills</b> <ul style="list-style-type: none"> <li>■ Strengthens targeted skills</li> <li>■ Achieves stated lesson objectives</li> <li>■ Understands how specific lesson fits into the larger whole</li> </ul>					
<b>Computer Skills</b> <ul style="list-style-type: none"> <li>■ Effectively navigates menus and executes commands</li> <li>■ Understands software application functions</li> <li>■ Selects appropriate software to complete a given task</li> <li>■ Demonstrates facility with hardware</li> </ul>					
<b>Participation and Teamwork</b> <ul style="list-style-type: none"> <li>■ Actively participates in class discussions</li> <li>■ Works cooperatively with classmates</li> <li>■ Collaborates with partner</li> </ul>					
<b>Project Completion</b> <ul style="list-style-type: none"> <li>■ Follows activity directions</li> <li>■ Completes all steps in an activity</li> <li>■ Fulfills project requirements</li> </ul>					

Comments: \_\_\_\_\_

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## Project Self-evaluation Rubric

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Project Title: \_\_\_\_\_

<b>Evaluation Criteria</b>	<b>1</b> Unsatisfactory	<b>2</b> Needs Work	<b>3</b> Satisfactory	<b>4</b> Strong	<b>5</b> Superior
<b>Goals and Objectives</b> <ul style="list-style-type: none"> <li>■ Purpose clearly articulated</li> <li>■ Learning objectives achievable through project</li> <li>■ Relevance of project to mathematics content</li> </ul>					
<b>Software</b> <ul style="list-style-type: none"> <li>■ Appropriate software applications utilized</li> <li>■ Software capabilities enhance project</li> </ul>					
<b>Content Enhancement</b> <ul style="list-style-type: none"> <li>■ Critical thinking skills emphasized</li> <li>■ Creative and original approach to content or skills established</li> <li>■ Active interaction with content necessary</li> </ul>					
<u><b>Student Involvement</b></u> <ul style="list-style-type: none"> <li>■ Strong encouragement of originality and creativity</li> <li>■ Engagement of student interest and enthusiasm</li> <li>■ Potential for further exploration</li> </ul>					
<b>Integration of Technology</b> <ul style="list-style-type: none"> <li>■ Technology essential to achieve learning objectives</li> <li>■ New perspectives resulting from technology use</li> <li>■ Strengthening of student technology skills</li> </ul>					

Comments: \_\_\_\_\_

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# Module 3: The Internet

## History

The Internet originated in a U.S. Department of Defense Project called ARPANET (Advanced Research Projects Agency Network). Established in 1969, ARPANET was designed to provide a secure communications network for organizations engaged in defense-related research. The key to its functionality was the TCP/IP (Transmission Control Protocol/Internet Protocol), which standardized addressing systems and communications protocol. In time, the National Science Foundation (NSF) networked ARPANET into the NSFNet. The two joined systems were able to handle more traffic than had been manageable previously, carrying data at the rate of 45 million bits per second.

Today, the NSF continues to maintain the backbone of the network. Internet protocol development is governed by the Internet Architecture Board, and the naming of computers and networks is administered by InterNIC (Internet Network Information Center).

## World Wide Web

Until 1989, the Internet was used primarily for e-mail and transferring files electronically. At that time, Tim Berners-Lee and his colleagues at CERN (in English, the European Particle Physics Laboratory) in Switzerland created the HyperText Transfer Protocol (http), which standardized communication between servers and clients. They then developed the first text-based Web browser released in 1992. The World Wide Web was rapidly accepted because of the creation of a Web browser called Mosaic, developed in the United States at the University of Illinois and released in September 1993. In April 1994, the first large-scale commercial release of a Web browser, *Netscape Navigator*, revolutionized how the Internet was used. Millions of computers now can access the Internet through the World Wide Web.



## Searching on the Web

There are two types of tools that can be used to search the World Wide Web: search engines and directories. **Search engines** explore the Web to find matches for keywords entered by the user. **Directories** are hierarchical subject indexes where users can choose headings, subheadings and topics. Many search engines now contain search directory features and vice versa.

When searching for broad general information, first use a directory. For more specific information, use a search engine.

**Keywords** are text entered by the user into a search engine or directory. Found matches (known as hits) appear in a list. To get an idea of what keywords users are currently entering, view *Metaspy* at <http://www.metacrawler.com/info.metac/searchspy>. This site displays keywords that people have entered to search with the WebCrawler search engine. If any of the listed keywords are clicked, the search results for those keywords will be displayed.

**Note:** Because of the risk of potentially encountering mature content, it is best to view these sites outside the classroom setting.

## Keyword Search Assistance

Certain word combinations assist in narrowing or broadening a Web search. They are called Boolean Operators, named after the English mathematician George Boole, the first person to incorporate logic into mathematics. This algebra of logic, called Boolean algebra, is considered a fundamental step in the computer revolution. The following words are useful for searches:

- |             |  |
|-------------|--|
| AND         | searches for all the keywords entered  |
| AND NOT     | cannot contain the word following  |
| OR          | searches for at least one of the words   |
| Parentheses | used for Boolean queries; e.g., “fruit AND (banana OR apple)” would search for (“ ”) sites containing the keywords “fruit” and “banana” or “fruit” and “apple.” Make sure to use all caps for Boolean operators and to leave a space on either. Make sure to use all caps for Boolean operators and to leave a space on either side. |

## Standards and Performance Indicators on the Web

### **International Society for Technology in Education**

The International Society for Technology in Education (ISTE) is a nonprofit professional organization dedicated to promoting appropriate uses of information technology in the support and improvement of learning, teaching and administration in grades K–12 and teacher education. Information about the National Educational Technology Standards (NETS) Project and the National Center for Preparing Tomorrow's Teachers to Use Technology (NCPT<sup>3</sup>) is available at the ISTE site listed below:

**<http://www.iste.org/>**

### **National Science Teachers Association**

The National Science Teachers Association (NSTA) is devoted to improving the teaching and learning of science at all levels of education. For many years, the NSTA has provided a forum for the profession, an array of opportunities for teachers to continue their professional growth throughout their careers and a framework for cooperation to deal with issues that affect the teaching of science. For more information look at the Web site:

**<http://www.nsta.org/>**

### **National Council for Accreditation of Teacher Education**

The National Council for Accreditation of Teacher Education (NCATE) is the profession's mechanism to help establish high-quality teacher preparation. Through the process of professional accreditation of schools, colleges and departments of education, NCATE works to make a difference in the quality of teaching and teacher preparation today, tomorrow and for the next century. For more information look at the Web site:

**<http://www.ncate.org/>**

## Web Addresses: Departments of Education

U. S. Department  
of Education

<http://www.ed.gov/>  
Library > Education > K-12 Education > Government  
Policies > State Ed. Depts.

### State Departments of Education

Alabama	<a href="http://www.alsde.edu/">http://www.alsde.edu/</a>
Alaska	<a href="http://www.eed.state.ak.us/">http://www.eed.state.ak.us/</a>
Arizona	<a href="http://www.ade.state.az.us/">http://www.ade.state.az.us/</a>
Arkansas	<a href="http://arkansased.org/">http://arkansased.org/</a>
California	<a href="http://www.cde.ca.gov/">http://www.cde.ca.gov/</a>
Colorado	<a href="http://www.cde.state.co.us/">http://www.cde.state.co.us/</a>
Connecticut	<a href="http://www.state.ct.us/sde/">http://www.state.ct.us/sde/</a>
Delaware	<a href="http://www.doe.state.de.us/">http://www.doe.state.de.us/</a>
District of Columbia	<a href="http://www.seo.dc.gov/seo/site/default.asp">http://www.seo.dc.gov/seo/site/default.asp</a>
Florida	<a href="http://www.fldoe.org/">http://www.fldoe.org/</a>
Georgia	<a href="http://www.doe.k12.ga.us/">http://www.doe.k12.ga.us/</a>
Hawaii	<a href="http://doe.k12.hi.us/">http://doe.k12.hi.us/</a>
Idaho	<a href="http://www.sde.state.id.us/Dept/">http://www.sde.state.id.us/Dept/</a>
Illinois	<a href="http://www.isbe.state.il.us/">http://www.isbe.state.il.us/</a>
Indiana	<a href="http://www.doe.state.in.us/">http://www.doe.state.in.us/</a>
Iowa	<a href="http://www.state.ia.us/educate/">http://www.state.ia.us/educate/</a>
Kansas	<a href="http://www.ksbe.state.ks.us/Welcome.html">http://www.ksbe.state.ks.us/Welcome.html</a>
Kentucky	<a href="http://www.kde.state.ky.us/">http://www.kde.state.ky.us/</a>
Louisiana	<a href="http://www.doe.state.la.us/DOE/asps/home.asp">http://www.doe.state.la.us/DOE/asps/home.asp</a>
Maine	<a href="http://www.maine.gov/education/">http://www.maine.gov/education/</a>
Maryland	<a href="http://www.marylandpublicschools.org/msde">http://www.marylandpublicschools.org/msde</a>
Massachusetts	<a href="http://www.doe.mass.edu/">http://www.doe.mass.edu/</a>
Michigan	<a href="http://www.michigan.gov/mde">http://www.michigan.gov/mde</a>
Minnesota	<a href="http://children.state.mn.us/mde/index.html">http://children.state.mn.us/mde/index.html</a>

## State Departments of Education, (continued)

Mississippi	<a href="http://www.mde.k12.ms.us/">http://www.mde.k12.ms.us/</a>
Montana	<a href="http://www.opi.state.mt.us/">http://www.opi.state.mt.us/</a>
Nebraska	<a href="http://www.nde.state.ne.us/">http://www.nde.state.ne.us/</a>
Nevada	<a href="http://www.doe.nv.gov/">http://www.doe.nv.gov/</a>
New Hampshire	<a href="http://www.ed.state.nh.us/education/">http://www.ed.state.nh.us/education/</a>
New Jersey	<a href="http://www.state.nj.us/education/index.html">http://www.state.nj.us/education/index.html</a>
New Mexico	<a href="http://sde.state.nm.us/index.html">http://sde.state.nm.us/index.html</a>
New York	<a href="http://www.nysed.gov/">http://www.nysed.gov/</a>
North Carolina	<a href="http://www.dpi.state.nc.us/">http://www.dpi.state.nc.us/</a>
North Dakota	<a href="http://www.dpi.state.nd.us/index.shtm">http://www.dpi.state.nd.us/index.shtm</a>
Ohio	<a href="http://www.ode.state.oh.us/">http://www.ode.state.oh.us/</a>
Oklahoma	<a href="http://www.sde.state.ok.us/">http://www.sde.state.ok.us/</a>
Oregon	<a href="http://www.ode.state.or.us/">http://www.ode.state.or.us/</a>
Pennsylvania	<a href="http://www.pde.psu.edu/">http://www.pde.psu.edu/</a>
Rhode Island	<a href="http://www.rido.net/">http://www.rido.net/</a>
South Carolina	<a href="http://www.sde.state.sc.us/">http://www.sde.state.sc.us/</a>
South Dakota	<a href="http://doe.sd.gov/">http://doe.sd.gov/</a>
Tennessee	<a href="http://www.state.tn.us/education/">http://www.state.tn.us/education/</a>
Texas	<a href="http://www.tea.state.tx.us/">http://www.tea.state.tx.us/</a>
Utah	<a href="http://www.usoe.k12.ut.us/">http://www.usoe.k12.ut.us/</a>
Vermont	<a href="http://www.state.vt.us/educ/">http://www.state.vt.us/educ/</a>
Virginia	<a href="http://www.pen.k12.va.us/go/VDOE/">http://www.pen.k12.va.us/go/VDOE/</a>
Washington	<a href="http://www.sbe.wa.gov/">http://www.sbe.wa.gov/</a>
West Virginia	<a href="http://wvde.state.wv.us/">http://wvde.state.wv.us/</a>
Wisconsin	<a href="http://www.dpi.state.wi.us/index.html">http://www.dpi.state.wi.us/index.html</a>
Wyoming	<a href="http://www.k12.wy.us/wdehome.html">http://www.k12.wy.us/wdehome.html</a>

## Science Lesson Plans on the Web

The following Web sites provide lesson plans and links to other sites for the development of technology-infused science projects:

**[http://lessonplanz.com/Lesson\\_Plans/Science/](http://lessonplanz.com/Lesson_Plans/Science/)**

Lessonplanx.com offers 3,500 lesson plans and worksheets for all grade levels.

**<http://www.sitesforteachers.com/>**

This site was created by two college professors and includes a multitude of useful links.

**[http://www.awesomelibrary.org/Library/Materials\\_Search/Lesson\\_Plans/Science.html](http://www.awesomelibrary.org/Library/Materials_Search/Lesson_Plans/Science.html)**

This no-frills, clear index of lesson plans in nearly 70 categories is presented by Awesome Library.org.

**<http://www.col-ed.org/cur/#Sci>**

These teacher-generated lesson plans are presented by the Columbia Education Center.

**<http://www.lessonplanspage.com/>**

This interactive site offers a good cross-section of science lesson plans.

**<http://school.discovery.com/lessonplans/>**

The Discovery Channel's lesson plan page has some excellent suggestions.

**<http://www.eduref.org/>**

AskERIC database has moved to this site..

**<http://www.kn.pacbell.com/wired/bluewebn/>**

Blue Web site offers lesson plans (many geared to primary grades).

## Technology Integration Activities

The Web sites listed below provide a range of useful resources for general technology integration in the classroom:

**<http://www.ket.org/Education/IN/projects.html>**

Internet classroom projects from The Kentucky Educational Network Internet are offered.

**<http://www.teacherlink.org/>**

This University of Virginia School of Education site features information on integrating technology and teaching.

**<http://main.edc.org/newsroom/closer-look/edtech.asp>**

This Educational Development Center site focuses on leadership and the new technologies.

**<http://www.eschoolnews.org/>**

A commercial site with a range of school technology news from Eschoolnews.org.

**<http://www.quasar.ualberta.ca/edpy485/edtech/>**

This site provides further reading and links from the University of Alberta in Canada.

**<http://www.unescobkk.org/index.php?id=171>**

This interesting group of Web sites is presented by UNESCO Regional Office for Asia and the Pacific.

## Professional Development Sites on the Web

The following Web sites provide resources for technology-related training and more general teaching information.

**<http://staffdevelop.org/>**

Site by Jamie McKenzie, author of “How Teachers Learn Technology Best”

**<http://www.apple.com/education/professionaldevelopment/>**

A professional development site from Apple Computers

**<http://www.nsdc.org/>**

National Staff Development Council Web site

**<http://www.2learn.ca/profgrowth/index.html>**

Because We Care Education Society in Canada on professional growth and mentorship

**<http://reading.indiana.edu>**

Parent and teaching information from ERIC.

**<http://www.pacificnet.net/~mandel/index.html>**

Teachers Helping Teachers Web site has a variety of helpful resources.

**<http://www.teachnet.org/>**

Teachnet.org is another useful teacher-centered resource site.

**<http://www.nsba.org/sbot/toolkit/tne.html>**

National School Boards Association page focused on technology-related information.

## Bulletin Boards

**(Also called Web Forums, Message Boards, Discussion Boards)**

Messages and threaded discussion contributions can be posted on Internet bulletin boards. A bulletin board service is an online community that can be visited at any time to discuss current topics or share ideas and advice. Most Internet service providers offer a discussion board service to their members and many message boards can be joined through special interest Web sites. Some links to Web forums with active discussion groups on educational issues are listed below.

Teacher Talk Forums

**<http://www.iub.edu/~cafs/tforum/tforum.html>**

Teacher's Net

**<http://www.teachers.net/forum/>**

Teacherfocus Forums

**[www.teacherfocus.com/](http://www.teacherfocus.com/)**



## ListSerts

ListSerts are e-mailing lists administered by special interest groups and Web communities. Members may subscribe to the e-mail list. Those who subscribe can monitor topics, post questions and responses, and gather a range of ideas from others interested in the same topic. On an active e-mail list, information is usually up-to-date and useful to members of the group or Web community.

**[http://home.about.com/education/index.htm?PM=59\\_0204\\_T](http://home.about.com/education/index.htm?PM=59_0204_T)**

About.com: a source of newsletters about various educational issues and trends.

**<http://www.lsoft.com/lists/listref.html>**

CataList: 47,172 public lists out of 169,278 LISTSERV lists

**<http://www.cln.org/lists/home.html>**

Community Learning Network WWW home page. CLN is designed to help K-12 teachers integrate technology into their classrooms

**<http://etsc.esd105.wednet.edu>**

Washington State Educational Technology Support Center discussion group listing

# Operating Systems: Hardware Basics

**Hardware:** Physical components that comprise a computer system.

**Software:** Applications that direct a computer to perform various operations.

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The two major hardware platforms are **IBM compatibles** (IBM clones or PCs) and **Macintoshes**. IBM compatibles are made by such companies as IBM, Compaq, Dell, Hewlett-Packard, Gateway, Acer, Micron and Toshiba. Apple Inc. manufactures Macintoshes.

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Computers work on Base 2 numbers, instead of Base 10 and only know two possible states, on (1) or off (0),

Computers store data as a 1 (one) or a 0 (zero). This digit is known as a **bit** (binary digit).

8 bits = 1 byte = 1 character

1 kilobyte = 1 K = 1,024 bytes

1 megabyte = 1 MB = 1,024 K = 1,048,576 bytes

1 gigabyte = 1 GB = 1,024 MB = 1,048,576 K = 1,100,000,000,000 bytes

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A computer system contains input devices, processing components, storage devices and output devices.

## Input Devices

**Keyboard:** Similar to a typewriter keyboard, with extra keys such as control (Ctrl), escape (ESC), alt, enter, arrow keys and function keys (F1, F2, etc.).

**Mouse:** Small handheld device with a rotating ball underneath that when moved across a flat surface, such as a mousepad, relays signals to move the cursor on the screen. The mouse button is pressed to perform tasks. Similar devices include the trackball, track pad and track point. Mice are also available in optical and laser, in place of the conventional ball mouse.

**Scanner:** Device that converts text or graphics from a printed page into an electronic file that can be stored or manipulated. Flatbed and handheld scanners are the two main scanner types.

**Miscellaneous:** Joysticks, touch screens, bar code readers, graphics tablets, digital cameras and microphones are also input devices.

## Hardware Basics [continued]

### Output Devices

**Monitor:** Video display unit. Monitors can display at least 65,000 colors using 16 bit color. Typical monitors these days display using 32 bit color which is about 16.7 million colors.

**Printer:** Device that allows users to obtain a hard copy of their documents. Two main types of printers are inkjet and laser. Printer quality is determined by dots per inch (dpi).

**Speakers:** Devices for audio output. Speakers today can produce stereo-quality sound.

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### Input and Output

**Modem (modulator demodulator):** A mechanism that converts the digital data from the computer to analog signals (waves as tones) so that information can be transmitted over telephone or cable lines. It also translates the incoming analog signals back to digital data. A modem's bps (bits per second) indicates how fast it can send and receive information. Modems can be external or internal to the computer system.

**Peripherals:** A term used to describe all input and output devices.

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### Processing Components

**CPU (central processing unit):** The speed of the microprocessor's internal clock, measured in megahertz (MHz), determines how many times it can transition between on (1) or off (0) each second. This is a prime, though not the only, indication of processing speed and power as every transition indicates instructions being executed. Pentium, Pentium II, Pentium III, Celeron and K6 are CPU type examples.

**ROM (read-only memory):** Fundamental instructions required for the computer to operate that cannot be erased. ROM is recorded during the computer's manufacturing.

**RAM (random-access memory):** "Working memory" accessed when software is used. RAM is cleared when the computer is turned off and can be upgraded to increase the memory capacity.

## Hardware Basics [continued]

### Storage Devices

**Floppy disk drive:** A device that allows a computer to read from and write to the floppy disk. The 3.5-inch floppy disk holds 1.5 megabytes of data enclosed in a plastic case. Floppy disks use a magnetically coated flexible Mylar disk enclosed in a plastic case.

**Hard drive:** A device that uses many rigid disks coated with magnetic material that are permanently mounted inside the encased part of the computer system. Hard disks have much more data capacity than floppy disks and can be accessed more quickly. External hard drives may also be purchased.

Floppy disks and hard disks are magnetic storage media.

**CD-ROM (compact disc read-only memory):** Information can be read from the disc but not written to it. It uses optical storage techniques to store up to 650 MB of data. Information can be accessed from a CD-ROM faster than from a floppy disk but slower than from a hard drive.

**CD-ROM-RW (compact disc read-write):** Information can be both written to and read from the disc. Optical storage techniques can store up to 700 MB of audio or data files. CD-R discs can be recorded but are permanent and are often used for audio files; CD-RW discs can be erased and re-recorded but may only be used for data.

**ZIP Drive:** Data can be stored on these “super” discs which hold 100 MB to 250 MB of information. These devices are often external peripherals, but they can be internal.

**DVD (Digital Video Disc):** DVD is becoming much more common due to the large storage capacity (over 4 GBs). DVD is an optical disc storage media format that can be used to store high video and sound quality. They resemble CDs but are encoded in a different format and a much higher density.

**USB Flash Drive:** Flash memory data storage devices integrated with a USB interface. These are typically small, lightweight, removable and rewritable. Memory capacity typically ranges from 8 megabytes up to 64 gigabytes.

## Operating Systems: File Organization

**Back up** (*verb*): the act of copying information to a disk

**Backup** (*noun*): the information copied to a disk

It is important to back up all new document files. Files that have been backed up can be restored in case a file becomes corrupt (damaged).

Backing up should be performed regularly. Back ups should also be stored in a physically separate location from the main data to prevent loss from events that can cause the loss of the main data (i.e. fire, flood, earthquake).

Utility applications can be purchased that contain features to help back up files.

The *Microsoft Windows* backup utility can be launched by selecting START → ALL PROGRAMS → ACCESSORIES → SYSTEM TOOLS → BACKUP. Depending on your version of Windows, this might be slightly different.

Using Windows Explorer, files can be backed up manually by copying them to a floppy disk or to a networked drive.

Be careful when replacing a file or folder with another of the same name. In general, the newer version should replace the older. When in doubt, it is prudent to save the new file with a slightly different file name so that important data is not lost.

The following instructions apply to both Windows Explorer and My Computer.

### To select more than one file:

1. Choose the first file.
2. Hold down the CONTROL key.
3. Select other files as desired.

*or*

1. Choose the first file.
2. Hold down the SHIFT key.
3. Select the last file, and all other files between the first and the last are highlighted.

### To move files from one location on a drive to another location on the same drive:

1. Select the files.
2. Drag the files to another location on the same drive.

## **File Organization [continued]**

### **To copy files from one location on a drive to a different drive:**

1. Select the files.
2. Drag the files to another drive.

### **To copy files from one location on a drive to another location on the same drive:**

1. Select the files.
2. Press and hold down the CONTROL key.
3. Drag the files from one location to another.

### **To format a floppy disk:**

1. Insert the floppy disk into the floppy drive.
2. Right-click the floppy drive and choose FORMAT from the pop-up menu.
3. Choose the FULL radio button in the Format Type group.
4. Click start.
5. After the formatting is complete, select the CLOSE button when the summary appears.
6. Close the Format Floppy window.

### **Tips for Organizing the Hard Drive:**

1. Organize the hard drive by using Windows Explorer or My Computer.
2. Use folders liberally to help categorize the files in a meaningful manner.
3. Hard drive organization will likely change with time and experience. Be certain to incorporate new techniques as they are learned.
4. Attempt to determine the most efficient way to organize files and folders with respect to the potential tasks and users.

# Word Processing Basics

**Word processing** is the use of a computer application to create, edit, format and print documents.

Common word processing programs today are *Microsoft Word*, *WordPerfect*, *AppleWorks* and *WordPro*. Word processing applications specifically designed for children include *Storybook Weaver Deluxe*, *The Writing Center*, *Creative Writer* and *ClarisWorks for Kids*.

**Word wrap** is a word processing feature that automatically moves continuing text to the line below when the previous line becomes full. The ENTER key should be pressed only at the end of a paragraph to move the cursor to the next line.

The paragraph symbol ¶ indicates the end of each paragraph but does not appear on the printed document. Other non-printing characters include a raised dot • representing a space, and an arrow → for a tab. Users may choose whether to display these non-printing characters.

Word Processors today are WYSIWYG in format (pronounced wizzy-wig, short for What You See Is What You Get). The screen shows the appearance of the printed document.

The main features of word processing can be categorized as either editing or formatting functions. Editing features allow users to alter the content of text. Formatting features affect how information appears within a document. Formatting can be performed before the text is entered, while text is entered, or after the text is complete. To format text after it has been entered, highlight the text, then choose the desired formatting options.

Word processors allow users to access a variety of fonts. A font is an individual design of letters, numbers and punctuation characters. Many thousands of fonts exist. Fonts can be categorized as either serif or sans serif. Serif refers to cross strokes at the end points of letters and numbers, and sans is French for without. Compare the following:

Courier New is an example of a serif font.

Arial is an example of a sans serif font.

Consider using a serif font for text in the body of a document because it is easier to read. Sans serif fonts are typically used for shorter amounts of text, such as titles.

The size of a font is measured in **points**. One inch is equal to 72 points, and one centimeter is equal to 28 points. Font sizes of 10 or 12 point are common for text in the body of documents.

## Word Processing Basics [continued]

The **font style** refers to the defining characteristics that can be applied to fonts. The most common font styles are *italic*, underline and **bold**. In general, avoid applying multiple styles, such as bold and italics, to text.

**Bullets** are symbols (often a solid circle or square) used to distinguish items in a list. Bullets are used when listing items of relatively equal importance. Numbers can be inserted automatically to signify order in a list of items.

**Margins** are the blank spaces at the top, bottom, left and right edges of a document. The word wrap feature keeps text within the specified margins. Most printers require margins of at least half an inch.

**Text alignment** (also known as justification) refers to how text appears in relation to the left and right margins. Alignment applies to all of the text within a paragraph. Compare the alignment of the following three sentences.

This sentence is left aligned.

This sentence is center aligned.

This sentence is right aligned.

Other sentences in this document are justified (also known as full justification), meaning the text is aligned with both the left and the right margins.

The **header** comprises the text or graphics that appear at the top of every page in a multi-page document. Text or graphics at the bottom of each page comprise the **footer**. Page numbers are often inserted into the header or footer. It is possible to create different headers and footers for odd and even pages, as well as for the first page of a document.

A **footnote** is a note of reference or a comment that appears at the bottom of a page. An **endnote** is a note of reference or a comment that appears at the end of the document. To let readers know that a footnote or an endnote exists for a particular section of body text, superscript numbers (or sometimes symbols) are inserted after the corresponding sentence.

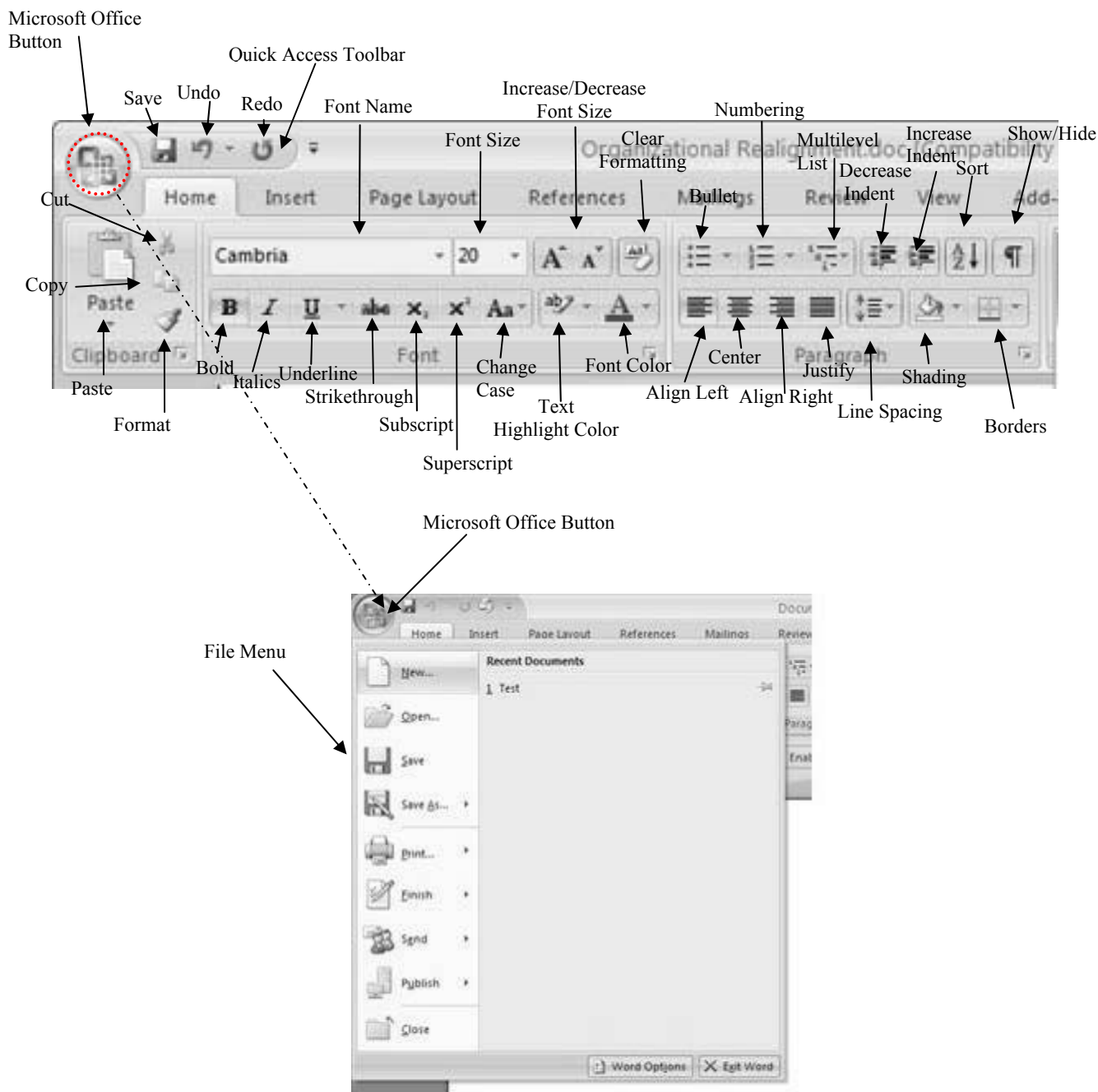
**Clip art** is a collection of previously created graphics that can be added to documents.

Documents can be printed in different **page orientations**. **Portrait** orientation refers to a printed page that is taller than it is wide. Portrait orientation is the default printing option in almost all applications. **Landscape** orientation is used to print a page that is wider than it is tall.



## Word Processing Basics: Using Microsoft Word 2007

### The Ribbon




## Using Microsoft Word 2007: Getting Started

### To open an existing document:

1. From the MICROSOFT OFFICE button  in the top left corner choose OPEN.
2. Locate the file and click OPEN.

### To create a new document:

1. From the MICROSOFT OFFICE button choose NEW. 
2. Select BLANK DOCUMENT and click CREATE.

### To create a new document based on a template or a wizard:

1. From the MICROSOFT OFFICE button choose NEW.
2. Under Template Categories on the left, chose a document type. For some templates you must have internet access.
3. Select the desired document style and click CREATE.

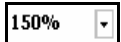
### To display a document in Normal View:

- ☐ From the VIEW TAB select DRAFT.

### To display a document in Print Layout View:

- ☐ From the VIEW TAB select PRINT LAYOUT.

### To enlarge or to reduce the view of a document:

1. From the VIEW TAB click the ZOOM button, then choose a percentage from the preset choices or a custom percent with the PERCENT drop-down box. 
2. Select the desired percentage. Click OK.

### To hide or to show non-printing characters:


- ☐ From the HOME TAB click the SHOW/HIDE button. 

### To check spelling while typing:


1. From the REVIEW TAB select SPELLING & GRAMMAR. The document will be auto checked for spelling and grammar.
2. *Word* indicates possible spelling errors with wavy red underlines. To correct an error, right-click a word with a wavy red underline, then select the appropriate correction listed in the pop-up menu.

## Using Microsoft Word 2007: Inserting Text and Objects


### To insert a table:

1. Position the cursor where the table will be added.
2. From the INSERT TAB select the TABLE button. 
3. Highlight the appropriate number of cells from the menu.
4. Click the left mouse button to insert the table into the document.


### To insert a picture from another file:

1. Position the cursor in the location where the picture will be placed.
2. From the INSERT TAB click on the PICTURE button. 
3. Locate and select the appropriate file, then click INSERT.

### To insert clip art:

1. Position the cursor where the clip art will be added.
2. From the INSERT TAB click on the CLIP ART button. 
3. Select the clip art to be added and click the insert clip button from the menu on the right side of the screen.
4. Close the INSERT CLIP ART TAB.

### To insert SmartArt (Diagram):

1. Position the cursor where the diagram will be added.
2. From the INSERT TAB click on the SMARTART button. 
3. Choose a DIAGRAM TYPE and click OK.

### To insert WordArt:

1. From the INSERT TAB click on WORDART.
2. Choose a WordArt style and click OK.
3. Enter and format the text, then click OK.
4. Resize and reposition the WordArt as desired.

### To insert a page break:


1. Position the cursor on the line below where the page break will be added.
2. From the INSERT TAB click on PAGE BREAK.

## Using Microsoft Word 2007: Inserting Text and Objects [continued]



### To insert page numbers:

1. Position the cursor in the footer or where the page numbers will be inserted.
2. From the INSERT TAB click on PAGE NUMBER.
3. Make the desired selections from the Position and Alignment drop-down lists.
4. The page number will be automatically added to the document.

### To create a header or a footer:

1. From the INSERT TAB click on HEADER or FOOTER.
2. From the drop-down list choose the HEADER style.
3. To create a footer, click the GO TO FOOTER button in the NAVIGATION SECTION. 
4. Select the CLOSE button in the DESIGN TAB.


### To insert a footnote or an endnote:

1. From the REFERENCES TAB click on INSERT FOOTNOTE. 
2. From the REFERENCES TAB click on INSERT FOOTNOTE. 

### To insert a symbol not shown on the keyboard:

1. Position the cursor where the symbol will be added.
2. From the INSERT TAB click on SYMBOL.
3. From the drop-down menu, select the symbol or character to be inserted.

### To insert the current date and time in a document:

1. Position the cursor where the date or time will be added.
2. From the INSERT TAB click on the DATE AND TIME logo. 
3. Choose the desired option from the Available Formats list, then click OK.

**Tip:** To automatically update the date or time whenever a document is opened or printed, check the UPDATE AUTOMATICALLY option in the Date and Time dialog box when inserting the date or time. Otherwise, the document will print the original date or time.

## Using Microsoft Word 2007: Editing

### To select all of the text in a document:

1. From the HOME TAB click on SELECT.
2. From the drop-down box click on SELECT ALL.

### To find a keyword or a phrase in a document:

1. From the HOME TAB click on FIND.
2. Enter the keyword or phrase in the Find What text box, and select FIND NEXT.

**Tip:** The located text will be automatically highlighted. To edit the text, close the Find and Replace dialog box and make the necessary changes.

### To replace a keyword or a phrase in a document:


1. From the HOME TAB click on REPLACE.
2. Enter the text to be replaced in the Find What text box.
3. Enter the replacement text in the Replace With text box.
4. Select FIND NEXT to locate the text.
5. Choose REPLACE to make the change, then click FIND NEXT to continue or select CLOSE.

**Tip:** If multiple occurrences of text are being replaced, choose the REPLACE ALL button.

### To view a specific page within a multi-page document:


1. From the HOME TAB click on GO TO.
2. On the GO TO tab of the Find and Replace dialog box, verify that page is selected in the GO TO WHAT list box.
3. Enter the desired page number in the Enter Page Number text box, then click GO TO.
4. Click the CLOSE button to close the dialog box.

### To copy text:


1. Highlight the text to be copied.
2. From the HOME TAB click on the COPY button. 

## Using Microsoft Word 2007: Editing [continued]

### To cut text from a document:


1. Highlight the text to be cut.
2. From the HOME TAB click on the CUT button. 

### To paste text that has been copied or cut from a document:


1. Position the cursor where the text is to be pasted.
2. From the HOME TAB click on the PASTE button. 

**Tip:** The last text copied or cut to the Clipboard will be pasted.


### To undo the last action performed:

1. Select the UNDO button  on the QUICK ACCESS TOOLBAR on the top left.

### To undo one or more previous actions:

1. Select the drop-down arrow next to the UNDO button. 
2. Select the appropriate actions to be undone.

### To redo the last action undone:

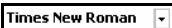
- Select the redo button  on the on the QUICK ACCESS TOOLBAR.

### To replace text manually:


1. Highlight the text to be replaced.
2. Enter the new text.

## Using Microsoft Word 2007: Formatting


### To change the text font:

1. Highlight the text to be changed.
2. Select the appropriate font from the FONT drop-down list. 


### To change the size of text:

1. Highlight the text to be changed.
2. Select a point size from the FONT SIZE drop-down list. 


### To bold text:

1. Highlight the text.
2. Select the BOLD button  on the FONT GROUP of the HOME TAB.


### To italicize text:

1. Highlight the text to be italicized.
2. Select the ITALIC button  on the FONT GROUP of the HOME TAB.


### To underline text:

1. Highlight the text to be underlined.
2. Select the UNDERLINE button  on the FONT GROUP of the HOME TAB.


### To change the color of text:

1. Highlight the text to be changed.
2. Click the FONT COLOR drop-down arrow. 
3. Select the appropriate color from the menu.


### To center a paragraph of text:

1. Highlight the text to be centered.
2. Click the CENTER button  on the PARAGRAPH GROUP of the HOME TAB.

### To align a paragraph of text to the left margin:


1. Highlight the text to be aligned.
2. Click the ALIGN LEFT button  on the PARAGRAPH GROUP of the HOME TAB.

### To align a paragraph of text to the right margin:


1. Highlight the text to be aligned.
2. Click the ALIGN RIGHT button  on the PARAGRAPH GROUP of the HOME TAB.

## Using Microsoft Word 2007: Formatting [continued]

### To justify a paragraph of text:

1. Highlight the text to be justified.
2. Click the JUSTIFY button  on the PARAGRAPH GROUP of the HOME TAB.


### To increase the indent of a paragraph:

1. Highlight the text to be indented.
2. Choose the INCREASE INDENT button  on the PARAGRAPH GROUP of the HOME TAB.


### To decrease the indent of a paragraph:

1. Highlight the text to be changed.
2. Choose the DECREASE INDENT button  on the PARAGRAPH GROUP of the HOME TAB.


### To change the vertical alignment of text in a document:

1. From the PAGE LAYOUT TAB, open the PAGE SETUP box by clicking  in the bottom right corner of the PAGE SETUP GROUP. This button is called the Dialog Box Launcher.
2. On the LAYOUT tab, choose a VERTICAL ALIGNMENT from the drop-down box.
3. Click OK.

### To change line spacing:

1. Highlight the paragraphs to be changed.
2. From the PAGE LAYOUT TAB, open the PARAGRAPH box by clicking  in the bottom right corner of the PARAGRAPH GROUP.
3. On the INDENTS AND SPACING TAB, select an option from the LINE SPACING drop-down list.
4. Click OK.

### To create a bulleted list from text:

1. Highlight the text to be bulleted.
2. Click the BULLETS button  on the PARAGRAPH GROUP of the HOME TAB.


### To modify a bulleted list:

1. Highlight the bulleted list to be changed.
2. Click the drop-down arrow on the BULLETS button on PARAGRAPH GROUP of the HOME TAB.
3. On the BULLET drop-down, select a bullet.



## Using Microsoft Word 2007: Formatting [continued]

### To create a numbered list from text:

1. Highlight the text to be numbered.
2. Click the NUMBERING button  on the PARAGRAPH GROUP of the HOME TAB.


### To modify a numbered list:

1. Highlight the numbered list to be changed.
2. Click the drop-down arrow on the NUMBERING button on the PARAGRAPH GROUP of the HOME TAB.
3. On the NUMBER drop-down list, select the appropriate options.

### To add a border to a page in a document:

1. From the PAGE LAYOUT TAB choose PAGE BORDERS.
2. Select the desired options and click OK.

### To format text as columns:

1. Highlight the text to be formatted as columns.
2. Choose the COLUMNS button  on the PAGE LAYOUT TAB.
3. Select the appropriate number of columns from the drop-down menu.

### To set a tab:

1. Highlight the paragraphs to be formatted.
2. Click the horizontal ruler at the desired location for the tab.

**Tip:** If you do not see the ruler at the top of the screen, go to the VIEW TAB and click the checkbox next to RULER.

## Using Microsoft Word 2007: Finishing Touches

### To check spelling and grammar:

1. From the REVIEW TAB select SPELLING & GRAMMAR. The document will be auto checked for spelling and grammar.
2. *Word* indicates possible spelling errors with wavy red underlines. To correct an error, right-click a word with a wavy red underline, then select the appropriate correction listed in the pop-up menu.
3. When a possible spelling or grammatical error has been located, make the necessary changes in the Spelling and Grammar dialog box and select CHANGE.

**Tip:** To check spelling or grammar on a particular section of the document, highlight only that section before choosing the SPELLING & GRAMMAR button.


### To count the number of words in a document:


- From the REVIEW TAB select WORD COUNT. 

### To change the margins of a document:


1. From the PAGE LAYOUT TAB select MARGINS.
2. On the MARGINS drop-down, select the desired margin settings.

### To save a new document:

1. From the MICROSOFT OFFICE button choose SAVE.  
or
1. Click the SAVE button  on the QUICK ACCESS TOOLBAR.
2. Navigate to the appropriate location to store the document, enter a name for the document in the File Name box and select SAVE.

**Tip:** To save the document in a new folder, click the NEW FOLDER button  before selecting SAVE.

### To save a document with the same name:


1. From the MICROSOFT OFFICE button choose SAVE.  
or
2. Click the SAVE button  on the QUICK ACCESS TOOLBAR.

## Using Microsoft Word 2007: Finishing Touches [continued]

### To save a document with a new name:

1. From the MICROSOFT OFFICE button choose SAVE AS.
2. Navigate to the desired location and enter a new name in the File Name box.
3. Click SAVE.


### To preview a document before printing:

1. From the MICROSOFT OFFICE button choose PRINT then PRINT PREVIEW.  
or
1. Click the PRINT PREVIEW button  on the QUICK ACCESS TOOLBAR.
2. Select the CLOSE button to exit Print Preview.

**Tip:** The PRINT PREVIEW button may have to be added by customizing this toolbar.

### To print a document:

1. From the MICROSOFT OFFICE button choose PRINT.
2. Enter the range of pages and the number of copies to be printed.
3. Click OK.

**Tip:** To print the whole document, click the PRINT button  on the QUICK ACCESS TOOLBAR.

### To print an envelope:

1. From the MAILINGS TAB choose ENVELOPES.
2. On the ENVELOPES tab, enter the envelope size under OPTIONS and click ok.
3. Enter the delivery address and the return address (or select the OMIT check box) and click PRINT.

**Tip:** To print an envelope for an existing letter, select the name and address within the text body, then follow the steps above and verify that the delivery address appears on the ENVELOPES tab.

### To close a document:

- ❑ From the MICROSOFT OFFICE button choose CLOSE.

## **Additional Features in Microsoft Word 2007:**

### **Quick Access Toolbar:**

1. Tools or commands that are not as readily available as you would like can be easily accessed by adding them to the QUICK ACCESS TOOLBAR.
2. To add a button right click on a feature in a tab, then click ADD TO QUICK ACCESS TOOLBAR. You may remove a button the same way, by right clicking and choosing REMOVE FROM QUICK ACCESS TOOLBAR.

# Graphics Basics

The term graphics refers to the use of a computer to create and modify images. *Microsoft Paint 5.1* is an example of a graphics program. *Microsoft Office 2000 Professional* contains graphics tools that are collectively known as *Office Art*. The newest drawing tool to be added to the Microsoft family is called *SmartArt*, and is available in the Office 2007 Suite. *SmartArt* graphics allow you to create process charts, radial charts, organization charts, and more. More advanced graphics applications include *Adobe Illustrator*, *Adobe Photoshop*, *CorelDRAW* and *Dabbler by Fractal Design*.

Common graphics file formats include:

\*.bmp (Bitmap graphics), \*.jpg (Joint Photographic Experts Group), \*.gif (Graphics Interchange Format) and \*.tif (Tagged-Image File Format).

## Painting Programs:

The two basic types of computer graphics applications are paint programs and draw programs. *Paint* is an example of a paint program.

1. Graphics are created by modifying pixels. A pixel is a single point in a graphic image.
2. Images are known as bitmap graphics (or raster graphics).
3. Painting tools mimic such real-life art tools as a pencil, an eraser, an airbrush, a paintbrush and a paint bucket.
4. Lines and shapes of varying thickness and color can be created.
5. Any portion of the picture can be selected to be moved, resized, flipped or rotated.
6. Clipart images can be inserted and modified.
7. Graphics become distorted (pixelated) when enlarged.
8. Painting programs are best suited for free-form artwork including delicate designs, shading and other artistic effects.

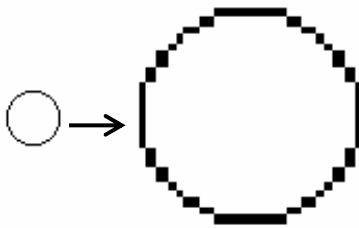
## Drawing Programs:

*Office Art* is a set of drawing tools found in *Microsoft Word 2003*, *Excel 2003* and *PowerPoint 2003*, and is accessible through the Drawing toolbar. The Drawing toolbar is not available in most of *Microsoft Office 2007*, and has been replaced by the Ribbon.

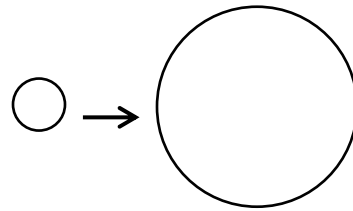
1. Images are known as object-oriented graphics (or vector graphics).
2. The directional lines (vectors) that constitute a graphic are stored as mathematical formulas.
3. Graphics are treated as separate objects.

## Graphics Basics [continued]

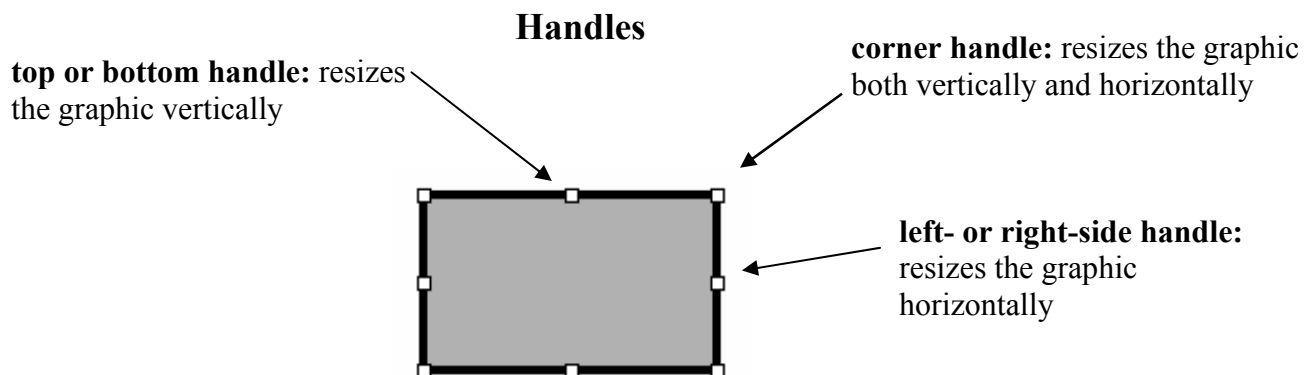
1. Graphics can be grouped and manipulated as one object or ungrouped and manipulated as separate objects.
2. Graphics are created in separate layers that can be reordered.
3. Graphics can be easily modified at any time.
4. Lines and shapes of various thickness and color can be created.
5. Objects can be selected and moved, resized, flipped or rotated.
6. Clip art can be inserted and modified.
7. Graphics do not become distorted when enlarged.
8. Drawing programs are best-suited for projects using shapes and lines in which the ability to reposition and resize is important.



This circle was enlarged in a painting program. Note the distortion.



This circle was enlarged in a drawing program. No distortion occurred.



## **Graphics Basics: Sources of Graphics**

### **Original Work**

Graphics created from scratch are considered original artwork. When time is limited, previously created graphics can be reused and modified. Some benefits of creating original images include fostering artistic and creative skills, ensuring the complete ownership of the material (no copyright issues) and promoting exploration and discovery of the capabilities of the graphics tools. Disadvantages include the time-consuming nature of creating original artwork, the difficulty of making realistic-looking images and the limitations of the graphics capabilities within some programs.

### **Scanners**

Scanners are peripheral devices that convert artwork or text from a printed page to an electronic file which can be stored or manipulated in other programs. The conversion process is known as digitizing. The two main types of scanners are flatbed, which are similar to a photocopy machine, and handheld, which are dragged across the page. Like printer quality, scanner quality is determined by its dpi (dots per inch). Some advantages of scanning artwork include the abilities to use previously created images, to scan photographs and to personalize documents easily. Some disadvantages include potential copyright violations, the length of time required to scan many images and the storage space demands that result from the large file sizes of scanned photographs and pictures.

### **Digital Cameras**

A digital camera is similar to a regular camera in that a user points the lens of the handheld device at a subject, looks through a viewfinder and presses a button to take a picture. A critical difference, however, is that a digital camera does not use film. Instead, images are saved digitally and can be copied to a computer's hard drive with a connecting cable. Benefits of using a digital camera include the elimination of expensive and time-consuming film processing and scanning, the portability of the camera and low operating costs. Some negative aspects include the high price of the camera, lower-quality pictures than film-based cameras, long downloading time and large hard drive space requirements.

## **Graphics Basics: Sources of Graphics [continued]**

### **Clip Art**

Clip Art is previously created digital artwork intended to be integrated into documents. A collection of clip art is known as a clip art library. To make it easier for users to browse and locate specific images, graphics in clip art libraries are often grouped in such categories as animals, food, household, maps and transportation. When some applications, including *Microsoft Word 2007* and *Microsoft Publisher 2007*, are installed, a clip art library is copied onto the computer's hard drive. With the exception of creating another clip art library, clip art can be used in any way without copyright violation. There are CD-ROMs that contain clip art libraries of images either within a particular category or with an assortment of categories.

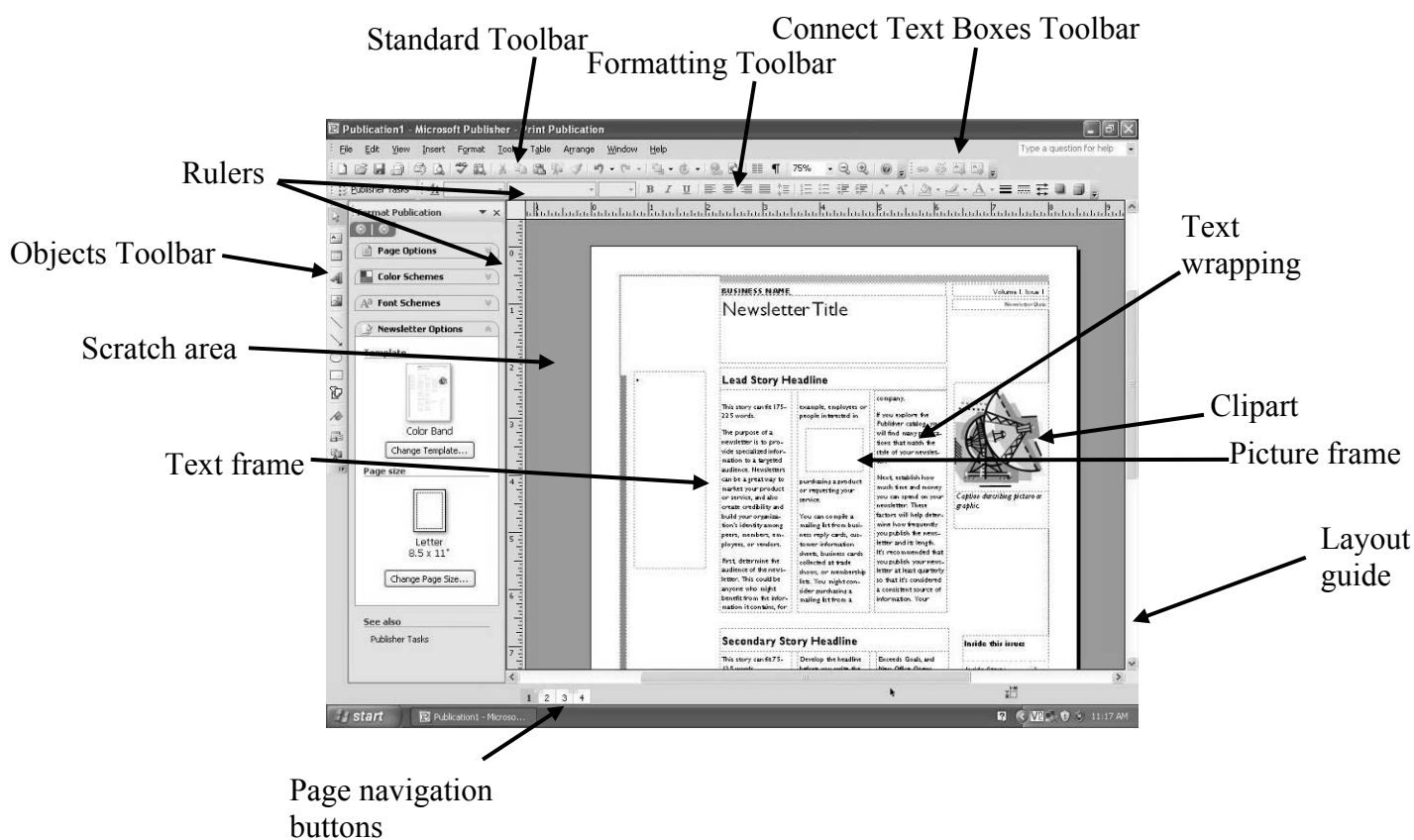


# Desktop Publishing: Basics

Desktop publishing is the process of using a computer to position text and graphics on a page to produce printed documents such as signs, newspapers, newsletters, magazines, brochures, banners, cards, calendars, letterheads, certificates, business cards, reports and resumes. The term desktop publishing was coined in the mid-1980s with the arrival of the Apple Macintosh, page layout software and the laser printer. For the first time, people could “publish” from their “desktop”, creating professional-looking printed materials at home.

Examples of desktop publishing applications include *Microsoft Publisher 2007*, *Adobe PageMaker* and *QuarkXPress*. Other software packages with desktop publishing features include the *Print Shop* series (from Broderbund), *Print Artist* (from Sierra On-Line), *The Children's Writing and Publishing Center* (from The Learning Company) and *Corel Print House*.

## Desktop Publishing Terminology



## Desktop Publishing Basics [continued]

**background:** the layer in which text and images that appear in the same location on every page of a document are placed

**clip art:** previously created digital artwork that is intended to be integrated into documents

**foreground:** the layer in which the text and images that vary from page to page in a document are placed

**Greek text:** a block of nonsensical text (representing the size and position of the actual text) used to evaluate the aesthetics of the page design

**grouping:** joining together separate objects so the components can be manipulated as one object

**importing:** the process of inserting text or graphics that originated in one program into another program

**landscape:** the page orientation in which the page is wider than it is tall

**layers:** invisible sheets on which users can place text or graphics so the objects are independent of other objects on other sheets

**layout:** the process of arranging text and graphics on a page

**layout guides:** nonprinting lines that can be helpful when placing text and graphics within a document

**linking:** connecting text frames so that the excess text from the first frame flows into the second frame

**portrait:** the page orientation in which the page is taller than it is wide

**picture frame:** a movable and resizable placeholder for a graphic

**pull quote:** a short phrase set in a larger type size that repeats information found within the article

**rulers:** on-screen bars that measure the page horizontally and vertically

**scratch area:** the nonprinting work area in which text and graphics can be placed before they are moved into a document

**text frame:** a placeholder for text, which can be moved or resized

**text wrapping:** the way that text flows around a graphic


**wizard:** a Help feature that guides users through multistep processes to create common documents; including creating cards, newsletters, banners and resumes

## **Desktop Publishing: Using Microsoft Publisher 2007**

### **To create a new publication:**

1. Choose FILE → NEW.
2. In the POPULAR PUBLICATION TYPES Task Pane, select the appropriate options to create the desired publication.
3. When finished click CREATE.

### **To create a bulleted list or a numbered list:**

1. Highlight the desired lines of text.
2. Choose the BULLETS button  on the Formatting toolbar.

**Tip:** To apply customized bullets, choose FORMAT → BULLETS AND NUMBERING. From the BULLETS tab, choose the desired bullet shape and size and select OK.

### **To undo the last action:**

- Choose EDIT → UNDO.

### **To insert page numbers on every page:**

1. Choose INSERT → PAGE NUMBERS.
2. Select the POSITION and ALIGNMENT and click OK.

### **To create a calendar, an advertisement, a coupon or a logo for an existing publication:**

1. Choose INSERT → DESIGN GALLERY OBJECT.
2. On the OBJECTS BY CATEGORY tab, select CALENDARS, ADVERTISEMENTS, COUPONS or LOGOS from the Categories list.
3. Choose the desired publication option in the menu to the right and click INSERT OBJECT.
4. Resize and reposition the object and make any desired changes.

**Tip:** You can double click on the desired publication option and it will be added to your document.

### **To insert a new page:**

1. Select INSERT → PAGE.
2. Enter and choose the desired options and click OK.

### **To preview the document as it will be printed:**

1. Select VIEW
2. Click on BOUNDARIES AND GUIDES to remove the checkmark.

## Using Microsoft Publisher 2007 [continued]

### To change the orientation of a page:

1. Select FILE → PAGE SETUP.
2. In the BLANK PAGE SIZES group, select a page type.
3. Choose a page option and click OK.

### To view the page at a specific percentage:


- ❑ Click the ZOOM drop-down box on the Standard toolbar and choose a percentage.

### To view a different page within a document:

- ❑ Click the appropriate PAGE NAVIGATION button at the bottom-left corner of the screen.

## **Text Formatting and Editing**

### To insert text:

1. Click the TEXT FRAME tool  on the Objects toolbar.
2. Drag to create a text frame.
3. Enter text.

### To import text:




1. Confirm that a text frame is selected.
2. Choose INSERT → TEXT FILE.
3. Navigate to and select the desired text file and click OK.

### To change the text font or text size:


1. Highlight the desired text.
2. Make the desired selections from the Font drop-down list or the Font Size drop-down list.

## Using Microsoft Publisher 2007: Text Formatting and Editing [continued]





### To change the text style:

1. Highlight the desired text.
2. Choose the BOLD button , the ITALIC button  or the UNDERLINE button  on the Formatting toolbar.




### To change the color of text:

1. Highlight the desired text.
2. Select the FONT COLOR button  on the Formatting toolbar, then select a color.

### To change text alignment:

1. Highlight the desired text.
2. Select the LEFT button , the CENTER button , the RIGHT button  or the JUSTIFY button  on the Formatting toolbar.

### To link two text frames:

1. Verify that a second frame already exists. If not, create one.
2. Click the text frame containing the text. Confirm that the TEXT IN OVERFLOW button  is displayed on the frame's bottom edge.
3. Choose CREATE TEXT BOX LINK button  from the Connect Text Boxes toolbar on the top right.
4. With the pitcher-shaped pointer , select the second text frame into which the overflow text should be placed.

### To change the number of columns in a text frame:

1. Select a text frame.
2. On the formatting toolbar choose the column button.
3. Highlight the number of columns.

### To wrap text closely around an image:

1. Select a graphic.
2. Choose FORMAT → PICTURE.
3. In the LAYOUT tab, select the features you desire and click OK.

## Using Microsoft Publisher 2007: Text Formatting and Editing [continued]



### To insert the date or time into a text frame:

1. Position the cursor in the desired location within a text frame.
2. Choose INSERT → DATE AND TIME.
3. Select an option from the Available Formats list.
4. Choose the UPDATE AUTOMATICALLY check box if desired, then click OK.


## Graphics Formatting and Editing

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### To insert clip art:

1. Select the PICTURE FRAME tool  on the Objects toolbar.
2. Choose the Clip Art logo  from the dropdown menu.
3. Enter a keyword or keywords in the Search For Clips box, then press the GO.
4. Choose the desired clip art image and it will automatically be entered into the document.
5. Close the Insert Clip Art window.

### To insert a picture file:


1. Select the PICTURE FRAME tool  on the Objects toolbar
2. Choose PICTURE FROM FILE.
3. Drag and create graphics frame.
4. Navigate to and select the desired picture file from the Insert Picture box, then choose INSERT.

### To create a straight line:

1. Choose the LINE tool  on the Objects toolbar.
2. Click and hold down the mouse button to establish the line's starting point, then drag to create the line.


**Tip:** Holding down the SHIFT key while dragging the mouse can create horizontal, vertical and 45-degree angle lines.

### To create a straight line with one or two arrowheads:


1. Select an existing line, or draw a new line.
2. Choose the ARROW STYLE button  on the Formatting toolbar and choose an arrow style from the drop-down box.

## Using Microsoft Publisher 2007: Graphics Formatting and Editing [continued]

### To change the thickness and color of a line:


1. Select a line.
2. Choose the LINE/BORDER STYLE button  on the Formatting toolbar.
3. Select one of the displayed options in the menu, or choose MORE STYLES to select a customized line width, style and color.

### To create an oval:

1. Select the OVAL tool  on the Objects toolbar.
2. Drag the mouse diagonally to create an oval.


**Tip:** Holding down the SHIFT key while dragging creates a circle.

### To create a rectangle:

1. Click the RECTANGLE tool  on the Objects toolbar.
2. Drag the mouse diagonally to create a rectangle.


**Tip:** Holding down the SHIFT key while dragging creates a square.

### To create a custom shape:

1. Select the CUSTOM SHAPES tool  on the Objects toolbar.
2. Click the desired shape from the pop-up menu, then drag to create the shape.


**Tip:** Holding down the SHIFT key while dragging creates a shape with the same horizontal and vertical proportions.

### To crop a bitmap image:






1. Select an image.
2. Click the CROP PICTURE tool  on the Picture toolbar.
3. Drag a handle to crop the image.

## Using Microsoft Publisher 2007: WordArt


### To insert WordArt:

1. Click the WORDART FRAME tool  on the Objects toolbar.
2. Select the WordArt shape, font and font size as desired, then click OK.
3. Enter text into the Enter Your Text Here box, then click OK.
4. Resize WordArt frame if needed.




### To change the style of the WordArt:

1. Make sure the WordArt is chosen, and click EDIT TEXT on the WordArt toolbar.
2. Use the BOLD button  to bold text and the ITALIC button  to italicize text.
3. From the WordArt toolbar select the SAME LETTER HEIGHTS button  to make all of the letters the same height.
4. To change the alignment of the WordArt text, click the JUSTIFICATION button  and select one of the alignment options.
5. Select the CHARACTER SPACING button  to change the spacing between the letters.

### To change the orientation of the WordArt:

1. Verify that the WordArt toolbar is open. If it is not displayed, click the WordArt.
2. Select the WORDART VERTICAL TEXT button  to toggle the WordArt between Vertical and Horizontal.
3. From the Arrange Menu choose ROTATE OR FLIP to rotate the WordArt at specified angles

### To change the color, shading, shadow and border for WordArt:

1. From the Formatting menu choose the FILL COLOR button  to change the color of the text.
2. Choose the LINE COLOR button  to change the color of the border around the text.
3. Choose the SHADOW STYLE button  to add shadow to the WordArt.



## Using Microsoft Publisher 2007: Working with Objects


### To group objects:

1. Hold down the SHIFT key and click the objects to select them.
2. Choose ARRANGE → GROUP OBJECTS.


### To ungroup an object:

1. Confirm that the grouped object is selected.
2. Choose ARRANGE → UNGROUP OBJECTS.

### To create a table:

1. Select the INSERT TABLE button  on the Objects toolbar.
2. Drag to create a table frame of the desired dimensions.
3. In the Create Table dialog box, enter the number of rows and columns, choose a table format and click OK.
4. Enter information into the cells of the table, pressing the TAB key to move to the next cell.

### To change an object's layer:

1. Select an object.
  2. Choose the BRING FORWARD button  on the Standard toolbar.
- or
1. Select an object.
  2. Choose ARRANGE → ORDER → BRING TO FRONT or ARRANGE → ORDER → SEND TO BACK.

### To move an object:

1. Select an object.
2. Position the pointer inside the object.
3. When the pointer takes the shape of a quad arrow with a moving-truck icon, drag the object.



## Using Microsoft Publisher 2007: Working with Objects [continued]

### To move an object in small increments:

1. Select an object.
2. Choose ARRANGE → NUDGE.
3. Click one of the arrow buttons to move the object in the desired direction.

**Tip:** Objects can also be nudged by holding down the ALT key and pressing one of the arrow keys on the keyboard.

### To duplicate an object:

1. Select the object.
2. Choose the COPY button  on the Standard toolbar or select EDIT → COPY.
3. Choose the PASTE button  on the Standard toolbar or select EDIT → PASTE.


**Tip:** Use the keyboard shortcut of CONTROL + C for the COPY command and CONTROL + V for the PASTE command.

### To resize an object:


1. Select an object.
2. Position the pointer on the handle.
3. When the pointer takes the shape of a double arrow labeled *resize*, drag the handle.

**Tips:** The corner handles resize the selection both horizontally and vertically. The left- and right-side handles resize the object horizontally. The top and bottom handles resize the object vertically. Holding down the SHIFT key will keep the proportions of the object intact as it is resized.

### To fill an object with a solid color:


1. Select an object.
2. Choose the FILL COLOR button  on the Formatting toolbar and select a color or an option from the drop-down menu.

### To fill an object with a pattern:


1. Select an object. Choose the FILL COLOR button  on the Formatting toolbar and select FILL EFFECTS.
2. Click the PATTERNS tab and choose a pattern style.
3. Make the desired selections from the FOREGROUND and BACKGROUND drop-down menus, then click OK.

## Using Microsoft Publisher 2007: Working with Objects [continued]


### To fill an object with a gradient:

1. Select an object. Choose the FILL COLOR button  on the Formatting toolbar and select fill effects. Click the GRADIENT tab and choose a gradient style.
2. Make the desired selections from the Color 1 and Color 2 drop-down menus, then click OK.

### To add a border to an object:

1. Select an object. Choose the LINE/BORDER STYLE button  on the Formatting toolbar.
2. Choose one of the displayed line widths in the drop-down menu or select MORE LINES to customize the line width, style and color.



### To add a shadow to an object:

1. Select an object.
2. Choose SHADOW STYLE button. 


### To flip an object:

1. Select an object.
2. ARRANGE → ROTATE OR FLIP → FLIP HORIZONTAL button  or ARRANGE → ROTATE OR FLIP → FLIP VERTICAL button. 

### To rotate an object 90 degrees:

1. Select an object.
2. ARRANGE → ROTATE OR FLIP → ROTATE RIGHT button  or ARRANGE → ROTATE OR FLIP → ROTATE LEFT button. 

### To rotate an object any number of degrees:

1. Select an object.
2. ARRANGE → ROTATE OR FLIP → FREE ROTATE button. 
3. Rotate the object from the corners.

### To align objects:

1. Select all of the objects to be aligned. Choose ARRANGE → ALIGN OR DISTRIBUTE.
2. Choose align left, align center, align right, align top, align middle or align bottom.

# Multimedia Basics

**Multimedia** can be defined as the use of two or more media elements, such as text, graphics, sound, animation and video. Although a book containing text and graphics would be considered multimedia by this definition, most people consider television and computers typical multimedia environments. The term hypermedia is often used as a synonym for multimedia.

Common multimedia applications include *Microsoft PowerPoint 2007*, *HyperStudio* (by Knowledge Adventure) and *Director* (by Macromedia). For younger children, *Kid Pix Studio Deluxe* (by Broderbund) and *Storybook Weaver Deluxe* (by The Learning Company) are appropriate. Other common multimedia applications are encyclopedias on CD-ROM including *Microsoft Encarta*, *Grolier Multimedia Encyclopedia*, *Britannica CD* and *World Book Multimedia Encyclopedia*.

Many different media elements may be used when creating a multimedia presentation. The following is a list of file extensions and file formats.

- ❑ \*.AVI (Audio Visual Interleave, a common *Windows* format for audio/video files)
- ❑ \*.MOV (a Macintosh-based audio/video file)
- ❑ \*.WAV (a *Windows* sound file)
- ❑ \*.JPG (Joint Photographic Experts Group, a graphics format often found on the World Wide Web)
- ❑ \*.GIF (Graphics Interchange Format, a graphics format often found on the World Wide Web)
- ❑ \*.BMP (Bitmap, a common format for *Windows* bitmap graphics)
- ❑ \*.WMF (Windows Metafile, a *Windows* object-oriented graphic)

## Multimedia Basics [continued]

### Related Terms:

**animation:** a series of still images displayed in rapid succession to create the illusion of movement

**branching slide:** a slide that is linked to another slide in a presentation, providing users with a choice of which slide to view next

**digitalization:** the process of transferring a film or video image to a format that a computer can use

**hot spot:** an area on the screen that can be selected to trigger an action, such as playing a sound, animating a graphic or displaying a different slide

**medium:** a single method used to communicate a message to an audience, including video, sound, text and graphics

**multimedia:** a computer-based method of presenting information by using more than one medium of communication, such as text, graphics, sound and video

**slide:** a screen in a *PowerPoint* presentation resembling an index card, on which users may arrange media elements

**Slide Master:** a special slide that can be used to determine the layout and formatting of all slides in a presentation

**slide show:** in presentation programs, several screens of information organized in a particular sequence

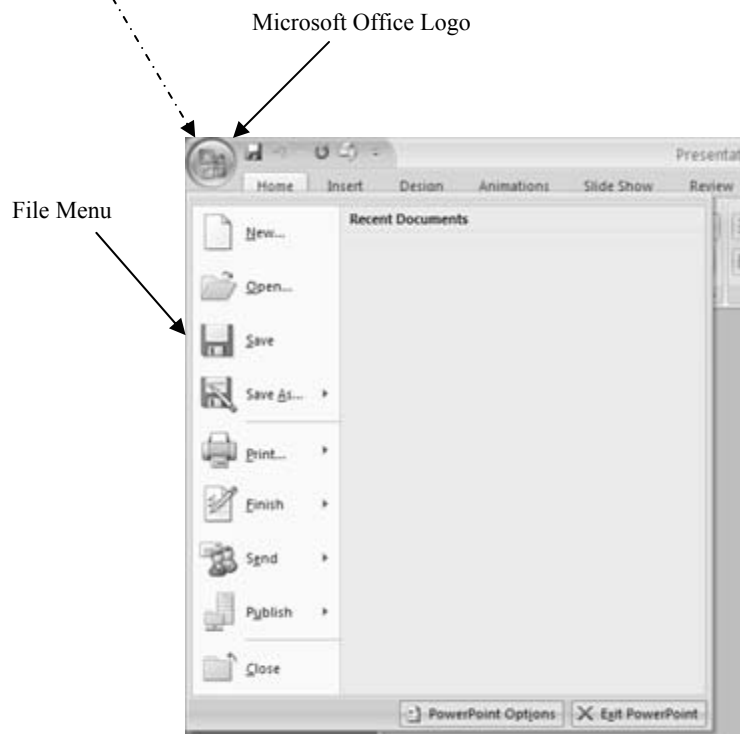
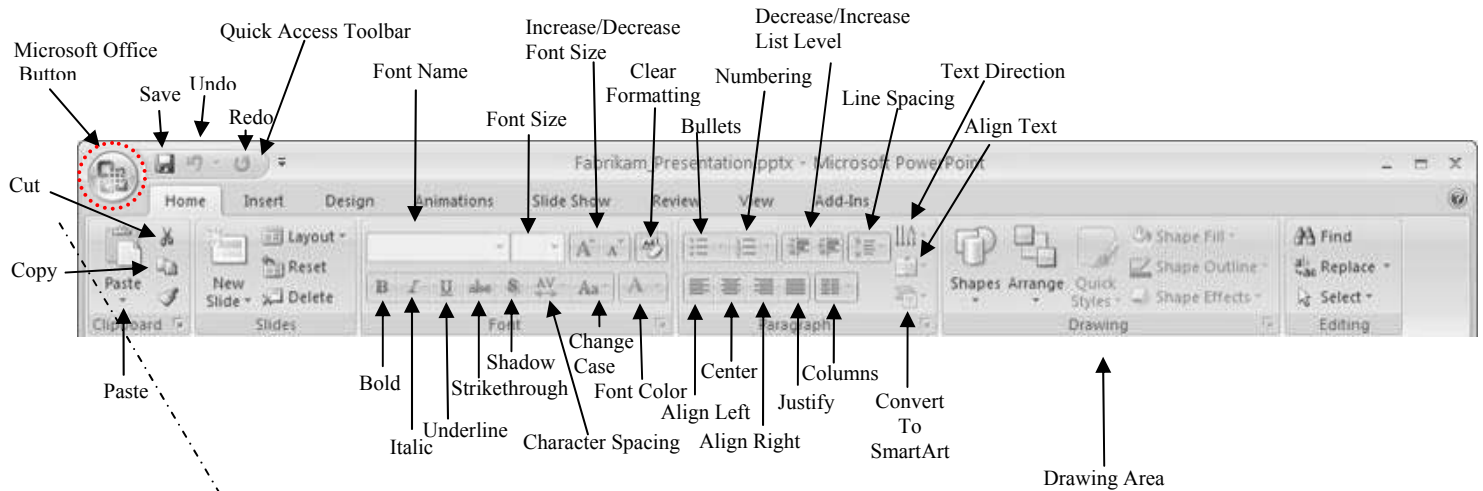
**stereo:** sound that is recorded and played back on two or more channels

**storyboard:** a series of panels on which a set of sketches is arranged for planning purposes

**transition:** the special effect that occurs when one slide advances to the next in a presentation


# Using Microsoft PowerPoint 2007

## The Ribbon



## Using PowerPoint 2007: Getting Started

### To create a new presentation:

1. From the MICROSOFT OFFICE button  in the top left corner choose NEW.
2. In the NEW PRESENTATION Task Pane, select BLANK PRESENTATION, click CREATE.
3. In the SLIDE GROUP of the HOME TAB, click on LAYOUT and select a slide layout for the first slide.

### To open an existing presentation:

1. From the MICROSOFT OFFICE button in the top left corner choose OPEN.
2. Locate the file to be opened and click OPEN.

### To create a new slide:

- In the SLIDE GROUP of the HOME TAB, click on ADD SLIDE.

### To change the slide layout:

1. In the SLIDE GROUP of the HOME TAB, click on LAYOUT and select a slide layout.
2. This will only change the slide you are currently on.
3. Choose a new master style in the VIEW TAB on the MASTER LAYOUT GROUP to change the style of all slides.


### To change the slide theme:

1. In the THEMES GROUP of the DESIGN TAB, click on a theme.
2. This theme will apply to all slides in the presentation.

**Tip:** You can scroll through the theme options by pressing the down arrow on the right side of the themes box.

## Using Microsoft PowerPoint 2007: Inserting Text and Objects

### To insert a text box:

1. Choose the TEXT BOX tool  on the INSERT TAB.
2. Hold down the mouse button and drag to create a text box.


### To insert clip art:

1. Choose the CLIP ART tool on the INSERT TAB.
2. Enter a keyword or keywords in the Search text box, then press GO.
3. Choose the desired clip art image and it will automatically be added to the current slide.
4. Close the CLIP ART Task Pane.

### To insert a picture from a file:

1. Choose the PICTURE tool on the INSERT TAB.
2. Navigate to the appropriate folder, select the file and click INSERT.


### To insert WordArt:

1. Click the WORDART button  on the INSERT TAB.
2. Select a WordArt style.
3. Double click in the WordArt box to edit the text.
4. You can format the WordArt on the FORMAT TAB.




## Using Microsoft PowerPoint 2007: Inserting Text and Objects [continued]


### To insert a chart:

1. Click the CHART button  on the INSERT TAB.
2. Choose a chart style from the CREATE CHART box and click OK.
3. Edit the chart's contents in the Datasheet window.
4. Click a blank space on the slide to return to the presentation.
5. To close the Datasheet, go to the MICROSOFT OFFICE button in the top left corner choose CLOSE.
6. You can edit the data by choosing the EDIT DATA SOURCE button on the DESIGN TAB.

### To insert a header or a footer:

1. From the INSERT TAB choose HEADER & FOOTER. 
2. Select the desired options and click APPLY TO ALL.


### To insert the date and time:

1. From the INSERT TAB choose DATE & TIME. 
2. Mark the checkbox next to Date and time and click APPLY TO ALL.


## **Editing**

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### To cut text from a presentation:


1. Highlight the text to be cut.
2. Choose the CUT button  on the HOME TAB.

### To copy text:


1. Highlight the text to be copied.
2. Select the COPY button  on the HOME TAB.

## Using Microsoft PowerPoint 2007: Editing [continued]


### To paste the most recently copied or cut text:

1. Position the cursor where the text will be pasted.
2. Choose the PASTE button  on the HOME TAB.

### To undo the last action:

- Select the UNDO button  on the QUICK ACCESS TOOLBAR on the top left.

### To redo the last undone action:

- Select the REDO button  on the QUICK ACCESS TOOLBAR.

### To delete a slide:

1. In Normal View, display the slide to be deleted.
2. Choose the DELETE button on the HOME TAB.

### To duplicate an object in the presentation:

1. Select the object to be duplicated.
2. From the HOME TAB click on the PASTE drop-down menu and choose DUPLICATE.

**Tips:** Because clicking a text box once only positions the cursor, text boxes need to be clicked twice before the DUPLICATE command becomes available. To select more than one object at a time to be duplicated, hold down the SHIFT key while selecting objects.

### To find text in a presentation:

1. Select FIND from the HOME TAB.
2. In the Find What box, enter the text to be located and click FIND NEXT.
3. After the text has been found, close the Find dialog box.

### To replace text in a presentation:

1. Select REPLACE from the HOME TAB.
2. In the Find What box, enter the text to be replaced.
3. Enter the replacement text in the Replace With box and click FIND NEXT or REPLACE ALL.
4. After the text has been replaced, close the Replace dialog box.

## Using Microsoft PowerPoint 2007: Formatting

### To animate an object:

1. Select the object to be animated.
2. Click on the ANIMATIONS TAB and select the desired animation effect from the ANIMATE drop-down box.
3. To add sound effects to an animation, choose a sound from the TRANSITION SOUND drop-down box.

### To format the slide color scheme:

1. From the DESIGN TAB click on the COLORS drop-down box.
2. Highlight a color and you will see a preview of your slide will look.
3. Once you click on a color it will apply to all slides.

### To change the background color of the presentation:

1. From the DESIGN TAB click on the BACKGROUND STYLES drop-down box.
2. Select a color from the drop-down menu or click on BACKGROUND to add a gradient, texture or pattern fill.

### To reorder slides within a presentation:

1. From the VIEW TAB choose SLIDE SORTER.
2. Drag the slide to be reordered to the appropriate location.
3. From the VIEW TAB choose NORMAL after the slides have been properly ordered.


**Tip:** You can also reorder the slides in the preview tab on the left side in NORMAL view.

### To resize a text box or a picture:


1. Select the object to be resized.
2. Drag one of the object's handles until it is properly resized.

## Using Microsoft PowerPoint 2007: Formatting [continued]


### To bold text:

1. Select the text to be bolded.
2. Choose the BOLD button  on the HOME TAB.

### To italicize text:

1. Select the text to be italicized.
2. Choose the ITALIC button  on the HOME TAB.

### To underline text:

1. Select the text to be underlined.
2. Choose the UNDERLINE button  on the HOME TAB.

### To change the text font:

1. Highlight the text.
2. Select a new font from the FONT drop-down list on the HOME TAB.


### To change the text size:

1. Highlight the text.
2. Select a new font size from the FONT SIZE drop-down list.

### To change the text color:

1. Highlight the text
2. Select a color from the FONT COLOR drop-down list. 

### To increase or decrease line or paragraph spacing:


1. Highlight the text.
2. Choose the LINE SPACING drop-down menu  from the HOME MENU.
3. Make the desired selection or click on more for additional options then click OK.

## Using Microsoft PowerPoint 2007: Formatting [continued]

### To change text alignment:

1. Highlight the text.
2. From the HOME TAB choose the desired alignment option (Left/Center/Right/Justify).

### To add bullets to text:

1. Highlight the text to be bulleted.
2. Select the BULLETS button  on the HOME TAB.

**Tips:** To apply custom bullets, or to change the appearance of existing bullets, choose BULLETS drop-down menu. A bullet is added each time the ENTER key is pressed.

## Finishing Touches


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### To add a transition between two slides:

1. From the ANIMATIONS TAB click on a transition option in the TRANSITION TO THIS SLIDE GROUP.
2. You can scroll through all options by moving the scroll bar on the right of the transition options box. To see all options at one time click the MORE arrow at the bottom of the scroll bar.

**Tip:** Select APPLY TO ALL to apply a transition to all of the slides in a presentation.

### To check the spelling in the presentation:

1. Select the SPELLING button  on the REVIEW TAB.
2. Follow the prompts to correct any misspelled words.

### To preview slide animation:

1. From the ANIMATIONS TAB select PREVIEW.
2. To edit, choose CUSTOM ANIMATION, Modify as needed and click PLAY.
3. When the preview is complete, close the CUSTOM ANIMATION Task Pane.

## **Using Microsoft PowerPoint 2007: Finishing Touches [continued]**

### **To view the slide show presentation:**

1. From the SLIDE SHOW TAB choose FROM BEGINNING or FROM CURRENT SLIDE.
2. Hit the SPACEBAR to transition between slides more quickly.

**Tip:** Press the ESCAPE key to end the slide show and to return to Normal View.

### **To set slide show options:**

1. From the SLIDE SHOW TAB choose SET UP SLIDE SHOW.
2. Select the desired options and click OK.

### **To change the page setup of the presentation:**

1. From the DESIGN TAB click on PAGE SETUP.
2. Make the appropriate changes and click OK.

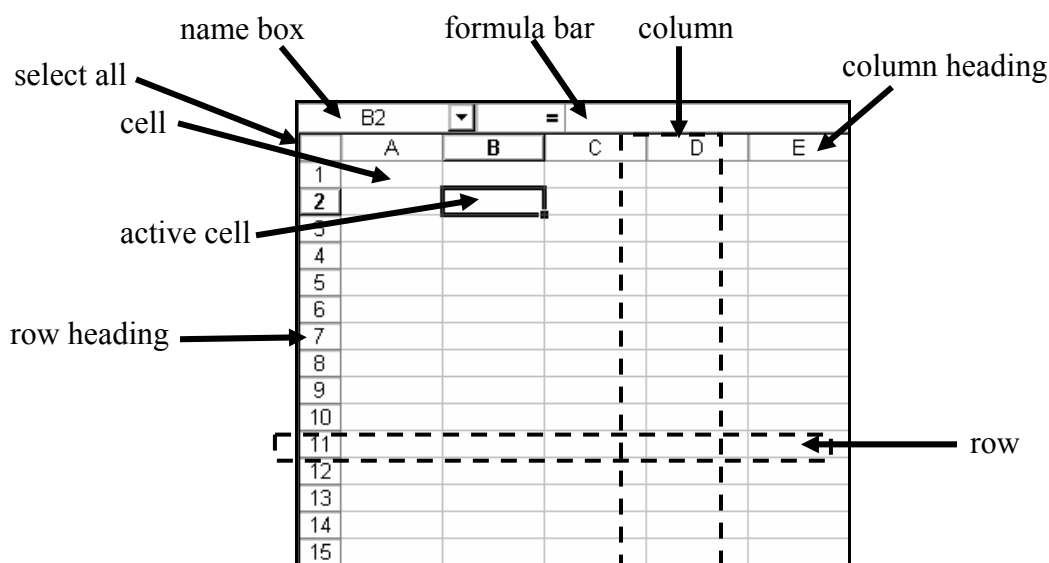
### **To print a presentation:**

1. From the MICROSOFT OFFICE button choose PRINT
2. Choose the appropriate options in the Print dialog box and click OK.

# Spreadsheet Basics

A **spreadsheet application** allows users to enter data, such as numbers and formulas, into an electronic worksheet and to use this data to perform multiple calculations. A document created by this type of program is called a **spreadsheet**.

The most popular spreadsheet applications are *Microsoft Excel 2007* and *Lotus 1-2-3*. Programs such as *AppleWorks* and *Microsoft Works* contain spreadsheet components. *The Cruncher*, by Knowledge Adventure, is a spreadsheet program for young children.



## Related Terms:

**absolute cell reference:** a cell reference that does not change when a formula is copied or moved; contains a \$ symbol before the column letter and row number

**active cell:** the cell currently selected in a spreadsheet, identified by its black border

**cell:** a rectangle in a spreadsheet, formed by the intersection of a row and a column, which can contain text, numbers or a formula

**cell reference:** the coordinates of the column and row position of a cell, or a cell address

**column:** a vertical line of cells in a spreadsheet, identified by a letter

**column heading:** a letter at the top of a column that can be clicked to select the entire column

**column label:** text at the top of a row that indicates the type of information in that column

## Spreadsheet Basics [continued]

**formula:** a mathematical equation that performs a calculation in a cell; formulas follow a specific structure beginning with an equal sign (=) followed by the elements to be calculated (the operands) and the calculation operators

**formula bar:** the bar at the top of a spreadsheet that displays the information contained or being entered in a cell

**function:** a ready-to-use formula that performs common calculations, such as averages and sums

**name box:** the box in a spreadsheet that lists the column letter and row number of a selected cell or a range of selected cells

**range:** a single cell or a rectangular group of adjacent cells within a spreadsheet

**row:** a horizontal line of cells in a spreadsheet, identified by a number

**row heading:** a number at the far-left side of a row that can be clicked to select the entire row of cells

**row label:** text at the left side of a row that indicates the type of information in that row

**worksheet:** a spreadsheet containing cells in columns and rows

### Important symbols used in spreadsheet formulas:

= **equal sign:** used at the beginning of each formula entered (e.g., =A2+B2-C2)

+ **addition sign:** adds values (e.g., =A1+A2); also can be used at the beginning of a formula instead of an equal sign

- **subtraction sign:** subtracts values (e.g., =B3-B4)

\* **asterisk:** multiplies values (e.g., =C2\*C6)

/ **slash:** divides values (e.g., =D1/D3)

: **colon:** used to indicate a consecutive range of cells in a row or column (e.g., =SUM(A2:A10), indicating the sum of the values in cells A2 through A10)

, **comma:** used to indicate a series of non-consecutive cells in a formula, (e.g., =SUM(B6,C12,D15), indicating the sum of the values in cells B6, C12 and D15)

() **parentheses:** used in functions to indicate a range of values or cell references to be calculated (e.g., =AVERAGE(F1:F6), indicating the average of the values in cells F1 through F6)



## Spreadsheet Basics: Charting Terminology

**chart:** a visual representation of data

**labels:** words or numbers, often found along the X axis and Y axis, which identify information in a chart

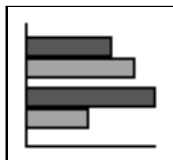
**legend:** the part of a chart in which the colors or patterns used in the chart are displayed with the items they represent

**series:** the basic unit of information in a chart, often contained in a single row or column.

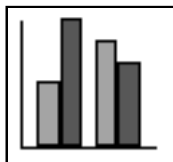
**values:** numeric entries within a spreadsheet

**X series:** the labels and data charted along the X axis, or horizontal axis

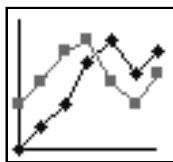
**Y series:** the labels and data charted along the Y axis, or vertical axis



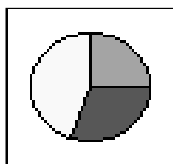
**Bar chart:** compares data or values horizontally without reference to trends over time



**Column chart:** compares data or values vertically without reference to trends over time



**Line chart:** shows trends or changes in values over time



**Pie chart:** shows the ratio of individual values to a total, or parts to a whole

## Using Microsoft Excel 2007

### To enter data into a cell:

1. Click the desired cell.
2. Use the keyboard to enter numbers or text; the entry will also appear in the Formula bar.
3. Press the ENTER key to accept the entered information and to advance to the cell below.

### To edit the contents of a cell:

1. Double-click the cell.
2. Make the desired changes.
3. Press the ENTER key.

**Tip:** To replace the entire contents of a cell, single-click the cell and enter the new data.

### To increase the width of a column manually:

1. Place the pointer on the right side of the heading of the column to be increased.
2. When the pointer takes the shape of a double arrow, hold down the mouse button and drag to the right to widen the column.

**Tip:** To make a series of columns the same width, select the appropriate columns, from the HOME TAB choose FORMAT, THEN WIDTH. Enter the desired width in the Column Width field and click OK.

### To change the width of a column using the AutoFit feature:

1. Click the column heading to select the entire column.
2. From the HOME TAB choose FORMAT, then WIDTH. On the WIDTH drop-down menu choose AUTOFIT SELECTION.

### To select a range of cells:

1. Click the first cell in the range and hold down the mouse button.
2. Drag to highlight the desired cells in the range, then release the mouse button.

### To delete a row or column:

1. Click the appropriate row or column heading to select the entire row or column.
2. From the HOME TAB choose DELETE to delete the entire row or column.

**Tip:** To delete a row or column's contents without actually removing the cells from the spreadsheet, press the DELETE key on the keyboard instead of DELETE on the HOME TAB.

## Using Microsoft Excel 2007 [continued]

### To insert a row:

1. Click a cell in the row below where the new row will be inserted.
2. From the HOME TAB choose the INSERT drop-down menu, and choose INSERT SHEET ROWS.

### To insert a column:

1. Click a cell in the column to the right of where the new column will be inserted.
2. From the HOME TAB choose the INSERT drop-down menu, and choose INSERT SHEET COLUMNS.

### To insert a new worksheet:

- From the HOME TAB choose the INSERT drop-down menu, and choose INSERT SHEET.

**Tip:** To name the new worksheet, double-click the appropriate tab in the bottom-left corner of the screen and enter a new name.

### To protect a worksheet:

1. From the HOME TAB choose the FORMAT drop-down menu then PROTECTION → PROTECT SHEET.
2. Enter a password (if desired) and select OK.


## Formulas and Calculations

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### To enter a formula:

1. Enter the equal sign followed by the desired formula, then press the ENTER key.
2. Examples of basic formulas:
  - =45+67
  - =C4-C5 (the contents of C4 minus the contents of C5)
  - =D3\*D6 (the contents of D3 multiplied by the contents of D6)
  - =A1/2 (the contents of A1 divided by 2)

### To copy a formula from one cell into a series of cells:


1. Starting with the cell that already contains the formula; select the entire series of cells into which the formula will be placed.
2. In the HOME TAB, choose the FILL drop-down button 
3. You may fill DOWN, RIGHT, UP or LEFT.
4. Click one of the highlighted cells to confirm that the cell references in the formula were updated properly.

## Using Microsoft Excel 2007: Formulas and Calculations [continued]


### To sum a series of cells:

1. Click the appropriate cell.
2. Enter the sum formula into that cell.
3. Sample sum formula: =SUM(E4:E8). The contents of cells E4 through E8 will be added, and the sum will be displayed in the cell that was initially selected.

or

1. Highlight the cells to be added.
2. Choose the AUTOSUM button  on the HOME TAB, and the calculated total will be placed in the cell immediately below or to the right of the selected range.

or

1. Click the cell in which the calculated sum should be displayed and choose the AUTOSUM button  on the HOME TAB.
2. Accept the default cell range, or enter the corrected cell range in the formula bar.
3. Press the ENTER key to accept the formula.

### To create a chart:

1. Select the cells to be included in the chart.
2. Choose the INSERT TAB then in the CHART GROUP choose a chart option.
3. From the DESIGN TAB you may edit the specific features of your chart.

### To resize a chart:

1. Click the chart to select it.
2. Drag the handles to resize the chart.

### To reposition a chart:

1. Click the chart to select it.
2. Drag the chart to reposition it on the worksheet.

### To change the colors in a chart:

1. Click the chart. The DESIGN, LAYOUT and FORMAT TABS will appear in the Ribbon.
2. When you click on a specific area of the chart, this will be noted under the CURRENT SELECTION GROUP of the FORMAT TAB. You may now edit the colors of the chart by choosing SHAPE FILL.


## Using Microsoft Excel 2007: Formulas and Calculations [continued]

### To create an absolute cell reference:

1. When entering a formula, place a dollar sign (\$) before both the column letter and the row number of the cell or cells to be designated as absolute references. A sample formula would be =SUM(\$A\$5:B6).

**Tip:** In the above example, if the FILL or the COPY and PASTE commands are used to place the formula into additional cells, cell A5 will be referenced regardless of the new formula's column and row position. However, because the second cell in the formula is designated as a relative cell reference, it will change according to the location of the cell in which the formula is placed.

### To insert a function:

1. Click the appropriate cell.
2. Choose the FUNCTION WIZARD  from the FORMULAS TAB.
3. Select the appropriate option from the Select a Function list and click OK.
4. Verify that the correct cell range is shown in the Number1 box and make any necessary changes.
5. Click OK.

## Formatting

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### To bold text within a range of cells:

1. Select the cells.
2. Click the BOLD button  on the HOME TAB.

### To underline text within a range of cells:


1. Select the cells.
2. Choose the UNDERLINE button  on the HOME TAB.

### To italicize text within a range of cells:


1. Select the cells.
2. Click the ITALIC button  on the HOME TAB.

## Using Microsoft Excel 2007: Formatting [continued]


### To format a spreadsheet by applying Format as Table:

1. Select the cells to be formatted.
2. On the HOME TAB choose FORMAT AS TABLE. 
3. Select a table style.


### To format numbers in cells as percentages:

1. Select the cells to be formatted.
2. On the HOME TAB choose the drop-down box in the NUMBER GROUP then choose PERCENTAGE
3. You can also select the Dialog Box Launcher  in the NUMBER GROUP to open the FORMAT CELLS box. On the NUMBER tab, select percentage from the Category list. If necessary, change the value in the Decimal Places box, then click OK.

**Tip:** This procedure can also be followed to customize appearance of existing percentages.  
or

1. Select the cells to be formatted.
2. Click the PERCENT STYLE button  on the NUMBER GROUP of the HOME TAB.

### To format numbers in cells as currency:

1. Select the cells to be formatted.
2. On the HOME TAB choose the drop-down box in the NUMBER GROUP then choose CURRENCY from the list.
3. You can also select the Dialog Box Launcher  in the NUMBER GROUP to open the FORMAT CELLS box. On the NUMBER tab, select CURRENCY from the Category list. If necessary, change the value in the Decimal Places box and select different options from the Symbol and Negative Numbers drop-down lists, then click OK.

or

1. Select the cells to be formatted.
2. Choose the CURRENCY STYLE button  on NUMBER GROUP of the HOME TAB.

### To format cell values with commas in the thousandth place:


1. Select the cells to be formatted.
2. Choose the COMMA STYLE button  on the NUMBER GROUP of the HOME TAB.

### To display cell values with an additional decimal place:

1. Select the cells to be formatted.
2. Choose the INCREASE DECIMAL button  NUMBER GROUP of the HOME TAB.

## Using Microsoft Excel 2007: Formatting [continued]

### To display cell values with one fewer decimal place:

1. Select the cells to be formatted.
2. Click the DECREASE DECIMAL button  on the NUMBER GROUP of the HOME TAB.


### To change the font of characters within a cell:

1. Select the cell(s) to be formatted.
2. Choose the desired font from the Font drop-down list on the FONT GROUP of the HOME TAB.



### To fill a cell with color:

1. Select the cell(s) to be formatted.
2. Click the FILL COLOR drop-down arrow  on the FONT GROUP of the HOME TAB and choose a color from the pop-up menu.

### To change the color of characters within a cell:

1. Select the cell(s) to be formatted.
2. Click the FONT COLOR drop-down arrow  on the FONT GROUP of the HOME TAB and choose a color from the pop-up menu.

### To sort rows:

1. Select the cells to be included in the sort.
  2. From the EDITING GROUP of the HOME TAB choose SORT & FILTER.
  3. From the SORT & FILTER drop-down list, select CUSTOM SORT to specify the column by which the information should be sorted.
  4. If you want to sort by column header, check MY DATA HAS HEADERS.
  5. As appropriate, click either A TO Z (ASCENDING ) or Z TO A (DESCENDING) from the ORDER drop-down list
  6. If sorting according to another column, click ADD LEVEL then make the desired selections in the Then By group(s).
  7. Click OK.
- or
1. Select the cells to be included in the sort.
  2. Click the SORT A TO Z  button or the SORT Z TO A  button on the EDITING GROUP of the HOME TAB.

## Using Microsoft Excel 2007: Formatting [continued]


### To add headers or footers to a printed worksheet:

1. Choose FILE → PAGE SETUP.
2. Select the HEADER/FOOTER tab.
3. Choose the desired header text from the HEADER drop-down list or the desired footer text from the Footer drop-down list, then click OK.


or

1. Click the CUSTOM HEADER or CUSTOM FOOTER buttons, enter the desired text in the appropriate column and choose OK.
2. Click OK again.

### To insert a picture into the worksheet:

1. From the INSERT TAB choose the PICTURE logo. 
2. Locate and select the desired graphics file and select INSERT.


or

1. From the INSERT TAB choose the CLIP ART logo. 
2. Enter a keyword or keywords in the Search For box, then press the ENTER key or choose GO.
3. Click on the desired clip art. It will be automatically inserted into the spreadsheet.

### To change the page orientation:

1. On the PAGE LAYOUT TAB choose ORIENTATION.
2. From the drop-down menu select PORTRAIT or LANDSCAPE.

### To modify print options:

1. On the PAGE LAYOUT TAB you can modify print settings from the PAGE SETUP GROUP.
2. You can also access all PAGE SETUP options by pressing  in the PAGE SETUP GROUP.
3. Select the SHEET TAB, then enter or choose the desired print options.
4. Click OK to return to the spreadsheet or select PRINT.



# Database Basics

**Data** is information that can be processed and from which conclusions can be inferred. A **database** is a collection of related information. A **database application** is a computer program that allows users to enter, update, organize and retrieve information. Popular database applications today include *Microsoft Access 2007*, *FileMaker Pro*, *Lotus Approach* and *Microsoft Visual FoxPro*. There are also database components in *AppleWorks* and *Microsoft Works*. Database programs designed for children include *Tabletop Jr.*, *Tabletop Sr.* and *ClarisWorks for Kids*.

Although most databases today are stored on computers, databases can also be stored in paper form, such as a Rolodex or index cards. A box of index cards containing recipes is an example of this type of database. A **field** is the location reserved for a category of information within a database. Fields in a recipe database could include recipe name, ingredients, preparation time, directions and serving size. A **record** is a complete unit of categorized information. In the recipe example, each recipe written on a single index card would be a record. **Form** is the term often used to describe the display of one record at a time. Many users prefer to use a form when entering information into a database.

The screenshot shows a database form titled 'Countries' with the following fields and values:

Country:	Norway
Currency:	kroner
Official Language(s):	Norwegian
Capital:	Oslo
% Arable Land:	3
Literacy Rate:	100%
Bordering Countries:	Sweden & Finland

At the bottom, there is a status bar showing 'Record: 2 of 16', 'Unfiltered', and a search field.

A **table** is a way of displaying information in a database in which records appear in rows and fields appear in columns. The basic layout of a database table is similar to that of a spreadsheet.

The screenshot shows a database table titled 'Countries' with the following columns and data:

Country	Capital	Bordering Countries	Official Language(s)	% Arable Land	Literacy Rate	Currency
France	Paris	Spain & Italy	French	33.3	99%	euro
Italy	Rome	France & Switzerland	Italian	28	98%	euro
Spain	Madrid	Portugal & France	Spanish	29	97%	euro
Portugal	Lisbon	Spain	Portuguese	21	87.4	euro
The Netherlands	Amsterdam	Belgium & Germany	Dutch	27	99%	euro
United Kingdom	London	Republic of Ireland	English	26	99%	pound
Belgium	Brussels	France & the Netherlands	Dutch & French	25	98%	euro
Germany	Berlin	Denmark & Poland	German	34	99%	euro
Luxembourg	Luxembourg	France & Germany	French, German & Luxembourgish	25	100%	euro
Greece	Athens	Albania & Macedonia	Greek	22	97%	euro
Switzerland	Bern	Germany & Austria	German, French, & Italian	11	99%	franc
Austria	Vienna	Germany & Switzerland	German	17	98%	euro
Norway	Oslo	Sweden & Finland	Norwegian	3	100%	kroner
Denmark	Copenhagen	Germany	Danish	56	100%	kroner
Sweden	Stockholm	Norway & Finland	Swedish	7	99%	krona

At the bottom, there is a status bar showing 'Record: 1 of 15', 'No Filter', and a search field.

## Database Basics [continued]

**Sorting** is rearranging data so it appears in ascending or descending order, either alphabetically or numerically. To sort information in a database, a field must be specified. A database can also be sorted by multiple fields.

A **filter** is a set of criteria applied to records to show a subset of the records. Mathematical operations can be applied to build the criteria, including greater than ( $>$ ), less than ( $<$ ), greater than or equal to ( $>=$ ), less than or equal to ( $<=$ ) and not equal to ( $<>$ ). *And*, *or* and *not* are **Boolean operators**, which are used to specify the logical relationship between values. All of these terms can be used to broaden or narrow a filter.

Specifying criteria with a **query** is a method that can be used to indicate what records should be retrieved. Queries are more flexible and more advanced than filters, although both queries and filters can perform the same basic functions. If desired, queries can also be saved so the search results can be accessed in the future.

**Mail merge** allows information in a database to be inserted into a word processing document to create individualized letters, envelopes and labels. The most common way that mail merge is used is to personalize form letters.

A **report** is a way of printing the information in a database. There is considerable flexibility in the generation of reports. All aspects of the layout, as well as which fields and records are included, can be specified.

## Using Microsoft Access 2007

Country	Capital	Bordering Countries	Official Language(s)	% Arable Land	Literacy Rate	Currency
France	Paris	Spain & Italy	French	33.3	99%	euro
Italy	Rome	France & Switzerland	Italian	28	98%	euro
Spain	Madrid	Portugal & France	Spanish	29	97%	euro
Portugal	Lisbon	Spain	Portuguese	21	87.4	euro
The Netherlands	Amsterdam	Belgium & Germany	Dutch	27	99%	euro
United Kingdom	London	Republic of Ireland	English	26	99%	pound
Belgium	Brussels	France & the Netherlands	Dutch & French	25	98%	euro
Germany	Berlin	Denmark & Poland	German	34	99%	euro
Luxembourg	Luxembourg	France & Germany	French, German & Luxembourgish	25	100%	euro
Greece	Athens	Albania & Macedonia	Greek	22	97%	euro
Switzerland	Bern	Germany & Austria	German, French, & Italian	11	99%	franc
Austria	Vienna	Germany & Switzerland	German	17	98%	euro
Norway	Oslo	Sweden & Finland	Norwegian	3	100%	krone
Denmark	Copenhagen	Germany	Danish	56	100%	krone
Sweden	Stockholm	Norway & Finland	Swedish	7	99%	krona

A table in Datasheet View can be used to add, edit or view the data in a table. Also in this view, it is possible to print the table, to sort or filter the records, to modify the appearance of the data and to insert or delete columns (fields) and rows (records).

Field Name	Data Type	Description
Country	Text	
Official Name	Text	
Capital	Text	
Official Language(s)	Text	
Primary Religion	Text	
% Arable Land	Text	
Life Expectancy at Birth	Text	
# of TVs/1000 people	Text	
Literacy Rate	Text	
Bordering Countries	Text	
Currency	Text	

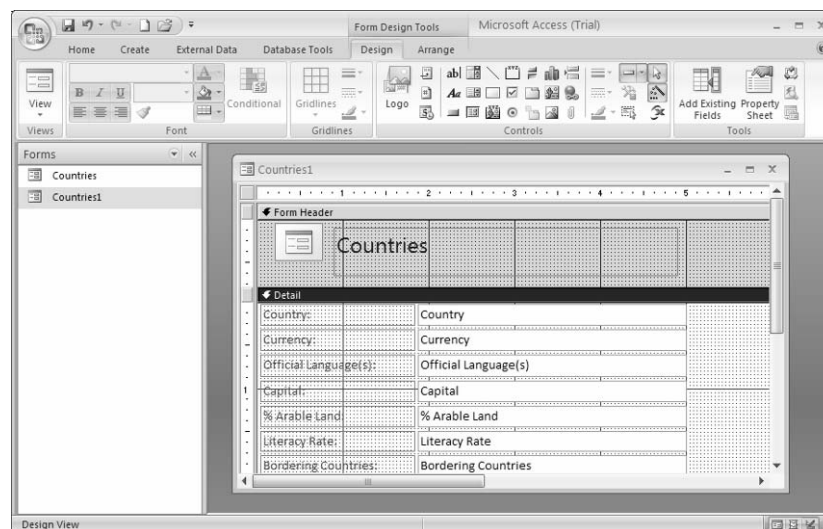
Field Properties	
General	Lookup
Field Size	50
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	
Validation Text	
Required	No
Allow Zero Length	Yes
Indexed	No
Unicode Compression	Yes
IME Mode	No Control
IME Sentence Mode	None
Smart Tags	

In Design View, an existing table's fields can be added, deleted or customized. Also, a new table can be created from scratch.

## Using Microsoft Access 2007 [continued]

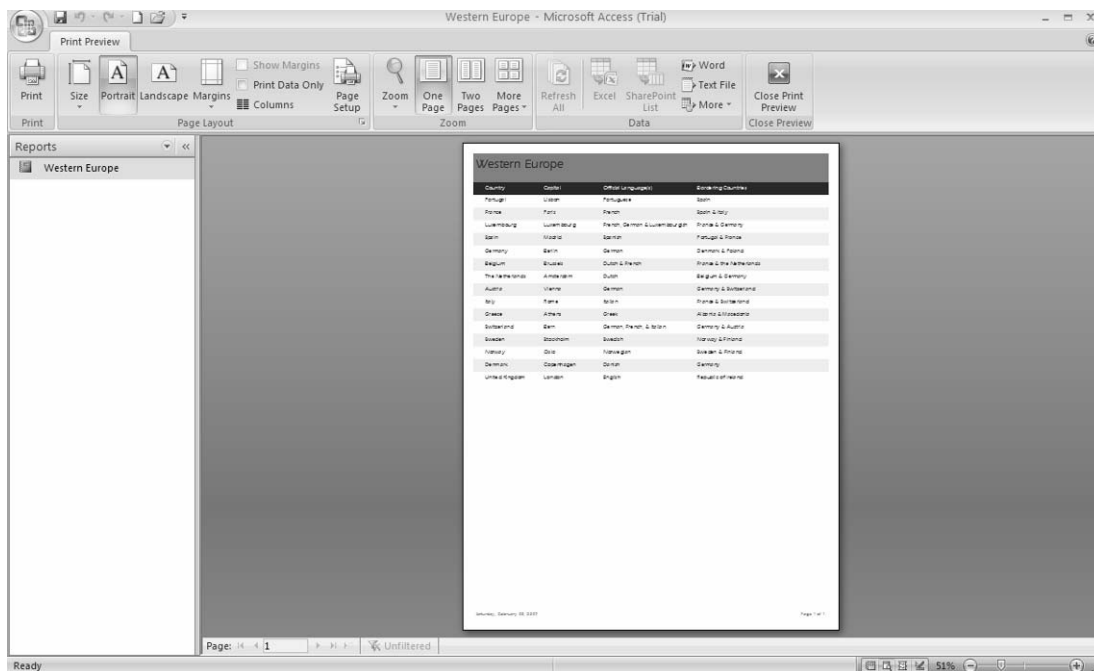


A form in Form View displays one record at a time, and this view is often used to enter and edit information within a database. In Form View it is also possible to sort and filter records.

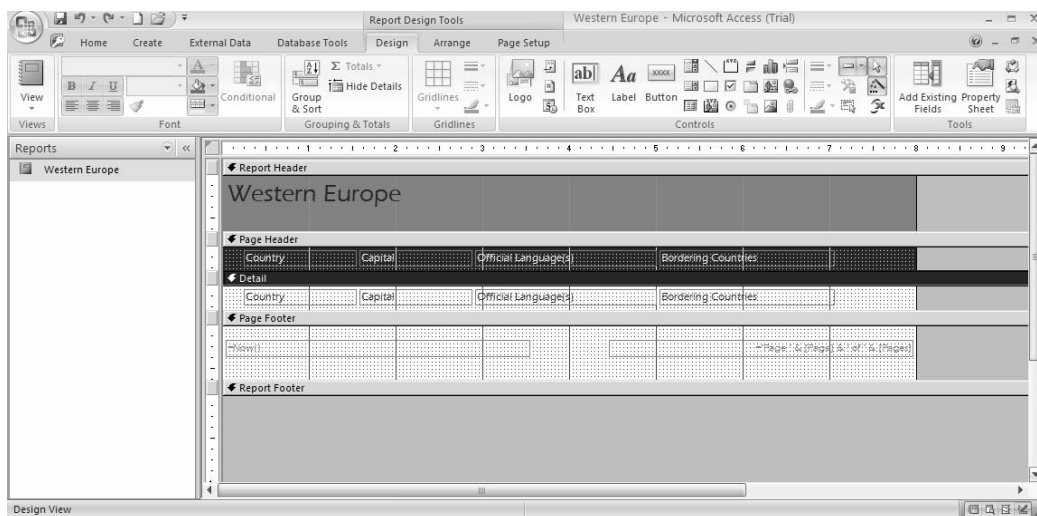


The appearance of a form can be modified in Design View. The label text can be edited and formatted. Fields can be added, moved and resized. Text color, background colors and graphics can be added, and header and footer text can be inserted.

## Using Microsoft Access 2007 [continued]





A report in Print Preview is displayed the way that the report will be printed. A report is an effective way to present data in a printed format.



The appearance of a report can be modified in Design View. Label text, header and footer text, graphics and colors within a report can be altered in this view, with formatting options similar to those available for a form in Design View.

## Using Microsoft Access 2007: Basic Database Management, Editing and Formatting


### To create a new database:

1. From the MICROSOFT OFFICE button  choose NEW.
2. In the NEW BLANK DATABASE Task Pane, select BLANK DATABASE.
3. Enter a name in the File Name box on the right hand side of the screen. Click on the file folder button  to navigate to the location where the database should be saved, click OK and then choose CREATE.


### To rename a table or a form within a database:

1. In the Database window, select the appropriate icon and right-click the name of the file to be changed.
2. Select RENAME and enter the new name.
3. Press the ENTER key on the keyboard.


### To copy text:

1. Highlight the text to be copied.
2. Select the COPY button  on the HOME TAB.

### To cut text:

1. Highlight the text to be cut.
2. Select the CUT button  on the HOME TAB.


### To paste text that has been cut or copied:

1. Position the cursor where the text will be inserted.
2. Select the PASTE button  on the HOME TAB.



**Tip:** The most recently copied or cut text will be pasted.

## Using Microsoft Access 2007: Creating Tables

### To create a table:



1. In the Datasheet view, click the TABLE button  on the CREATE TAB.
2. To enter the first field name, double-click the field name *Add New Field*.
3. Enter the name for the first field then press the ENTER key to add another field.
4. Repeat until all the necessary fields have been added.

or


1. In the Design View, click the TABLE DESIGN button  on the CREATE TAB.
2. Enter the appropriate field names and click the SAVE button. 
3. Enter the table name and click OK.

### To switch between Design View and Datasheet View of a table:

- ❑ Select the VIEW button  on the HOME TAB.

**Tip:** The VIEW button toggles between the DESIGN icon  and the DATASHEET icon  depending upon the current view.

### To choose a primary key in a table:

1. In Design View, position the cursor in the row to be designated the primary key.
2. Click the PRIMARY KEY button  on the DESIGN TAB in the TOOLS GROUP.

**Tip:** Each entry in the primary key field must be unique.

### To change a field's data type in a table:

1. In Design View, position the cursor in the data type field to be changed.
2. Select the desired data type from the DATA TYPE drop-down menu on the DATASHEET TAB.

### To change a field size in a table:


1. In Datasheet View, position the pointer on the field name's right or left border.
2. When the pointer takes the shape of a double-arrow, drag to widen the field.

### To select an entire field (column) in a table:

- ❑ Click the field name at the top of the column.



## Using Microsoft Access 2007: Creating Tables [continued]

### To add a row (record) to a table:




- ❑ In Datasheet View, select the NEW button  in the RECORDS GROUP on the HOME TAB.

**Tip:** The new record will be inserted at the bottom of the table.

### To add a field to a table:



1. In Datasheet View, position the cursor in the column to the right of where the new column will be inserted.
2. Select the INSERT COLUMN button  on the DATASHEET TAB.  
or
  1. In Design View, position the cursor in the row above where the new row will be inserted.
  2. Select the INSERT ROWS button  on the DESIGN TAB.

### To delete a row (record) from a table:

1. In Datasheet View, position the cursor within the record to be deleted.
2. On the HOME TAB, click the drop-down arrow next to the DELETE button  and select DELETE RECORD. 
3. Click YES to confirm the deletion.  
or
  1. Select the record to be deleted by clicking in the box to the left of the first field.
  2. Click the DELETE button  on the HOME TAB.
  3. Click YES to confirm the deletion.

**Tip:** Once a record has been deleted, it cannot be retrieved.


### To delete a column (field) from a table:

1. In Datasheet View, select the column to be deleted by clicking on the field name at the top of the column.
2. Click the DELETE button  on the HOME TAB.
3. Click YES to confirm the deletion of the field.  
or
  1. In Design View, position the cursor in the row to be deleted.
  2. Choose the DELETE ROWS button  on the DESIGN TAB.
  3. Click YES to confirm the deletion of the field.




## Using Microsoft Access 2007: Creating Tables [continued]

### To change the gridline layout in a table:

- ❑ In Datasheet View, click the GRIDLINES button  on the HOME TAB and make the desired selection.


### To change the gridline color in a table:

1. In Datasheet View, click the Dialog Box Launcher button  on the HOME TAB in the bottom right-hand corner of the FONT GROUP to open the DATASHEET FORMATTING box.
2. In the Datasheet Formatting dialog box, make the desired selection from the GRIDLINE COLOR drop-down list and click OK.



## Creating Forms

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### To create a form:

1. On the CREATE TAB in the Database window, click the MORE FORMS drop-down arrow and select FORM WIZARD. 
2. Make the appropriate selections to create the form.

### To add a record to a form:


1. In Form View, click the NEW button  on the HOME TAB.  
or
2. In Form View, choose the NEW (BLANK) RECORD button  in the bottom-left corner of the window.


### To delete a record from a form:

1. In Form View, display the record to be deleted.
2. On the HOME TAB, click the drop-down arrow next to the DELETE button  and select DELETE RECORD. 
3. Click YES to confirm the deletion.

**Tip:** Once a record has been deleted, it cannot be retrieved.

### To advance one record in Form View:


- ❑ Select the NEXT RECORD button  in the bottom-left corner of the window.

**Tip:** To advance to the final record, select the LAST RECORD button. 

## Using Microsoft Access 2007: Creating Forms [continued]

**To view the preceding record in Form View:**

- ❑ Select the PREVIOUS RECORD button  in the bottom-left corner of the window.



**Tip:** To advance to the first record, select the FIRST RECORD button. 

### Sorts, Filters, Queries and Reports


**To edit an existing table, query, form or report:**

1. In the Navigation Pane of the Database window, select the appropriate icon for the file to be edited.
2. Right-click the file to be edited and choose OPEN or DESIGN VIEW.

**To sort a table or form by one field:**

1. In Datasheet View or Form View, position the cursor in the field to be sorted.
2. Select either the ASCENDING button  or the DESCENDING button  in the SORT & FILTER GROUP on the HOME TAB.

**To sort a table or form by more than one field:**

1. In Datasheet View or Form View, click the ADVANCED FILTER OPTIONS button  on the HOME TAB.
2. Select ADVANCED FILTER/SORT from the menu.
3. Position the cursor in the Field box in the grid's first column.
4. From the drop-down list that appears, select the field to be sorted.
5. Position the cursor in the corresponding Sort box.
6. Select ASCENDING or DESCENDING from the drop-down list.
7. In the neighboring columns in the grid, choose additional fields to sort.
8. After all of the fields have been set, click the ADVANCED FILTER OPTIONS button and select APPLY FILTER/SORT.


**Tip:** The field farthest to the left in the design grid will be sorted first.

**To remove a sort or a filter from a table or form:**

- ❑ In Datasheet View or Form View, click the REMOVE ALL SORTS button  on the HOME TAB.



## Using Microsoft Access 2007: Sorts, Filters, Queries and Reports [continued]

### To perform a filter in a table or form:


1. In Datasheet View or Form View, click the ADVANCED FILTER OPTIONS button. 
2. Select ADVANCED FILTER/SORT from the menu.
3. Position the cursor in the Field box in the grid's first column.
4. From the drop-down list that appears, select the field to be filtered.
5. Position the cursor in the corresponding Sort box.
6. Select ASCENDING, DESCENDING or NOT SORTED from the drop-down list.
7. Position the cursor in the corresponding Criteria box.
8. Enter the desired value or expression.
9. Click the ADVANCED FILTER OPTIONS button and select APPLY FILTER/SORT.

**Tip:** To perform additional sorts or filters on the filtered data, click on the small filter graphic in the field which has been filtered. A pop-up menu will appear.


### To create a query:

1. In Datasheet View, on the CREATE TAB click the QUERY DESIGN button. 
2. In the Show Table window, choose the table to be used in the query on the TABLES TAB and click ADD. Close the Show Table window.
3. Position the cursor in the Field box in the grid's first column.
4. From the drop-down list, select the field to be included in the query.
5. Make the desired selection from the Sort drop-down list and enter the desired value in the Criteria box.
6. In neighboring columns in the grid, add other fields to be included in the query and enter the desired sorting and criteria information.
7. Select the RUN button  from the DESIGN TAB.

### To save a query:

1. Click the SAVE button  on the QUICK ACCESS TOOLBAR on the top left.
2. Enter a query name and select OK.

### To create a report:

1. Click the REPORT WIZARD button  on the CREATE TAB.
2. Follow the instructions in the Report wizard and select FINISH when completed.

## Using Microsoft Access 2007 [continued]

### To start a mail merge document:

1. Launch *Microsoft Word 2007*.
2. On the MAILINGS TAB, click START MAIL MERGE and select STEP BY STEP MAIL MERGE WIZARD from the drop-down menu.
3. Choose a document type from the Mail Merge pane. For example, select the DIRECTORY document type to create a continuous document of entries, such as a bibliography.
4. At the bottom of the Mail Merge pane, click NEXT: STARTING DOCUMENT to continue to the next step.
5. Select the starting document and click NEXT: SELECT RECIPIENTS.

### To link the mail merge document to an *Access* database:

1. Choose the USE AN EXISTING LIST radio button then click the BROWSE button to locate the data source for the recipients.
2. In the FILES OF TYPE list, choose ALL DATA SOURCES then locate the desired database file.
3. Select the table or query containing the desired data and click OK.
4. Review the list of recipients to include and click OK.
5. Click NEXT: WRITE YOUR LETTER.

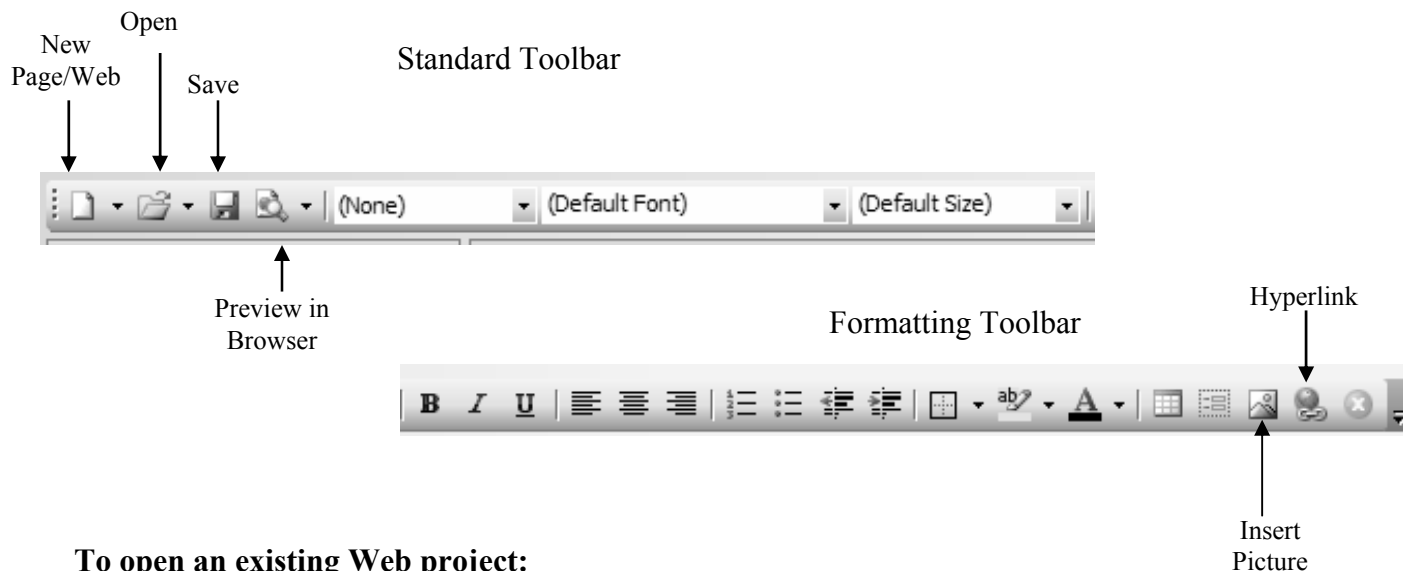
### To add merge fields to the mail merge document:

1. Position the cursor where the first field will be placed on the page.
2. Select the desired item to merge from the Mail Merge pane.
3. Verify that the example is correct. If it is correct, click OK to close the window. If it is incorrect, click the MATCH FIELDS button to fix any errors.
4. Continue this process for all desired merge fields.

### To merge the mail merge document with the data source:

1. Click the NEXT: PREVIEW YOUR LETTERS button. At the top of the Mail Merge pane, use the double arrows to preview all of the documents.
2. Click the NEXT: COMPLETE THE MERGE button. Individual documents may now be edited if desired. The merged documents can also be printed now.

# Using Microsoft SharePoint Designer 2007



## To open an existing Web project:

1. Select **FILE** → **OPEN**.
2. Locate the Web (.html, .htm, .asp) file containing the first page of the Web project and click **OPEN**.

## To create a new Web page:

1. Choose **FILE** → **NEW** → **PAGE**.
2. In the New dialog box, choose **GENERAL** for a standard HTML page, or choose one of the CSS Layouts or Frames Pages for specific needs.
3. Click **OK**.

**Tip:** ASP.Net options are for advanced programmers.



## To save a Web project:

1. Choose **FILE** → **SAVE**.
2. Locate the folder in which you wish to save the Web project and click **SAVE**.
3. When the Save Embedded Files dialog box appears, verify that all component files are saved in the Web project folder and click **OK**.

**Tip:** A Web project is composed of one or more linked HTML files, each representing one page of the project, along with files containing any components embedded in the HTML pages, such as pictures or music. The collection of files that make up a Web project is typically organized in one folder for convenience.

## Using Microsoft SharePoint Designer 2007: Inserting Objects

### To insert a hyperlink to a file:

1. Highlight the image or text that will serve as the starting point for the hyperlink.
2. Choose INSERT → HYPERLINK.
3. In the Insert Hyperlink dialog box, click the BROWSE THE WEB button  or the BROWSE FOR FILE button  to locate the destination file, or ending point, for the hyperlink and click OK.

### To insert a hyperlink to a location within a page:

1. Mark the destination, or ending point, for the hyperlink by highlighting an image or text and selecting INSERT → BOOKMARK.
2. Enter a name for the bookmark and click OK.
3. Create the hyperlink by selecting the starting image or text for the hyperlink and choosing INSERT → HYPERLINK.
4. Delete any text in the Address box.
5. Click BOOKMARK. Select the bookmark name from the Select Place in Document dialog box and click OK twice.

### To insert a picture:

1. Choose INSERT → PICTURE → CLIP ART.
2. Locate and click the desired clipart picture and select INSERT from the popup menu.

or

1. Choose INSERT → PICTURE → FROM FILE.
2. In the Picture dialog box, locate the desired picture file and click INSERT.

## **Using Microsoft SharePoint Designer 2007: Inserting Objects [continued]**

### **To insert sound or music:**

1. Choose FILE → PROPERTIES.
2. On the GENERAL TAB, select the BROWSE button in the Background Sound group.
3. Locate the desired music or sound clip and click OPEN.
4. Make sure that the FOREVER checkbox is selected or choose a number in the Loop spin box, then click OK.

### **To insert a button:**

1. Choose INSERT → INTERACTIVE BUTTON.
2. In the Interactive Buttons dialog box, choose a button from the Buttons list.
3. Enter the text that should appear on the button in the Text box.
4. Select the BROWSE button to locate a destination for the button's hyperlink.
5. Choose a font and text size on the FONT TAB.
6. Select the colors and size of the button on the IMAGE TAB and click OK.

### **To insert a horizontal line:**

1. Choose TASK PANES → TOOLBOX. The TOOLBOX will appear to the right of the main .htm pane.
2. Double-click on HORIZONTAL LINE.

### **To insert scrolling text:**

1. Choose INSERT → WEB COMPONENT. Make sure DYNAMIC EFFECTS is selected under Component Type and select MARQUEE under Choose an Effect. Click FINISH.
2. Enter the text in the Text box.
3. Select LEFT or RIGHT for the direction and click OK.

## **Using Microsoft SharePoint Designer 2007: Inserting Objects [continued]**

### **To insert a background picture:**

1. Select FORMAT → BACKGROUND.
2. On the FORMATTING TAB, select the BACKGROUND PICTURE checkbox.
3. Click the BROWSE button.
4. Locate the desired picture and click OPEN.
5. Click OK to close the Page Properties window.


## **Designing a Page or Web Project**

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### **To choose a background color:**

1. Select FORMAT → BACKGROUND.
2. On the FORMATTING TAB, click the BACKGROUND drop-down arrow, choose a color and click OK.

### **To preview a Web page as it would appear in a Web browser:**

- ❑ Choose FILE → PREVIEW IN BROWSER and select the appropriate browser from the list.
- or
- ❑ Click the arrow next to the PREVIEW IN BROWSER button  on the Standard Toolbar and select the appropriate browser from the list.





# Miscellaneous Topics:

## Creating a Screen Shot

A **screen shot** is a graphic image of what appears on the computer screen. Screen shots can be helpful in acquiring an image of something on the screen for incorporation into another document. Remember that the screen shot will include everything that appears on your monitor.

Follow the steps below to create, insert and size a screen shot.

1. Choose an image that you want to insert into another document. You may want to choose a graphic, a picture file, or the desktop itself.
2. Press the PRINT SCREEN key on the upper right side on the keyboard to copy the image on the screen to the Clipboard. **Note:** The screen shot shows everything that appears on the computer screen. If you only want one small part or area of the screen shot, launch Paint by selecting START → PROGRAMS → ACCESSORIES → PAINT. Select EDIT → PASTE. Choose the SELECT tool or the FREE-FROM SELECT tool and select only the area that you want. Select EDIT → COPY or EDIT → CUT and close Paint.
3. Open the application into which you want to insert the screen shot, for example *Word 2007*.
4. From the MICROSOFT OFFICE button  in the top left corner choose NEW.
5. From the HOME TAB click on the PASTE button.
6. Your screen shot will have the Windows frame around it. To eliminate the frame and insure that you have exactly the image desired, click on the image.
7. Go to the PICTURE TOOLS/FORMAT TAB.
8. Click on the CROP tool  from the SIZE GROUP.
9. Position the CROP tool on the handles of the screen shot and crop unneeded portions of the image.
10. If you desire to change the size of the image, adjust the vertical and horizontal measurements on the SIZE GROUP on the FORMAT TAB. An alternative method to re-size the image is to click on the image, position the cursor at any corner and drag the image to the desired size.

## Miscellaneous Topics: Troubleshooting Tips

### Common problems and solutions:

**Problem:** After the computer starts up, a blank screen appears.

#### Potential Solutions:

Be certain that the monitor is turned on. Check for the lights on the surge protector (if applicable), the system unit and the monitor indicating that electricity is traveling through that component. Check the cable connections to and from each component, in case they have become loose.

If these measures do not solve the problem, insert a boot disk and restart the machine. An emergency boot disk is packaged with diagnostic programs such as *Norton Utilities*. A boot disk can also be created in *Microsoft Windows* by selecting the ADD/REMOVE PROGRAMS icon from the Control Panel, choosing the STARTUP DISK tab and following the directions. If the computer does not start using a boot disk, the problem may be with the hardware. The appropriate hardware vendor should be contacted for service instructions.

**Problem:** When attempting to print, nothing happens.

#### Potential Solutions:

Verify that the printer is turned on and check the cable connections. Look at the lights on the printer to see whether an error is indicated. If so, check the printer manual for interpretations and solutions: the printer could be out of paper or have a paper jam. Check the printer status by choosing START → SETTINGS → PRINTERS, then double-clicking the printer in question. Try printing another document or printing from another program (such as WordPad) to see whether the problem is with the particular file or application.

**Problem:** The computer is frozen.

#### Potential Solutions:

If possible, select the CANCEL or CLOSE button. If the computer is still not responding, press the CONTROL, ALT and DELETE keys simultaneously. From the Close Program dialog box, select the application that is not responding and click END TASK. If the computer is still frozen, the CONTROL, ALT and DELETE key combination can be used to restart the computer. The reset button on the computer system unit may need to be used to restart the computer. If the reset button does not work, turn the computer off, wait 15 seconds or so and turn it back on. Windows should detect that the computer was not shut down properly and will execute the Scandisk program to check the hard drive for errors. If the computer freezes each time the same particular action is performed, it may help to reduce the number of files or applications open at one time.

## Miscellaneous Topics: Troubleshooting Tips [continued]

**Problem:** A “not enough memory” error message appears.

**Potential Solutions:**

Try restarting the computer and launching the program again. If the message still appears, disable the programs that automatically start up. To do so, select START → SETTINGS → TASKBAR & START MENU. Choose the START MENU PROGRAMS tab, then the ADVANCED button and select the PROGRAMS folder. Move the shortcuts from the Startup folder into another folder, and restart the computer. If the error message continues to appear, try removing unnecessary files (such as unnecessary or backed-up documents) from the hard drive to free space that *Windows* can use for memory management.

**Problem:** A “not enough disk space” message appears when installing a program or when copying files to the hard drive.

**Potential Solutions:**

Right-click the RECYCLE BIN icon on the desktop, and choose EMPTY RECYCLE BIN . Check the amount of free hard drive space by right-clicking the HARD DRIVE icon in Windows Explorer and selecting PROPERTIES. Choose the TOOLS tab and select CHECK NOW to check the hard drive for errors that may be taking up space. To free some hard drive space, back up files to floppy disks or delete files that are no longer needed.

To help prevent this type of problem, consider compressing the hard drive before it becomes too full. To do so, select START → PROGRAMS → ACCESSORIES → SYSTEM TOOLS → DRIVESPACE.

**Problem:** No sound is heard from the speakers.

**Potential Solutions:**

Verify that the speakers are turned on and check the volume knob and the cable connections. Be certain that the speakers are connected to the correct jack (often labeled *Out* or *Speaker Out*). From the Control Panel, double-click the SOUNDS icon and determine if sound is heard when the name of a sound is highlighted and the PLAY button selected. From the Control Panel, double-click the MULTIMEDIA icon, select the AUDIO tab and adjust the Playback volume control.

## **Miscellaneous Topics: Troubleshooting Tips [continued]**

**Problem:** A software program does not run properly.

**Potential Solutions:**

First, create backups of any document files created by the program. Double-click the ADD/REMOVE PROGRAMS icon in the Control Panel window, choose CHANGE/REMOVE and follow the instructions to uninstall the program. If problems still persist, right-click the HARD DRIVE icon in Windows Explorer and select PROPERTIES. Verify that there is adequate hard drive space available. Choose the TOOLS tab, then select CHECK NOW and DEFRAGMENT NOW. Reinstall the program.

**Problem:** An error occurs when copying a file or when installing software.

**Potential Solutions:**

The actual file being copied could be damaged. Try copying the file or installing the program on other computers. If the same error message occurs during the same process on a few different machines, the floppy disk or CD-ROM could be defective or could contain a corrupt file. The appropriate software manufacturer must be contacted to receive replacement disks.

**Problem:** The colors on the screen appear unnatural.

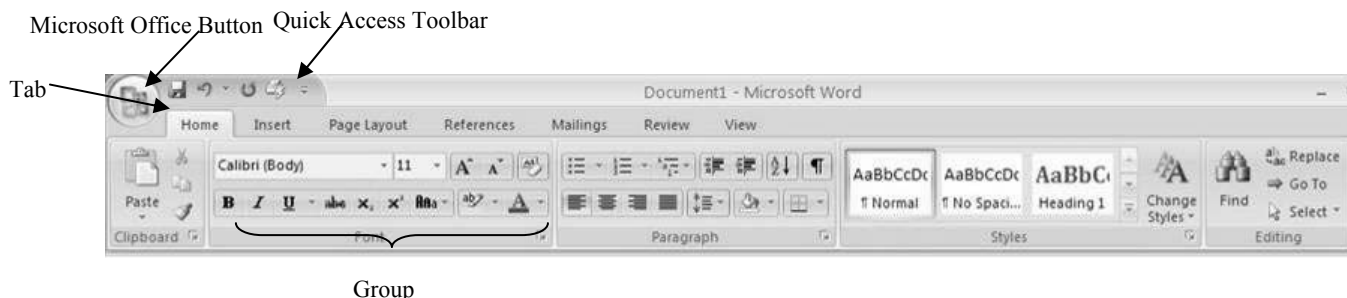
**Potential Solutions:**

The monitor display settings may need to be changed. Double-click the DISPLAY icon in the Control Panel window and click the SETTINGS tab. Choose a different option in the COLOR QUALITY drop-down list. Also, from the SETTINGS tab, select ADVANCED and click the MONITOR tab to verify that the correct monitor is chosen. If not, select CHANGE and choose another monitor.

# Office 2007 Tips and Tricks

## The Ribbon

The menus and toolbars in some programs have been replaced with the Ribbon, a panel that runs along the top of each application window.



The Ribbon is divided into a series of *tabs*. In Word, for example, you will see tabs for Home (the default tab view), Insert, Page Layout, References, Mailings, Review, and View. There are also tabs that only appear when needed. So, for example, if you insert a table in Word, you'll get a new Table tab, or if you insert a picture, you will see a Picture tab.

Commands are organized in logical *groups*, which are collected together under the tabs.


The groups on each tab are organized to help you complete a task.

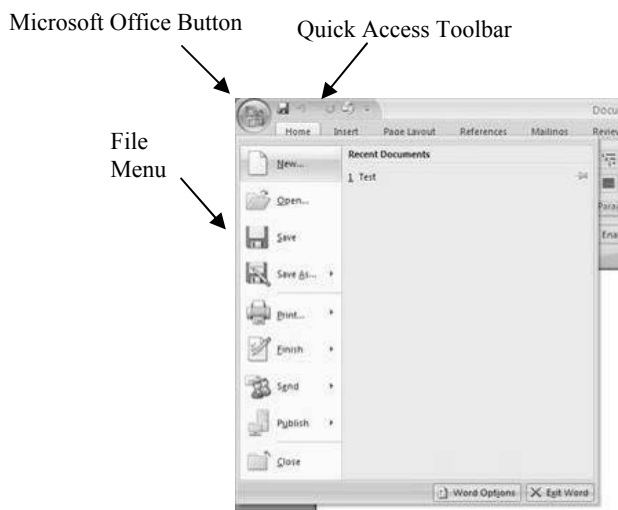
The Ribbon can be found in Office Access 2007, Office Excel 2007, Office PowerPoint 2007, Office Word 2007 and Office Outlook 2007.

## Office 2007 Tips and Tricks [continued]

### Microsoft Office Button

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The Microsoft Office Button  replaces the file menu. When you click the Microsoft Office Button, you see the same basic commands available in earlier releases of Microsoft Office to open, save, and print your file.



### Quick Access Toolbar

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Tools or commands that are not as readily available as you would like can be easily accessed by adding them to the quick access toolbar. To add a button right click on a feature in a tab, then click ADD TO QUICK ACCESS TOOLBAR. You may remove a button the same way, by right clicking and choosing REMOVE FROM QUICK ACCESS TOOLBAR.

### Saving a File

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Office 2007 saves files in a slightly different format, as compared to previous Office versions. To ensure you can access your 2007 files in other versions of Office, you must click on SAVE AS from the File menu. Choose *[Office Program] 97-2003 [File Type]* from the SAVE A COPY OF THE [FILE TYPE] list. Name the file and click SAVE.

For example from Word, you would choose *Word 97-2003 Document* from the SAVE A COPY OF THE DOCUMENT list.

# Glossary

**absolute cell reference:** a cell reference that does not change when a formula is copied or moved; contains a \$ symbol before the column letter and row number

**active cell:** the cell currently selected in a spreadsheet, identified by its black border

**animation:** a series of still images displayed in rapid succession to create the illusion of movement

**background:** the layer in which text and images that appear in the same location on every page of a document are placed

**Boolean operators:** words used to specify a logical relationship *And*, *or* and *and not* are Boolean operators

**bullets:** symbols (often a solid circle or square) used to distinguish items in a list

**branching slide:** a slide that is linked to another slide in a presentation, providing users with a choice of which slide to view next

**cell:** a rectangle in a spreadsheet, formed by the intersection of a row and a column, which can contain text, numbers or a formula

**cell reference:** the coordinates of the column and row position of a cell, or a cell address

**clip art:** previously created digital artwork that is intended to be integrated into documents

**column:** a vertical line of cells in a spreadsheet, identified by a letter

**column heading:** a letter at the top of a column that can be clicked to select the entire column

**column label:** text at the top of a row that indicates the type of information in that column

**data:** information that can be processed and from which conclusions can be inferred

## Glossary [continued]

**database:** a collection of related information

**database application:** a computer software program that allows users to enter, update, organize and retrieve information

**digitalization:** the process of transferring a film or video image to a format that a computer can use

**field:** the location reserved for a category of information within a database

**filter:** a set of criteria applied to records to show a subset of the records

**footer:** the text or graphics that appear at the bottom of a page

**foreground:** the layer in which the text and images that vary from page to page in a document are placed

**formula:** a mathematical equation that performs a calculation in a cell; formulas follow a specific structure beginning with an equal sign (=) followed by the elements to be calculated (the operands) and the calculation operators

**formula bar:** the bar at the top of a spreadsheet that displays the information contained or being entered in a cell

**frames:** a term related to the viewing and layout style of a Web site in which two or more Web pages are loaded at the same time within the same screen; Web pages with frames contain scroll bars for each embedded page that can be viewed independently

**Function:** a ready-to-use formula that performs common calculations, such as averages and sums

**Greek text:** a block of nonsensical text that represents the size and position of text so the aesthetics of the page design can be evaluated

**grouping:** joining together separate objects so the components can be manipulated as one object

**hot spot:** an area on the screen that can be selected to trigger an action, such as playing a sound, animating a graphic or displaying a different slide



## Glossary [continued]

**HyperText Markup Language (HTML):** the special code that allows the Web browser to display the layout of a document

**HyperText Transfer Protocol (HTTP):** the Internet standard that enables access to documents on the World Wide Web

**Importing:** the process of inserting text or graphics that originated in one program into another program

**landscape:** the page orientation in which the page is wider than it is tall

**layers:** invisible sheets on which users can place text or graphics so the objects are independent of other objects on other sheets

**layout:** the process of arranging text and graphics on a page

**layout guides:** nonprinting lines that can be helpful when placing text and graphics within a document

**linking:** connecting text frames so that the excess text from the first frame flows into the second frame

**mail merge:** merging database information and word processing to create individualized letters, envelopes and labels

**medium:** a single method used to communicate a message to an audience, including video, sound, text and graphics

**name box:** the box in a spreadsheet that lists the column letter and row number of a selected cell or a range of selected cells

**picture frame:** a movable and resizable placeholder for a graphic

**points:** a font measure. One inch is equal to 72 points, and one centimeter is equal to 28 points. Font sizes of 10 point or 12 point are common for text in the body of documents.

**Portrait:** the page orientation in which the page is taller than it is wide

## Glossary [continued]

**pull quote:** a short phrase set in a larger type size that repeats information found within the article

**query:** a method used to specify criteria to indicate what records should be retrieved from a database

**range:** a single cell or a rectangular group of adjacent cells within a spreadsheet

**Record:** a complete unit of fields (categorized information)

**row:** a horizontal line of cells in a spreadsheet, identified by a number

**row heading:** a number at the far-left side of a row that can be clicked to select the entire row of cells

**row label:** text at the left side of a row that indicates the type of information in that row

**rulers:** on-screen bars that measure the page horizontally and vertically

**scratch area:** the nonprinting work area in which text and graphics can be placed before they are moved into a document

**slide:** a screen in a *PowerPoint* presentation resembling an index card, on which users may arrange media elements

**slide master:** a special slide that can be used to determine the layout and formatting of all slides in a presentation

**slide show:** in presentation programs, several screens of information organized in a particular sequence

**smart tags:** a set of buttons shared across Office 2007 applications, smart tags appear as needed to provide options for completing a task quickly

**sorting:** rearranging data so that it appears in ascending or descending order, either alphabetically or numerically

**spreadsheet:** a document created by a spreadsheet application

**spreadsheet application:** allows users to enter data, such as numbers and formulas, into an electronic worksheet and to use this data to perform multiple calculations

## Glossary [continued]

**storyboard:** a series of panels on which a set of sketches is arranged for planning purposes

**table:** Information displayed in rows and columns

**task panes:** located on the right side of the screen, allows users to access important tasks such as performing searches, opening documents, viewing the Clipboard, formatting documents and more

**text alignment:** (also known as justification) refers to how text appears in relation to the left and right margins

**text frame:** a placeholder for text, which can be moved or resized

**text wrapping:** the way that text flows around a graphic

**transition:** the special effect that occurs when one slide advances to the next in a presentation

**Uniform Resource Locator (URL):** A Web page's address, often beginning with *http://www*

**wizard:** a Help feature that guides users through multi-step processes to create common documents

**Word wrap:** a word processing feature that automatically moves continuing text to the line below when the previous line becomes full.

**Worksheet:** a spreadsheet containing cells in columns and rows