Infusing Technology into Mathematics 2007

Self-Study Guide

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Introduction

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

This guide leads mathematics 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 classroom-ready sample integrated projects. After review of the sample, a step-by-step guide for the creation of a technology-infused project based on the teacher's existing instructional materials 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 Mathematics 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 mathematics 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 process than *Infusing Technology into Mathematics.*

Required Materials

PC with at least 64 MB of RAM and Internet access

CD-ROM drive

Floppy, Zip or CD-R/W drive

Infusing Technology into Mathematics 2007 course book and CD

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

Microsoft SharePoint Designer 2007

Internet Explorer or *Netscape Navigator*

Printer (color, if available)

Organization of the Course Materials

Course Book

The course book is divided into an introduction, three modules containing practical advice and simple techniques and a comprehensive set of appendices.

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

The **Sample Projects** module 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 component and a student handout. The teacher guide includes preparation, evaluation, extension activities and enrichment activities. Each guide also cites relevant standards from the National Council for Teachers of Mathematics (NCTM) and performance indicators from the 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** module 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** module contains a broad range of excellent professional development and mathematics 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

Microsoft Access 2007*	A relational database program, *Microsoft Access* 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.
Microsoft Excel 2007*	This comprehensive spreadsheet program enables users to analyze, report and share data. *Microsoft Excel* can be used to manipulate and analyze data within a spreadsheet, as well as create tables, charts and graphs to display information.
Microsoft SharePoint Designer 2007	*Microsoft SharePoint Designer* allows users to create and manage Web pages and sites in an easy-to-learn format.
Internet Explorer 7.0†	This Web browser allows users to connect to the Internet and access a wide variety of information. *Internet Explorer 7.0* enables users to access search engines and directories, view Web sites and gain a thorough understanding of the Internet. *Netscape Navigator* may be substituted.
Microsoft PowerPoint 2007*	With *Microsoft PowerPoint*, users can create multimedia presentations to illustrate and deliver ideas.
Microsoft Publisher 2007*	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.
Microsoft Word 2007*	With this word processing application, users may edit and format text, create tables, insert graphics, design headers and footers and link information between documents. The program features automatic spelling and grammar functions as well as Internet capabilities.

*These programs are bundled as part of *Microsoft Office 2007 Professional.*
†*Internet Explorer* is bundled as part of *Windows.* It is also available for download at 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.

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http://www.microsoft.com

Course of Self-Study

If you are using this guide as part of an integration class, then the instructor will provide directions for working with this book. If you are using it as a self-study tool, then the following steps are recommended:

Begin by reviewing 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 disks as needed. Make copies of the materials, such as handouts and assessment tools.
4. Implement the project 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 hone 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 Possible Organizational Approaches section on pages 9-10 to decide which project to sample first. Set aside approximately two hours for the first self-study session.

Project Descriptions

Project 1: Circle Comparison

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

Examine the relationship between a circle's radius and its circumference and area. Enter data into a spreadsheet and create a chart. Finally, generate a word processing document to report the findings.

Project 2: Mathematician Biography

- *Microsoft PowerPoint 2007*
- Web browser

Perform Internet research to gather information about a famous mathematician, then create a multimedia presentation about the mathematician's life and work.

Project 3: Tessellation Creation

- *Paint*
- Web browser

Use the Internet to learn about tessellations and how the designs relate to mathematics. Then use *Paint* to create original tessellations.

Project 4: Graphing Parabolas

- *Microsoft Excel 2007*

Review second-degree equations in the form of $y = ax^2 + bx + c$. Use a spreadsheet to visualize and graph parabolic equations.

Project 5: Euclid's Algorithm

- *Microsoft Excel 2007*

Investigate Euclid's Algorithm and how it can be used to find the greatest common divisor of two positive integers. Create a spreadsheet to calculate Euclid's Algorithm for any two positive integers.

Project 6: Mean, Median, and Mode

- *Microsoft Access 2007*
- Web browser

Employ the Internet to learn about the Old Faithful Geyser in Yellowstone National Park. Then use a database containing information about the frequency, duration and intervals between eruptions. The database is analyzed to determine the mean, median and mode of the duration of eruptions and the interval between eruptions.

Project 7: Solving Variables

- *Microsoft Excel 2007*

Solve a variety of algebraic problems using a spreadsheet.

Project 8: Fractal Fun

- *Microsoft Word 2007*
- Web browser

Use the Internet to learn about fractals, then create a well-known fractal called the Sierpinski Triangle using graphics tools. The fractal is mathematically analyzed and a report is generated in a word processing document.

Project 9: Correlation Coefficients

- *Microsoft Excel 2007*

Learn about correlation coefficients to determine the strength of relationship between two data sets. Use a spreadsheet to explore the relationship between sample data sets, then perform correlation analyses on average height and weight data of males and females from birth to 13 years of age and create scatter plots of the data.

Project 10: Find the Formula

- *Microsoft Excel 2007*

Use a spreadsheet to determine hidden mathematical formulas.

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 Circle Comparison (with *Excel*)
- Project 8 Fractal Fun (with Web browser)

Access

- Project 6 Mean, Median, and Mode (with Web browser)

Excel

- Project 1 Circle Comparison (with *Word*)
- Project 4 Graphing Parabolas
- Project 5 Euclid's Algorithm
- Project 7 Solving Variables (with Web browser)
- Project 9 Correlation Coefficients
- Project 10 Find the Formula

PowerPoint

- Project 2 Mathematician Biography (with Web browser)

Paint

- Project 3 Tessellation Creation (with Web browser)

Project Type

Another effective approach is to choose projects that reflect teaching style or curriculum requirements. Classes studying specific areas of mathematics will benefit from the skill-based projects below:

Algebra

- Project 5 Euclid's Algorithm
- Project 7 Solving Variables
- Project 10 Find the Formula

Statistics

- Project 6 Mean, Median and Mode
- Project 9 Correlation Coefficients

Geometry

- Project 1 Circle Comparison
- Project 3 Tessellation Creation
- Project 4 Graphing Parabolas
- Project 8 Fractal Fun

Math History

- Project 2 Mathematician Biography

Project 1: Circle Comparison
Teacher Guide

Description:

The students will examine the relationship between a circle's radius and its circumference and area. They will enter data in a spreadsheet and create a chart. Finally, the pupils will generate a word processing document to report their findings.

Grade Levels: 7-10

PA Academic Standards:

Grade 8:

2.5.8B Mathematical Problem Solving and Communication: Verify and interpret results using precise mathematical language, notation and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs and diagrams.

2.6.8F Statistics and Data Analysis: Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.

2.9.8D Geometry: Identify, name, draw and list all properties of squares, cubes, pyramids, parallelograms, quadrilaterals, trapezoids, polygons, rectangles, rhombi, circles, spheres, triangles, prisms and cylinders.

Grade 11:

2.2.11F Computation and Estimation: Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.

2.5.11B Mathematical Problem Solving and Communication: Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

2.8.11Q: Algebra and Functions: Represent functional relationships in tables, charts and graphs.

2.9.11F Geometry: Use the properties of angles, arcs, chords, tangents and secants to solve problems involving circles.

NCTM Standards (Grades 6–8 and 9–12):

Standard 3: Geometric and Spatial Sense
Standard 4: Measurement
Standard 6: Problem Solving
Standard 7: Reasoning and Proof

Standard 8: Communication
Standard 9: Connections
Standard 10: Representation

NETS Performance Indicators (Grades 6–8):

5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration and learning throughout the curriculum.
6. Design, develop, publish and present products (e.g., Web pages, videotapes) using technology to demonstrate and communicate curriculum concepts.
8. Select and use appropriate tools and technology to problem solve and accomplish a variety of tasks.

NETS Performance Indicators (Grades 9-12):

5. Use technology for managing and communicating personal or professional information (e.g., finances, schedules, addresses, correspondence and purchases).
8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.

- 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.

Materials:

Microsoft Excel 2007

Microsoft Word 2007

CIRCLE COMPARISON REPORT SAMPLE.DOCX

CIRCLE COMPARISON SAMPLE.XLSX

Prerequisite Skills:

Students should be familiar with entering, editing and formatting data in a spreadsheet, creating charts in a spreadsheet, and formatting text in a word processing document. Also, they should have had exposure to the concept of pi and calculating a circle's circumference and area.

Suggested Time Allotment: One class period

Process:

Announce that the students will explore the relationship between a circle's radius and its circumference and area. Review the formula for calculating a circle's circumference ($2\pi r$) and area (πr^2). Explain that a spreadsheet will be used to examine how different radii can affect a circle's circumference and area. They will create a chart to illustrate the relationship, and generate a *Word* document to explain the findings.

Evaluation:

Evaluate the students on the accuracy of their spreadsheet charts, as well as the quality of their *Word* documents analyzing the linear relationship between radii and circumference and the exponential relationship between radii and area.

Extensions:

Suggest that the students explore the relationship between the length of various regular polygon sides, and their perimeters and areas.

Technology Enrichment:

Have the students create a line chart in addition to a bar graph. Suggest that they use *Excel*'s pi function, which is accurate to 15 digits. To do so, have them enter *=PI()* in the appropriate cells in column A. Recommend that they round the resulting values in columns C and D as well. For example, *=ROUND(2*A5*B5, 2)* should be entered in cell C5 and *=ROUND(A5*B5^2, 2)* should be entered in cell D5 to round the values to two decimal places.

Circle Comparison
Student Handout

- Launch *Microsoft Excel 2007* and begin a new workbook.
- Enter *Circles* as the title in cell C1. Format the text as desired.
- Enter *Pi* in cell A4, *Radius* in cell B4, *Circumference* in cell C4 and *Area* in cell D4.
- To accommodate the text in column C, select Column Heading C then click the FORMAT drop-down arrow on the HOME TAB and select AUTOFIT COLUMN WIDTH.
- To display the formula needed to calculate a circle's circumference, enter *2pr* in cell C3. Next, highlight the letter *p* and change the font to Symbol. Then center all the text in the cell.
- Enter *3.14* in cell A5. Select cells A5 through A10 and choose the FILL BUTTON from the EDITING GROUP on the HOME TAB and click DOWN. Verify that the same values appear in cells A5 through A10.
- Enter *2* in cell B5. Select cells B5 through B10. Choose FILL and select SERIES. Confirm that the values increase by increments of 1 in cells B5 through B10 and click OK.
- Enter the formula *=2*A5*B5* in cell C5. **Note:** If there is an error in the formula, a Microsoft Office Excel window will open and suggest a correction.
- Select cells C5 through C10, choose the FILL button and click DOWN. Verify that circumference values are calculated for cells C5 through C10.
- Enter the formula *=A5*B5^2* in cell D5.
- Choose cells D5 through D10 and use the FILL DOWN command to calculate the area values in the selected cells.
- To create a chart, highlight cells B4 through D10. On the INSERT TAB, select BAR from the CHARTS GROUP. Clustered Bar, the first option in the first row, is a good choice.
- Choose the DESIGN TAB and click the SELECT DATA button, verify that RADIUS appears in the Legend Entries (Series) list and click REMOVE.
- Click the EDIT button in the Horizontal (Category) Axis Labels box and enter *=Sheet1!$B$5:$B$10* then click OK. Click OK again to close the Select Data Source dialog box.

- ❑ Select the LAYOUT TAB, choose the AXIS TITLES button, click PRIMARY VERTICAL AXIS TITLE then choose ROTATED TITLE. Click to select the Vertical (Category) Axis Title box and enter *Radius* as the title.
- ❑ Enlarge the chart and reposition it below row 10 in the spreadsheet.
- ❑ Examine the chart to analyze the relationship between the radius values and the circumference and area values. Change the values in column B and view the resulting changes in the chart.
- ❑ Select the chart and click the COPY button on the HOME TAB.
- ❑ Launch *Microsoft Word 2007* and begin a new document.
- ❑ Enter a title, such as *Radii, Circumference* and *Area*. Format the text as desired and center the title. Press the ENTER key four times.
- ❑ Choose the PASTE button to insert the chart. Click the PASTE OPTIONS Smart Tag and choose CHART (LINKED TO EXCEL DATA). Resize and reposition the chart as desired.
- ❑ Write a paragraph explaining what the chart depicts as well as the relationship among radii, circumference and area.
- ❑ Select the INSERT TAB and click the HEADER button. Choose BLANK then enter your name(s) in the header. Close the header by clicking the CLOSE HEADER AND FOOTER BUTTON on the DESIGN TAB.
- ❑ Save and print the file.
- ❑ Close the file and exit *Word*.
- ❑ Save and close the spreadsheet file, then exit *Excel*.

Project 2: Mathematician Biography
Teacher Guide

Description:

The students will perform research on the Internet to gather information about a famous mathematician. Using this information, they will create a multimedia presentation about the mathematician's life and work. Afterward, the students will present their multimedia reports to the class.

Grade Levels: 7-12

PA Academic Standards:

Grade 7:

3.7.7C Technological Devices: Explain and demonstrate basic computer operations and concepts.

- Demonstrate age appropriate keyboarding skills and techniques

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

- Identify basic multimedia applications.

3.7.7E Technological Devices: Explain basic computer communications systems.

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

Grade 10:

3.7.10C Technological Devices: Apply basic computer operations and concepts.

- Apply touch keyboarding skills and techniques at expectable speed and accuracy.

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

- Apply basic multimedia applications.

3.7.10E Technological Devices: Apply basic computer communications systems.

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

Grade 12:

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

- Design and apply advanced multimedia techniques.

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.

NCTM Standards (Grades 6–8 and 9–12):

Standard 6: Problem Solving

Standard 7: Reasoning and Proof

Standard 8: Communication

Standard 9: Connections

Standard 10: Representation

NETS Performance Indicators (Grades 6–8):

5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration and learning throughout the curriculum.
6. Design, develop, publish and present products (e.g., Web pages, videotapes) using technology to demonstrate and communicate curriculum concepts.
7. Collaborate with peers, experts and others using telecommunication and collaborative tools to investigate curriculum-related problems, issues and information and develop solutions.
8. Select and use appropriate tools and technology to problem solve and accomplish a variety of tasks.

NETS Performance Indicators (Grades 9-12):

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

Materials:

Web browser

Microsoft PowerPoint 2007

MATHEMATICIAN BIOGRAPHY SAMPLE.PPTX

Prerequisite Skills:

The students should have experience using a Web browser to conduct research on the Internet. They should also be familiar with the basic commands needed to create, edit and format a multimedia presentation using *PowerPoint*.

Suggested Time Allotment: Four to six class periods

Process:

Distribute the *Mathematician Biography Student Handout* and provide an overview of the project. Explain to the students that they will perform Internet research to gather information about the early life, education, mathematical work and later life of a mathematician of their choice. Then they will assemble the information into a multimedia report and finally present the report to the class.

Evaluation:

Evaluate the students on the clarity and completeness of their multimedia presentations as well as their oral presentations.

Extensions:

Have the students create an additional slide to teach the class about a mathematical concept that the chosen mathematician is credited with discovering.

Technology Enrichment:

Recommend that the students animate the objects on each slide. To do so, choose the CUSTOM ANIMATION button on the ANIMATIONS TAB. The CUSTOM ANIMATION Task Pane will appear to the right. Select a text box or graphic to animate. In the Task Pane, click on the drop-down arrow beside Add Effect and select ENTRANCE, EXIT, EMPHASIS or MOTION PATHS. Choose the desired option. Designate an effect and modify the timing of each object, then click OK. Repeat these steps for each slide in the presentation.

Mathematician Biography
Student Handout

- Launch the Web browser and access the following sites:

  http://turnbull.dcs.st-and.ac.uk/history/
  University of St. Andrews (Scotland) index of mathematicians

  www.maths.tcd.ie/pub/HistMath/People/RBallHist.html
  Trinity College (Ireland) chronological index of mathematicians

  http://www.agnesscott.edu/lriddle/women/
  Agnes Scott College's biographies of women mathematicians

- Determine which mathematician you will feature in your report. Locate information about the mathematician in the following areas:

  Early Life:

  Education:

  Mathematical Work:

  Later Life:

- Graphics from the Internet can be saved by pressing the right mouse button and choosing the appropriate command to save the picture to the hard disk drive.

- After accumulating the desired information and graphics, create a multimedia presentation. Launch *Microsoft PowerPoint 2007.*

- To select a slide layout, click the LAYOUT button on the HOME TAB and choose the TITLE ONLY option. Select the text *Click to add title* on the slide and enter a title for the presentation. Format the text as desired.

- Insert a graphic file saved from the Internet or a clipart image. To insert a saved graphics file, click the PICTURE button on the INSERT TAB. Locate and select the desired file and click INSERT. To insert a clipart image, choose the CLIP ART button on the INSERT TAB. The ClipArt Task Pane will open. Enter text in the Search For Text box and click GO. Click on the selected graphic to insert it. Resize and reposition the graphic as desired.

- To create a new slide, choose the NEW SLIDE button on the HOME TAB. To change the slide layout, click the LAYOUT button and choose the TITLE AND CONTENT slide.

- Select the *Click to add title* text on the slide and enter *Early Life*. Select the text *Click to add text* and enter information about the mathematician's early life. Insert a graphic for the slide as well.

- Repeat the last two steps to insert additional slides about the mathematician. The titles of the slides should be *Education, Mathematical Work* and *Later Life*.

- Select the DESIGN TAB to choose a theme. Select a theme from the examples at the top of the screen or by clicking the COLORS button and choosing one. The same theme will be applied to each slide in the presentation.

- On the ANIMATIONS TAB apply a transition to all of the slides by selecting a transition from the TRANSITION TO THIS SLIDE GROUP. Modify the speed of the transition and click APPLY TO ALL.

- Format the slides as desired.

- Preview the presentation by selecting the SLIDE SHOW button on the VIEW TAB.

- Save the file and exit *PowerPoint*.

Project 3: Tessellation Creation
Teacher Guide

Description:

Students will use the Internet to learn about tessellations and how the designs relate to mathematics. Then the students will use *Paint* to create original tessellations.

Grade Levels: 7-8

PA Academic Standards:

Grade 8:

2.9.8I Geometry: Generate transformations using computer software.

2.9.8J Geometry: Analyze geometric patterns (e.g., tessellations, sequences of shapes) and develop descriptions of the patterns.

2.9.8K Geometry: Analyze objects to determine whether they illustrate tessellations, symmetry, congruence, similarity and scale.

NCTM Standards (Grades 6-8):

Standard 2: Patterns, Functions, and Algebra

Standard 3: Geometric and Spatial Sense

Standard 9: Connections

Standard 10: Representation

NETS Performance Indicators (Grades 6-8):

5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum.
6. Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology to demonstrate and communicate curriculum concepts.
7. Collaborate with peers, experts and others using telecommunication and collaborative tools to investigate curriculum-related problems, issues, and information and to develop solutions.
8. Select and use appropriate tools and technology to accomplish a variety of tasks and solve problems.

Materials:

Web browser

Paint

TESSELLATION CREATION SAMPLE.BMP

Prerequisite Skills:

The students should know how to use the Internet to navigate Web pages. They should also have experience using the basic graphics tools in *Paint*.

Suggested Time Allotment: One class period

Process:

Discuss the concept of pattern symmetry with the class, including rotation, translation, reflection and glide reflection. Explain that the students will use the Internet to learn about repeating tiled patterns known as tessellations. Then they will use a graphics program to create their own original tessellations. Have them follow the directions listed on *Tessellation Creation: Student Handout* to complete the activity.

Evaluation:

Evaluate students on the symmetry of the tessellations they create.

Extensions:

Suggest that the students create a different tessellation using rotation. Starting with a blank document in *Paint*, use the PENCIL tool to make a "squiggly" line. Use the BRUSH tool to make a dot at the bottom edge of the line. Use the SELECT tool with the TRANSPARENT option to select the image and choose EDIT → COPY. Select EDIT → PASTE and choose IMAGE → FLIP/ROTATE. Click the ROTATE BY ANGLE radio button, verify that the 90° radio button is selected and click OK. Reposition the selection so its dot overlaps the dot of the original line. Choose EDIT → PASTE, rotate the selection 180 degrees, then align the dots. Paste the image again, rotate it 270 degrees, and align the dots. To create the tessellation, use the SELECT tool, then copy and paste the design and position it next to the original. Continue to paste the designs and reposition them to align them in a row. After completing a line, copy and paste the line of designs below the original line. Continue in this manner to create multiple lines of designs.

Technology Enrichment:

Designate the created tessellation as the computer's desktop wallpaper. To do so using *Paint*, choose FILE → SET AS BACKGROUND (TILED).

Tessellation Creation
Student Handout

- Launch the Web browser and access the following Web sites to learn about tessellations:

  http://mathforum.org/sum95/suzanne/whattess.html/
  Drexel University Math Forum's page on tessellations

  http://library.thinkquest.org/16661
  Site on tessellations developed as part of the 1998 ThinkQuest student competition

  http://library.thinkquest.org/11750/eschpage/MathClass1.html
  Tessellations and M.C. Escher by a 1997 ThinkQuest competing team

- To begin to create your own tessellation, launch *Paint*.

- Designate the size of the document by choosing IMAGE → ATTRIBUTES. Enter *800* in the Width box and *600* in the Height box. Verify that the PIXELS radio button is selected in the Units group and click OK.

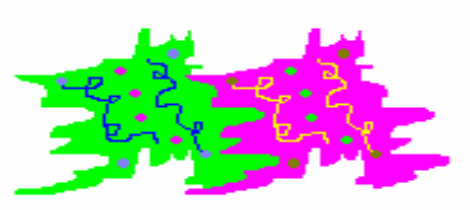
- Select a color in the Color box. Choose the rectangle tool, hold down the SHIFT key and create a square about 1-square inch in area near the top-left corner of the document. Select the FILL WITH COLOR tool and click inside the square shape to fill the shape with color.

- Choose the FREE-FORM SELECT tool and create a zig-zag line from the square's top-left corner to the bottom-left corner. Click the TRANSPARENT option below the tool box. Drag the selection so its left edge is aligned with the square's right edge, being certain not to leave a gap.

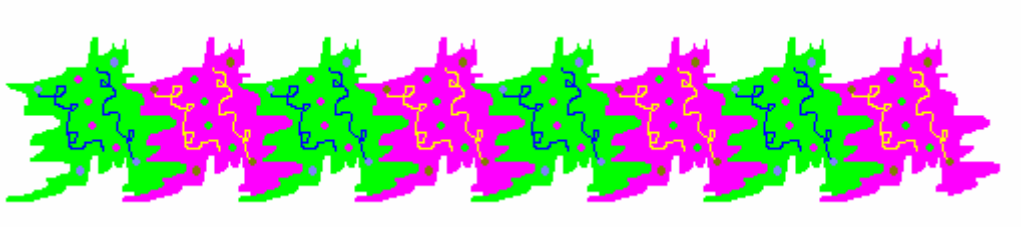
- Use the FREE-FORM SELECT tool again and draw a line from the shape's bottom-left corner to the bottom-right corner, being certain to stay within the filled portion of the shape. Drag the selection so its bottom edge is aligned with the top edge of the shape.

- Use the PENCIL tool and the BRUSH tool with different colors to decorate the shape within its boundaries. Save the file with your initials and the number 1 as its file name.

- Choose IMAGE → INVERT COLORS. Select WHITE in the color box, choose the FILL WITH COLOR tool and click within the black area of the document. Select FILE → SAVE AS and name the file with your initials and the number 2. Choose the SELECT tool and draw a rectangle to encompass the image, then select EDIT → COPY. Open the original file (containing the number 1 in its filename) and choose EDIT → PASTE. Reposition the pasted image so its left edges are exactly aligned with the other image's right edges.



- Use the SELECT tool to encompass the larger image and copy it. Paste the image and reposition it to align the left edges of the pasted image with the right edges of the original. Continue to paste the image and reposition the image to create a single row.



- Use the SELECT tool to select the entire row, then copy and paste the image. Reposition the pasted image so its top edges are aligned with the bottom edges of the row. Continue in this manner to paste additional rows and reposition them below the graphic to complete the tessellation.

- Save and print the file, then exit *Paint*.

Project 4: Graphing Parabolas
Teacher Guide

Description:

In this lesson, the students will graph parabolic equations using a spreadsheet.

Grade Levels: 8-10

PA Academic Standards:

Grade 8:

2.1.8A Numbers, Number Systems and Number Relationships: Represent and use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, exponents, scientific notation, square roots).

2.5.8B Mathematical Problem Solving and Communication: Verify and interpret results using precise mathematical language, notation and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs and diagrams.

2.6.8F Statistics and Data Analysis: Use scientific and graphing calculators and computer spreadsheets to organize and analyze data.

2.8.8F Algebra and Functions: Solve and graph equations and inequalities using scientific and graphing calculators and computer spreadsheets.

2.8.8I Algebra and Functions: Generate a table or graph from a function and use graphing calculators and computer spreadsheets to graph and analyze functions.

Grade 11:

2.1.11A Numbers, Number Systems and Number Relationships: Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

2.2.11F Computation and Estimation: Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.

2.5.11B Mathematical Problem Solving and Communication: Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

2.8.11F Algebra and Functions: Use equations to represent curves (e.g., lines, circles, ellipses, parabolas, hyperbolas).

2.8.11H Algebra and Functions: Select and use an appropriate strategy to solve systems of equations and inequalities using graphing calculators, symbol

manipulators, spreadsheets and other software.

2.8.11Q Algebra and Functions: Represent functional relationships in tables, charts and graphs.

NCTM Standards (Grades 6-8 and 9-12):

Standard 2: Patterns, Functions and Algebra
Standard 3: Geometric and Spatial Sense
Standard 4: Measurement
Standard 6: Problem Solving
Standard 7: Reasoning and Proof
Standard 8: Communication
Standard 9: Connections
Standard 10: Representation

NETS Performance Indicators (Grades 6-8):

5. Apply productivity/multimedia tools and peripherals 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):

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

Materials:

Microsoft Excel 2007

GRAPHING PARABOLAS SAMPLE.XLSX

Prerequisite Skills:

The students should be familiar with editing and formatting a spreadsheet, as well as creating charts. They also should have some knowledge of second-degree equations.

Suggested Time Allotment: One to two class periods

Process:

Review second-degree equations in the form of $y = ax^2 + bx + c$. Explain that the students will use a spreadsheet to visualize equations similar to these. Have them follow the instructions on the *Graphing Parabolas: Student Handout* to complete the activity.

Evaluation:

Evaluate the students on the quality and clarity of their spreadsheet data and charts.

Extensions:

Have the students create their own second-degree equations and generate graphs to display them. Suggest that they try solving cubic equations (e.g., $2x^3 - 4x^2 + 7x - 3$) using a spreadsheet.

Technology Enrichment:

Recommend that the students insert additional rows in an equation's data. Highlight the x values and choose FILL → SERIES to fill a series of x values. Highlight the y values and select FILL → DOWN. If the parabola is not symmetrical, create more rows and insert the appropriate x values and use the FILL DOWN command for the y values.

Graphing Parabolas
Student Handout

- ❑ Launch *Microsoft Excel 2007* and begin a new workbook.

- ❑ Select cell A1 and enter *Graph of y = 2x2 – 4x + 3*. To format the exponent, highlight the second number 2 and click in the corner of the FONT GROUP on the HOME TAB. Select the SUPERSCRIPT check box, reduce the font size to 8 and then click OK. Verify that the text now reads *Graph of* $y = 2x^2 - 4x + 3$.

- ❑ Enter *x* in cell A2. Enter *y* in cell B2. Select cells A2 and B2, then bold and center the text. Enter *-3* in cell A3. Select cells A3 through A11. Choose the FILL button in the EDITING GROUP on the HOME TAB, select SERIES and click OK. Confirm that a sequential series of values from –3 to 5 appears in the selected cells.

- ❑ Select cells A2 through A11, choose the CREATE FROM SELECTION button from the DEFINED NAMES GROUP on the FORMULA TAB and click OK.

- ❑ Select cell B3 and enter the formula *=2*x^2-4*x+3* for y. The * symbol is used to indicate multiplication and the ^ symbol is used to indicate an exponent. **Note:** If there is an error in the formula, a Microsoft Office Excel window will open and suggest a correction.

- ❑ Highlight cells B3 through B11, click the FILL button on the HOME TAB and select DOWN.

- ❑ To create a graph of the data, select cells A2 through B11. On the INSERT TAB click the SCATTER button in the CHARTS GROUP, and select the second option in the first row as the chart sub-type.

- ❑ On the LAYOUT TAB, choose the CHART TITLE button in the LABELS GROUP and enter *y = 2x2 – 4x + 3* in the chart title box. Click the LEGEND button and choose NONE to turn off the legend. Select the GRIDLINES button, click PRIMARY HORIZONTAL GRIDLINES and choose NONE.

- ❑ Increase the height of the inserted chart.

- ❑ Click to select the chart title and then highlight the second number 2 in the title and click in the corner of the FONT GROUP on the HOME TAB. Select the SUPERSCRIPT check box, reduce the font size by one or two points then click OK.

- ❑ Click the SHEET2 tab at the bottom of the worksheet. Follow similar steps to create x and y data for the equation $y = x^2 + 2x - 6$. Use –5 as the starting value for x. Make a graph of the data as well.

- ❑ On SHEET3 and SHEET4 respectively, graph the equations $y = -2x^2 - 4x + 3$ and $y = -x^2 + 2x - 6$. Compare these graphs with the ones created on Sheet1 and Sheet2.

- ❑ Save the file and print the entire workbook.

- ❑ Close the file and exit *Excel.*

Project 5: Euclid's Algorithm
Teacher Guide

Description:

In this lesson, the students learn about Euclid's Algorithm and how it can be used to find the greatest common divisor of two positive integers. Then they create a spreadsheet to calculate Euclid's Algorithm for any two positive integers.

Grade Levels: 9-11

PA Academic Standards:

Grade 11:

2.1.11A Numbers, Number Systems and Number Relationships: Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

2.2.11F Computation and Estimation: Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.

2.5.11B Mathematical Problem Solving and Communication: Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

2.8.11A Algebra and Functions: Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.

2.8.11Q Algebra and Functions: Represent functional relationships in tables, charts and graphs.

NCTM Standards (Grades 9-12):

Standard 1: Number and Operation
Standard 2: Patterns, Functions and Algebra
Standard 6: Problem Solving
Standard 7: Reasoning and Proof
Standard 9: Connections

NETS Performance Indicators (Grades 9-12):

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

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.

Materials:

Microsoft Excel 2007

Prerequisite Skills:

Students should have experience editing and formatting information in a spreadsheet as well as entering formulas and functions in a spreadsheet.

Suggested Time Allotment: One to two class periods

Process:

Tell the students that they will learn about Euclid's Algorithm to determine the greatest common divisor of two positive integers. Show how to calculate Euclid's Algorithm by using two integers, such as 440 and 120. The first step is to determine how many multiples of the smaller number are in the larger number. Since 440 = 120 x 3 + 80, there are three multiples of 120 in 440 with a remainder of 80. Now the smaller number of the original two numbers (120) and the remainder found in the previous step (80) are used with the same algorithm. How many multiples of the smaller number are in the larger number? Since 120 = 80 x 1 + 40, there is one multiple of 80 in 120 with a remainder of 40. Now the numbers 80 and 40 are used with the same algorithm. Because 80 = 40 x 2, having no remainder indicates that the greatest common devisor has been found. The greatest common divisor of 440 and 120 is 40. Have the pupils use the *Euclid's Algorithm: Student Handout* and follow the instructions to create a spreadsheet to calculate Euclid's Algorithm for any two positive integers.

Evaluation:

Evaluate the accuracy and quality of the students' spreadsheets as well as the correctness of their answers on the questions at the end of the handout.

Extensions:

Use a Web browser and access the following Web site:

www.cut-the-knot.com/blue/EuclidAlg.html
A very diverse mathematics site that contains a clever game using the algorithm

This interactive activity intends to clarify Euclid's Algorithm and the concept of the greatest common divisor of two integers.

Technology Enrichment:

Insert conditional statements so the *=DIV/0!* error messages are not displayed. To do so, enter *IF(F3=0,0,IF(F3=" ",0,F3))* in cell B4 and use the FILL DOWN command. Enter *=IF(B3=0, " ", A3/B3)* in cell C3 and use the FILL DOWN command. Enter *=IF(B3=0," ",FLOOR(C3,1))* in cell D3 and use the FILL DOWN command. Enter *=IF(B3=0," ", B3*D3)* in cell E3 and use the FILL DOWN command. Enter *=IF(B3=0, " ", A3-E3)* in cell F3 and use the FILL DOWN command.

Euclid's Algorithm
Student Handout

- ❑ Launch *Microsoft Excel 2007* and begin a new workbook.
- ❑ Enter *Euclid's Algorithm* in cell A1. Format the text as desired.
- ❑ Enter *A* in cell A2. Enter *B* in cell B2.
- ❑ Use sample integers in cells A3 and B3. Enter *440* in cell A3 and *120* in cell B3.
- ❑ Enter *A/B* in cell C2. Enter the formula *=A3/B3* in cell C3.
- ❑ Select cells C3 through C15, click the FILL button on the HOME TAB and choose DOWN. The *#DIV/0!* error message will appear in the cell since the formula is attempting to divide by zero.
- ❑ Enter *Multiples of B in A* in cell D2. Select Column Heading D then click the FORMAT drop-down arrow on the HOME TAB and select AUTOFIT COLUMN WIDTH. Column D should now be wide enough to accommodate the text.
- ❑ Enter *=FLOOR(C3,1)* in cell D3. The floor function rounds a number down, toward the nearest number of significance.
- ❑ Select cells D3 through D15, click the FILL button and choose DOWN.
- ❑ Enter *B x (Multiples of B in A)* in cell E2. Adjust the width of column E to accommodate the text. Enter *=B3*D3* in cell E3.
- ❑ Choose cells E3 through E15 and use the FILL DOWN command.
- ❑ Enter *Remainder* in cell F2. Adjust the width of column F to accommodate the text. Enter *=A3-E3* in cell F3.
- ❑ Select cells F3 through F15 and use the FILL DOWN command.
- ❑ Enter *=B3* in cell A4. Choose cells A4 through A15 and use the FILL DOWN command.
- ❑ Enter *=F3* in cell B4. Select cells B4 through B15 and use the FILL DOWN command.
- ❑ The last non-zero integer in column A is the greatest common divisor of the integers entered in cells A2 and B2.

- ❑ Change the numbers in cells A3 and B3 to test the spreadsheet. Be certain that both integers are positive and that the number in cell A3 is greater than the number entered in cell B3.

- ❑ Save and print the file.

- ❑ Determine the greatest common integer of the following pairs of numbers:

  630, 360 ____

  459, 289 ____

  1521, 923 ____

  5967, 1173 ____

- ❑ Close the file and exit *Excel*.

Project 6: Mean, Median and Mode
Teacher Guide

Description:

In this lesson, the students will use the Internet to learn about the Old Faithful Geyser in Yellowstone National Park. Then they will use database containing information collected over 16 days about the number of eruptions, the duration of eruptions and the interval between eruptions. The database is analyzed to determine the mean, median and mode of the duration of eruptions and the interval between eruptions.

Grade Levels: 7-10

PA Academic Standards:

Grade 8:

2.5.8B Mathematical Problem Solving and Communication: Verify and interpret results using precise mathematical language, notation and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs and diagrams.

2.6.8A Statistics and Data Analysis: Compare and contrast different plots of data using values of mean, median, mode, quartiles and range.

2.7.8B Probability and Predictions: Present the results of an experiment using visual representations (e.g., tables, charts, graphs).

2.11.8A Concepts of Calculus: Analyze graphs of related quantities for minimum and maximum values and justify the findings.

Grade 11:

2.5.11B Mathematical Problem Solving and Communication: Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

2.8.11Q Algebra and Functions: Represent functional relationships in tables, charts and graphs.

2.11.11A Concepts of Calculus: Determine maximum and minimum values of a function over a specified interval.

NCTM Standards (Grades 6-8 and 9-12):

Standard 5: Data Analysis, Statistics and Probability

Standard 6: Problem Solving

Standard 7: Reasoning and Proof

Standard 9: Connections

NETS Performance Indicators (Grades 6-8):

5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration and learning throughout the curriculum.
6. Design, develop, publish and present products (e.g., Web pages, videotapes) using technology to demonstrate and communicate curriculum concepts.
7. Select and use appropriate tools and technological resources to accomplish a variety of tasks and solve problems.

NETS Performance Indicators (Grades 9-12):

5. Use technology for managing and communicating both personal and professional information (e.g., finances, schedules, addresses, correspondence and purchases).
8. Select and apply technology for research, information analysis, problem solving and decision making in content learning.
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.

Materials:

Web browser

Microsoft Access 2007

OLD FAITHFUL DATABASE.ACCDB

Prerequisite Skills:

The pupils should have experience using a Web browser and database to perform basic queries. They should also be familiar with the terms *mean*, *median* and *mode*.

Suggested Time Allotment: One to two class periods

Process:

Review the terms *mean*, *median* and *mode*. Announce to the students that they will use the Internet to learn about the Old Faithful Geyser at Yellowstone National Park in Wyoming. Then they will use a database containing information about the geyser to determine the mean, median and mode of the duration of the geyser's eruptions and the intervals between eruptions.

Evaluation:

Evaluate the students on the accuracy of their answers related to mean, median and mode.

Extensions:

Have the students create a report about the Old Faithful Geyser that discusses their findings about the mean, median and mode of the duration of eruptions and the intervals between eruptions.

Technology Enrichment:

Find the minimum and maximum values for the Duration and Interval fields. To do so, create a new query using the Old Faithful Geyser Data. Select DURATION as the first field in the first column. Choose TOTALS, select MIN in the Totals field and run the query. To locate the maximum value, select MAX instead of MIN. Follow similar steps for the Interval field to determine the minimum and maximum values.

Mean, Median and Mode
Student Handout

- Use a search engine to locate and access Web sites to learn about the Old Faithful Geyser:

- Launch *Microsoft Access 2007* and open the OLD FAITHFUL DATABASE.ACCDB.

- In the Navigation Pane on the left, verify that the OLD FAITHFUL GEYSER DATA table is chosen and double-click to open the database. Briefly view the data table to confirm that the first field indicates which of the 16 days the information was collected, that the second field refers to the duration in minutes of the geyser's eruptions, and that the third field corresponds to the interval in minutes between the geyser's eruptions. Close the table.

- To determine the mean of the duration of the eruptions, select the CREATE TAB and click QUERY DESIGN. On the TABLES TAB, confirm that OLD FAITHFUL GEYSER DATA is highlighted, choose ADD and click CLOSE.

- Select the FIELD drop-down arrow in the first column and choose DURATION. Select the TOTALS button in the SHOW/HIDE GROUP. Position the cursor in the Total field in the first column, click the drop-down arrow and choose AVG.

- Choose RUN. Note the result and answer the first question on the next page.

- Click the SAVE icon on the Quick Access Toolbar, enter *Duration Mean* as the name of the query and click OK. Close the query. Determine the mean of the intervals between eruptions in a similar manner, then answer the second question on the next page.

- To determine the median of the duration of eruptions, create a new query in Design View using the Old Faithful Geyser Data. Select DURATION as the first field in the first column. Click TOTALS.

- Select DURATION as the first field in the second column. Choose COUNT in the Totals field in the second column. Select DESCENDING in the Sort field in the second column.

- Click RUN. Verify that the most common value in the Duration field is listed first. Answer the third question at the bottom of the page.

- Save and close the query. Determine the median of the intervals between eruptions in a similar manner, then answer the fourth question at the bottom of the page.

- ❑ To find the mode of the duration of eruptions, create a new query in Design View using the OLD FAITHFUL GEYSER DATA table.
- ❑ Select DURATION as the first field in the first column. Click TOTALS.
- ❑ Select DURATION as the first field in the second column. Choose COUNT in the Totals field in the second column.
- ❑ Click RUN. As shown by the *34* at the bottom of the window, 34 records appear. Since the median record is needed, highlight the *1* in the Specific Record box at the bottom of the screen, enter *17* and press the ENTER key. Note the duration value and answer the fifth question at the end of this handout.
- ❑ Save and close the query.
- ❑ Determine the mode of the intervals between eruptions in a similar manner, then answer the sixth question at the end of this handout.
- ❑ Close the file and exit *Access*.

Questions:

1. What is the mean of the duration of Old Faithful Geyser eruptions? _____
2. What is the mean of the intervals between Old Faithful Geyser eruptions? _____
3. What is the median of the duration of Old Faithful Geyser eruptions? _____
4. What is the median of the intervals between Old Faithful Geyser eruptions? _____
5. What is the mode of the duration of Old Faithful Geyser eruptions? _____
6. What is the mode of the intervals between Old Faithful Geyser eruptions? _____

Project 7: Solving Variables
Teacher Guide

Description:

The students learn to solve algebraic problems using a spreadsheet.

Grade Levels: 8-9

PA Academic Standards:

Grade 8:

2.2.8B Computation and Estimation: Add, subtract, multiply and divide different kinds and forms of rational numbers including integers, decimal fractions, percents and proper and improper fractions.

2.3.8A Measurement and Estimation: Develop formulas and procedures for determining measurements (e.g., area, volume, distance).

2.3.8D Measurement and Estimation: Estimate, use and describe measures of distance, rate, perimeter, area, volume, weight, mass and angles.

2.3.8E Measurement and Estimation: Describe how a change in linear dimension of an object affects its perimeter, area and volume.

2.5.8B Mathematical Problem Solving and Communication: Verify and interpret results using precise mathematical language, notation and representations, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs and diagrams.

2.5.8D Mathematical Problem Solving and Communication: Determine pertinent information in problem situations and whether any further information is needed for solution.

2.10.8B Trigonometry: Solve problems requiring indirect measurement for lengths of sides of triangles.

Grade 11:

2.2.11B Computation and Estimation: Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.

2.2.11F Computation and Estimation: Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.

2.3.11A Measurement and Estimation: Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

2.5.11B Mathematical Problem Solving and Communication: Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

NCTM Standards (Grades 6-8 and 9-12):

Standard 1: Number and Operation
Standard 2: Patterns, Functions, and Algebra
Standard 3: Geometric and Spatial Sense
Standard 4: Measurement
Standard 6: Problem Solving
Standard 7: Reasoning and Proof
Standard 9: Connections
Standard 10: Representation

NETS Performance Indicators (Grades 6-8):

5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum.
6. Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology to demonstrate and communicate curriculum concepts.
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.
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.

Materials:

Microsoft Excel 2007

Prerequisite Skills:

The pupils should have familiarity with entering and formatting data in a spreadsheet. They also should have previous experience solving simple algebraic problems.

Suggested Time Allotment: One class period

Process:

Review the steps involved in setting up a simple algebraic problem such as finding the formula for the perimeter of a square whose side is equal to 2x + 1. Determine the perimeter for different values of x, such as 1, 2, 3 and 4. Announce to the students that they will now use a spreadsheet to solve similar algebraic problems. Have them use the *Solving Variables: Student Handout* and follow the instructions to complete the activity.

Evaluation:

Evaluate the students on the accuracy of their answers on the handout and the quality of their spreadsheets.

Extensions:

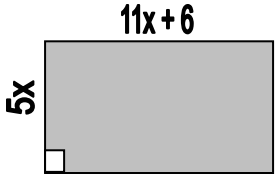
Have the pupils devise their own algebraic problems and use spreadsheets to solve them.

Technology Enrichment:

Suggest that the student use the Goal Seek feature to locate a specific value for a variable. To do so, select a cell containing a formula and choose WHAT-IF ANALYSIS on the DATA TAB, in the DATA TOOLS GROUP, and then click GOAL SEEK. In the Set Cell box enter the cell reference (cell address) of the cell that will be modified, enter the target value in the To Value box, and click OK.

Solving Variables
Student Handout

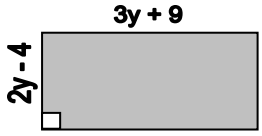
Problem #1: Determine the perimeter of the following rectangle:
What is the value for x when the perimeter is 300?



- ❑ Launch *Microsoft Excel 2007* and begin a new workbook.
- ❑ Enter "x" in cell A1. Center and bold the text.
- ❑ Since the perimeter of the rectangle is 2[5x + (11x + 6)], which is equal to 32x + 12, select cell B1 and enter "perimeter = 32x + 12".
- ❑ Enter "1" in cell A2. Select cells A2 through A16. To insert other values for x, choose the FILL button on the HOME TAB, select SERIES and click OK. Verify that a sequential series of values from 1 to 15 appears in the selected cells.
- ❑ Select cells A1 through A16. Choose the CREATE FROM SELECTION button from the DEFINED NAMES GROUP on the FORMULA TAB and click OK.
- ❑ Enter the formula "=32*x+12" in cell B2.
- ❑ Choose cells B2 through B16 and select FILL → DOWN.
- ❑ View the different values for the perimeter in column B and determine the value for x when the perimeter is 300 to answer Problem #1.
- ❑ Follow similar steps to answer the following problems on Sheet2 and Sheet3 of the workbook:

Problem #2

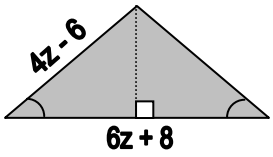
Determine the perimeter of the rectangle:



What is the value for y if the perimeter is 80?

Problem #3

Determine the perimeter of the triangle:



What is the value for z if the perimeter is 150?

Project 8: Fractal Fun
Teacher Guide

Description:

The students will perform research on the Internet to learn about fractals. Then they will create a well-known fractal called the Sierpinski Triangle using graphics tools. Next, the students will mathematically analyze the fractal and then generate a report in a word processing document.

Grade Levels: 7-10

PA Academic Standards:

Grade 8:

2.1.8D Numbers, Number Systems and Number Relationships: Apply ratio and proportion to mathematical problem situations involving distance, rate, time and similar triangles

2.8.8A Algebra and Functions: Apply simple algebraic patterns to basic number theory and to spatial relations.

2.9.8I Geometry: Generate transformations using computer software.

2.9.8J Geometry: Analyze geometric patterns (e.g., tessellations, sequences of shapes) and develop descriptions of the patterns.

2.9.8K Geometry: Analyze objects to determine whether they illustrate tessellations, symmetry, congruence, similarity and scale.

Grade 11:

2.8.11A Algebra and Functions: Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.

2.8.11Q Algebra and Functions: Represent functional relationships in tables, charts and graphs.

2.8.11S Algebra and Functions: Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).

2.9.11H Geometry: Construct a geometric figure and its image using various transformations.

2.9.11I Geometry: Model situations geometrically to formulate and solve problems.

NCTM Standards (Grades 6-8 and 9-12):

Standard 2: Patterns, Functions and Algebra
Standard 3: Geometric and Spatial Sense
Standard 4: Measurement
Standard 5: Data Analysis, Statistics and Probability
Standard 6: Problem Solving
Standard 7: Reasoning and Proof
Standard 8: Communication
Standard 9: Connections
Standard 10: Representation

NETS Performance Indicators (Grades 6-8):

4. Use content-specific tools, software and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning.
5. Apply productivity/multimedia tools and peripherals 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):

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:

Web browser
Microsoft Word 2007

Prerequisite Skills:

The students should have experience using a Web browser to access Web sites as well as previous experience using graphics tools to create, move, resize and group objects. Basic geometry knowledge is needed to analyze the fractal.

Suggested Time Allotment: Two or three class periods

Process:

Inform the students that they will learn about fractals. Explain that a fractal is any pattern that reveals greater complexity as it is enlarged. Have the students use a Web browser to access the sites listed on the Fractal Fun Student Handout to research fractals and to answer the questions listed below the Web sites on the handout.

Next, have the students follow the instructions on the handout to create the Sierpinski Triangle using the graphics tools in *Word*. Finally, have the pupils read the questions at the end of the handout and generate a report about the Sierpinski Triangle.

Evaluation:

Assess students on the quality and accuracy of the Sierpinski Triangle they create, as well as their analyses and conclusions about the fractal.

Extensions:

Have the pupils visit some of the following Web sites to learn about Pascal's Triangle:

www.maa.org/mathland/mathland_2_10.html
The Mathematics Association of America's page on Pascal's Fractals

http://mathforum.org/dr.math/faq/faq.pascal.triangle.html
Math Forum: Ask Dr. Math FAQ: Pascal's Triangle

Technology Enrichment:

Suggest that the students create Sierpinski Triangles of different colors and sizes. Flip and rotate the triangles to make interesting designs and repeating patterns.

Fractal Fun
Student Handout

- ❑ Launch the Web browser and research fractals using the following Web sites:

  www.glyphs.com/art/fractals/what_is.html
  An arts-related site that defines fractals

  http://sprott.physics.wisc.edu/fractals.htm
  A site on fractals created by a professor of Physics at the University of Wisconsin

  http://library.thinkquest.org/11679/
  A 1997 ThinkQuest project on fractal tutorials

- ❑ After learning about fractals, answer the following questions:

  What does the term *fractal* mean?

  What do fractals have to do with mathematics?

  Locate a picture of a fractal on the World Wide Web that looks like an object in nature. Once found, right-click the image and save it as a file. What object in nature does the fractal look like?

- ❑ To make the fractal known as the Sierpinski Triangle, launch *Microsoft Word 2007* and create a new document.

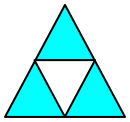
- ❑ On the INSERT TAB, choose the SHAPES button and select the ISOSCELES TRIANGLE option under BASIC SHAPES. Hold down the SHIFT key and create a medium-sized triangle in the middle of the page.

- ❑ On the FORMAT TAB, select the SHAPE FILL drop-down arrow and fill the shape with a light color. Click the COPY and PASTE buttons on the HOME TAB to duplicate the shape. Fill the new triangle with white.

- ❑ Make sure the white triangle is selected, right-click and choose FORMAT AUTOSHAPE. Choose the SIZE TAB and enter *50* in both the Height and Width boxes in the Scale group. Click OK and confirm that the duplicate triangle is half its original size.

- ❑ On the PAGE LAYOUT TAB, select the ROTATE button and choose FLIP VERTICAL. Reposition the flipped triangle so its corners touch the midpoints of each side of the original triangle.

- ❑ With the smaller rectangle still selected, hold down the SHIFT key and select the larger triangle so that both triangles are selected. Choose the GROUP button on the PAGE LAYOUT TAB and select GROUP to group the two selected triangles.



- ❑ Use the COPY and PASTE buttons to duplicate the grouped object. Reposition the two objects so the lower-left corner of one touches the lower-right corner of the other.

- ❑ Choose the PASTE command again to insert another object. Position the newest object so its bottom corners touch the tops of the other two objects. Click on an empty area of the page to deselect all objects.

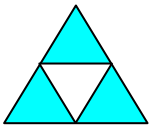
- ❑ Hold down the SHIFT key and select all three objects. Next, choose the GROUP button on the PAGE LAYOUT TAB and select GROUP to group the three triangles. Right-click the large triangle and choose FORMAT AUTOSHAPE. Choose the SIZE TAB and enter *50* in both the Height and Width boxes in the Scale group. Click OK.

- ❑ Use the COPY and PASTE buttons to duplicate the grouped object. Reposition the two objects so the lower-left corner of one touches the lower-right corner of the other.

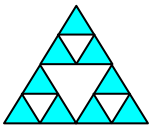
- ❑ Choose the PASTE button again to insert another object. Position the newest object so its bottom corners touch the tops of the other two objects. Deselect the objects.

- ❑ Repeat the last four steps, then answer the following questions:

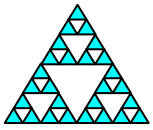
  Of the four triangles below, can you determine the fraction of each shape that is colored?



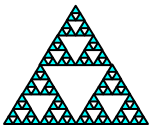
Triangle 1



Triangle 2



Triangle 3



Triangle 4

  Can you determine the pattern? Use the pattern to develop a formula to calculate the portion of Triangle n.

- ❑ Below your Sierpinski Triangle, write a paragraph defining the term fractal, and explain how a pattern was found to determine the fraction of the colored area of the Sierpinski Triangle. Discuss how the complexity of the Sierpinski Triangle affects the fraction of the colored area. On the INSERT TAB, choose PICTURE and insert the fractal graphic saved from the Internet and describe the picture inserted.

- ❑ Save and print the document. Close the file and exit *Word*.

Project 9: Correlation Coefficients
Teacher Guide

Description:

The students will learn about correlation coefficients to determine the strength of relationship between two data sets. They will be introduced to the use of spreadsheets to explore the relationship between sample data sets. Then they will perform correlation analyses on average height and weight data of males and females from birth to 13 years of age and create scatter plots of the data.

Grade Levels: 11-12

PA Academic Standards:

Grade 11:

2.2.11F Computation and Estimation: Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.

2.5.11B Mathematical Problem Solving and Communication: Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results.

2.5.11C Mathematical Problem Solving and Communication: Present mathematical procedures and results clearly, systematically, succinctly and correctly.

2.7.11B Probability and Predictions: Apply probability and statistics to perform an experiment involving a sample and generalize its results to the entire population.

2.8.11A Algebra and Functions: Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.

NCTM Standards (Grades 9-12):

Standard 4: Measurement
Standard 5: Data Analysis, Statistics and Probability
Standard 6: Problem Solving
Standard 7: Reasoning and Proof
Standard 8: Communication
Standard 9: Connections
Standard 10: Representation

NETS Performance Indicators (Grades 9-12):

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

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.

Materials:

Microsoft Excel 2007

HEIGHT AND WEIGHT SPREADSHEET.XLSX

Prerequisite Skills:

The students should be familiar with entering and formatting data in a spreadsheet as well as using functions and formulas. An awareness of basic descriptive statistics would also be helpful.

Suggested Time Allotment: One to two class periods

Process:

Announce that today's lesson will focus on correlation analysis. Explain that a correlation analysis is a valuable tool for researchers as it can determine the strength of relationship between variables. Define the three types of correlation: no relationship, positive correlation and negative correlation. Given the variables x and y, a positive relationship is characterized by variable x and y varying together, meaning when x increases or decreases, y increases or decreases similarly. If a negative correlation existed, an increase in x would produce a decrease in y (or a decrease in x would produce an increase in y). If x and y increase or decrease randomly, then there is no relationship. A correlation coefficient, usually abbreviated as r, is used to indicate the strength of relationship and can vary between –1 and +1. If no relationship exists, the correlation coefficient is 0. Relationships between 0 and –1 are classified as a negative relationship, while those between 0 and +1 are a positive relationship. The closer the correlation coefficient is to –1 or +1, the stronger the relationship. Tell the students that they will learn more about correlation coefficients by using a spreadsheet. Have them use *Correlation Coefficients: Student Handout* and follow the instructions to complete the activity.

Evaluation:

Assess the accuracy of the students' spreadsheets, including the answers to the questions listed on the handout.

Extensions:

Survey the class and create a spreadsheet containing data of each student's height in inches and his or her shoe size. Determine the correlation coefficient and create a scatter plot of the data.

Technology Enrichment

Explain that related to the correlation coefficient is the coefficient of determination which provides the percentage of variance accounted for by the data sets. To calculate this, the correlation coefficient is squared and the percentage of variance can then be determined. Thus, if r is .3, r2 would be 0.09, indicating that nine percent of the variance is accounted for. Calculate the coefficient of determination in the HEIGHT&WEIGHT.XLSX spreadsheet by entering *=D9^2* in a cell and *=D39^2* in another cell.

Correlation Coefficients
Student Handout

- ❑ Launch *Microsoft Excel 2007* and begin a new workbook.
- ❑ Enter the following sample data in the designated cells:

  15 in cell A1, *8* in cell A2, *33* in cell A3, *67* in cell A4, *18* in cell A5,

  35 in cell B1, *20* in cell B2, *160* in cell B3, *75* in cell B4, *35* in cell B5

- ❑ To determine the correlation coefficient of the data in columns A and B, select cell B7 and enter *=CORREL(A1:A5, B1:B5)*.
- ❑ What is the strength of the relationship of the data in columns A and B? Use the table below to determine your answer. Enter your answer in cell B8.

between 0 and -.20	slight negative correlation
between -.20 and -.40	low negative correlation
between -.40 and -.70	moderate negative correlation
between -.70 and -.90	high negative correlation
between -.90 and -1	very high negative correlation

between 0 and .20	slight positive correlation
between .20 and .40	low positive correlation
between .40 and .70	moderate positive correlation
between .70 and .90	high positive correlation
between .90 and 1	very high positive correlation

- ❑ Create a scatter plot of the data. To do so, select cells A1 through B5 and choose SCATTER in the CHARTS GROUP on the INSERT TAB.
- ❑ Choose the first option in the second row as the chart sub-type. On the LAYOUT TAB, select the LEGEND button and choose NONE to turn off the legend.
- ❑ Resize and reposition the chart as desired.
- ❑ Choose cells A1 through A5 and select the COPY button on the HOME TAB. Click the SHEET 2 tab at the bottom of the window to display a blank worksheet.
- ❑ Verify that cell A1 is selected on Sheet 2 and choose the PASTE button to insert the copied data.
- ❑ Enter *10* in cell B1, *20* in cell B2, *0* in cell B3, *-20* in cell B4 and *5* in cell B5.
- ❑ Select cell B7 and enter *=CORREL(A1:A5, B1:B5)*.

- ❑ What is the strength of the relationship of the data in columns A and B? Enter your answer in cell B8.
- ❑ Choose cells A1 through B5 and choose SCATTER in the CHARTS GROUP on the INSERT TAB. Create a scatter plot of the selected data and resize and reposition the chart.
- ❑ Click the SHEET3 tab, confirm that cell A1 is selected and choose the PASTE button to insert the previously copied data.
- ❑ Enter *55* in cell B1, *15* in cell B2, *-55* in cell B3, *40* in cell B4, and *20* in cell B5. Select cell B7 and determine the correlation coefficient of the data in columns A and B.
- ❑ What is the strength of the relationship of the data in columns A and B? Enter your answer in cell B8.
- ❑ Create a scatter plot of the data. Save and print the file. In the Print Dialog box, be certain to choose the ENTIRE WORKBOOK radio button in the Print What group.
- ❑ Close the file and open the HEIGHT AND WEIGHT SPREADSHEET.XLSX file.
- ❑ View the spreadsheet and confirm that the spreadsheet contains height and weight averages for male and female children from birth to 13 years of age.
- ❑ Select cell D9 and enter *=CORREL(B2:B18, C2:C18)* to perform a correlation analysis on height and weight averages for females. Next, describe this relationship in cell D10.
- ❑ Choose cells B2 through C18 and create a scatter plot of the data. Resize and reposition the chart in the top-half of the spreadsheet.
- ❑ Select cell D39 and determine the correlation between the height and weight averages for males. Describe the relationship in cell D40.
- ❑ Choose cells B22 through C38 and create a scatter plot of the data. Resize and reposition the chart in the bottom half of the spreadsheet.
- ❑ Save and print the file. Close the file and exit *Excel*.

Project 10: Find the Formula
Teacher Guide

Description:

Using a spreadsheet, the students will work in pairs and take turns to determine each other's hidden mathematical formula.

Grade Levels: 7-9

PA Academic Standards:

Grade 8:

2.1.8A Numbers, Number Systems and Number Relationships: Represent and use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, exponents, scientific notation, square roots).

2.2.8A Computation and Estimation: Complete calculations by applying the order of operations.

2.2.8B Computation and Estimation: Add, subtract, multiply and divide different kinds and forms of rational numbers including integers, decimal fractions, percents and proper and improper fractions.

2.8.8J Algebra and Functions: Show that an equality relationship between two quantities remains the same as long as the same change is made to both quantities; explain how a change in one quantity determines another quantity in a functional relationship.

Grade 11:

2.1.11A Numbers, Number Systems and Number Relationships: Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

2.2.11A Computation and Estimation: Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.

2.2.11F Computation and Estimation: Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.

NCTM Standards (Grades 6-8 and 9-12):

Standard 1: Number and Operation
Standard 2: Patterns, Functions and Algebra
Standard 5: Data Analysis, Statistics and Probability
Standard 6: Problem Solving
Standard 7: Reasoning and Proof

Standard 8: Communication

NETS Performance Indicators (Grades 6-8):

5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration and learning throughout the curriculum.
6. Design, develop, publish and present products (e.g., Web pages, videotapes) using technology to demonstrate and communicate curriculum concepts.
8. Select and use appropriate tools and technology to accomplish a variety of tasks and solve problems.

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.
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.

Materials:

Microsoft Excel 2007

Prerequisite Skills:

The students should have experience editing data in a spreadsheet and entering formulas. They should also have experience solving simple algebraic problems.

Suggested Time Allotment: One class period

Process:

Announce to the students that they will participate in an activity in which they must determine hidden formulas. Write three headings on the board: *In*, *Out*, and *Formula*. Write *5* below *In* and *20* below *Out*. Ask the class to propose a mathematical formula that would transform 5 into 20. Likely suggestions are 5 x 4 and 5 + 15. Then tell the students to determine a formula for the same two numbers that contains two different mathematical operations. Recommendations could include 5 - 5 + 20, 5 x 2 + 10, and 5 x 6 – 10. Explain that the students will now work in pairs and use a spreadsheet to take turns trying to guess each other's formula containing two different mathematical operations. Have the students

form pairs and direct them to follow the instructions listed on *Find the Formula: Student Handout* for the remainder of the activity.

Evaluation:

Students can be evaluated on how many formulas each partner guesses correctly.

Extensions:

If the student attempting to guess the formula needs a hint, suggest that the other student name one of the mathematical operations used in the formula and, if needed, identify the second one as well. To make the activity more challenging, recommend that the students use at least three-digit numbers in the *In* column.

Technology Enrichment:

Once a formula is correctly guessed, suggest that the students select the cell containing the entered formula and use the fill color button to apply shading to indicate that it is correct. For the following round, begin in a blank row below the existing one. Each student should choose a different color to indicate that he or she guessed the formula correctly.

Find the Formula
Student Handout

- ❑ Launch *Microsoft Excel 2007* and begin a new workbook.
- ❑ Enter *In* in cell A1, *Out* in cell B1 and *Formula* in cell C1.
- ❑ One partner should cover his or her eyes while the other partner follows these steps:

    1. Enter a number in cell A2.
    2. Select cell B2 and enter a formula containing the cell reference A2 and two mathematical operations. Remember that a formula must begin with an equal sign. Examples of possible formulas are: *=A2*3-6* or *=(A2+10)/2*. **Note:** If there is an error in the formula, a Microsoft Office Excel window will open and suggest a correction.
    3. Choose cells B2 through B6 and select and choose the FILL BUTTON from the EDITING GROUP on the HOME TAB and click DOWN.
    4. Click cell B6 and select the CLEAR button and choose CLEAR CONTENTS.
    5. Enter different numbers in cells A2 through A5. Verify that values are shown in cells B2 through B5 as a result of the formula.
    6. To hide the formula bar, choose the VIEW TAB and click the FORMULA BAR check box in the SHOW/HIDE GROUP to deselect the option.

- ❑ The partner whose eyes were closed should now attempt to determine the formula. Enter possible formulas in column C. The partner can also enter a number in cell A6 to view the result of the formula in cell B6. The number in cell A6 can be changed as often as desired until the formula is determined.
- ❑ After the partner makes a final guess (or 3 minutes has elapsed), select cell B2, choose the VIEW TAB and click the FORMULA BAR check box in the SHOW/HIDE GROUP to determine if the formula was guessed correctly.
- ❑ After choosing cells A2 through B6 and selecting the CLEAR button and choosing CLEAR CONTENTS, the partners should switch roles and repeat steps 1 through 6 above.
- ❑ After time for the activity has expired, close the file without saving and exit *Excel*.

Project Analysis Form

Use this form to analyze the sample projects and take notes as they are being tested.

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 mathematics technology lesson is similar to planning a traditional mathematics lesson. Common steps include the identification of the purpose of the lesson, the development of the appropriate approach and the 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 teachers to create technology projects easily and efficiently. Two key aids are the Steps to Create a Math PowerPoint Presentation on pages 63-66 which demonstrates the thinking and development of a hypothetical project that presents a slideshow about the background and thinking of famous mathematicians, and the Process Planning Questions found on pages 67-68.

The International Society for Technology in Education (ISTE) has developed performance indicators known as the National Educational Technology Standards (NETS). When planning a technology project, use these standards to assess the level of technology performance in each lesson. The standards may be found on pages 69-70.

A Sample Rubric for Student Performance Review is included on pages 72-73.

The process provided is meant to point teachers in the right direction of successful project development. Feel free to adapt it as needed.

Project Creation Process Guide

Step-by-Step Guide	*Model Project*
Choose a central idea or focus for the project.	Develop a multimedia presentation about a famous mathematician.
Determine the goals of the project. What will the student learn? How will this knowledge address the overall goals of the unit or curriculum?	Students will research a specific individual using multiple sources. They will make connections between the mathematician and events and people of the same time period, and investigate mathematical theories and developments and recognize historical changes in mathematical methods and concepts
Identify what mathematics learning objectives and standards the students will achieve through the project.	***NCTM Standards*** 6. Problem Solving 7. Reasoning and Proof 8. Communication 9. Connections 10. Representation
Consider how these objectives have been achieved in previous years without the use of technology.	In previous years the students have participated in class discussions, completed problem sets, researched 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 first to decide the objectives of the lesson and then brainstorm how each software application could be used 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. Considering all the available software applications, and the achievement of lesson objectives through the different structures inherent to them, will aid in the creation of interesting and unusual projects.

Another way to decide which software applications to use is to consider which applications the students need to learn or practice and to 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 ***Access*** to build a database of biographical information about the chosen mathematician. Data might include important dates, contributions to mathematics, contemporaries and historical events. The database could be augmented with other students' selected mathematicians, resulting in a comprehensive tool for comparing the development of important theories.	Use ***PowerPoint*** to make presentations about the mathematician's life and work. Perform Internet research to find images or biographical information.
Use ***Excel*** to track the mathematician's theory through several problem sets, then graph the results for a visual representation of the theory. If possible, compare with the method used before the theory was invented and accepted.	Use ***Publisher*** to design a booklet featuring the mathematician. It could include illustrations of the person, an outline of the theory and biographical information about the mathematician, as well as information about that period in time.
Use ***SharePoint Designer*** to build a Web site that includes illustrations of the mathematician, information about his life and work and links to Internet sites about the mathematician or work.	Use ***Word*** to create a presentation of the mathematician's theory, include a short biography, developments in mathematics before and after the mathematician's work and discussion of opposition to the theory.

Steps to Create a Math PowerPoint Presentation on Famous Mathematicians

Determine if Internet research can be incorporated into the project.	Internet resources relevant to this project include illustrations, biographical and critical information about the famous mathematician, research on the work itself and relevant information from contemporary history. Using the Internet will provide students with a variety of resources to increase their knowledge, enliven their projects and stimulate their creativity.
Decide whether an electronic template is required. This decision will likely be based on the software application chosen and the structure of the project. Make a template if required.	Example: A *PowerPoint* presentation about a famous mathematician might incorporate an electronic template to aid students in the creation process. This would be especially appropriate for students who are less experienced in the use of *PowerPoint.*
Outline a logical progression of steps to create the project for distribution to the students.	**Sample Steps for the Student Handout** 1. Define the parameters of the presentation, i.e. the minimum number of required pages and the amount of class time that will be dedicated to making and presenting the project. 2. Identify the main highlights and objectives of the lesson. 3. Sketch, outline or map the structure of the project. Decide what each page will contain. Use animation, sound, video, graphics, links and text as elements of the presentation. 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 5. Outline and store the text elements in the digital file.

Outline a logical progression of steps to create the project, continued.	**Sample Steps for the Student Handout, continued** 6. Search for resources on the Internet. Make necessary copies for the digital file, carefully noting their sources. 7. Gather other needed resources such as video clips, hard copies and clip art. File resources in the digital and physical files as needed. 8. Create the presentation using the resources gathered. Find or write additional material as needed to complete the project. 9. Test the presentation to ensure that all inserted media, links and other details work as anticipated. Make needed adjustments and/or corrections. 10. Give presentation.
Create the project using your plan and keeping detailed notes on each step. These notes will form the foundation for the student handout.	Using the Project Creation Guidelines, construct the *PowerPoint* presentation. Keep careful notes detailing the steps in the process.
Decide on a time frame for student completion of the project.	Two classes and two homework assignments will be dedicated to this presentation.
Finalize the student handout. Take care to ensure that the directions are sequential and easily understood.	Proof, test and revise the Student Handout as needed.
Consider what background information and activities should be presented in class before students embark on the project.	Examine such topics as famous mathematicians, mathematics in ancient societies, the development of mathematical theory in other countries, etc., by assigning reading and leading class discussions.
Develop an assessment rubric/instrument to evaluate student performance on the project. (Refer to the sample on page 64)	Refer to the ISTE performance indicators that support the project's technology objectives, the provided project evaluation rubric (page 64) and other appropriate criteria to develop an evaluation instrument to assess the project.

Check performance indicators to ensure that the desired skills are met.	***ISTE Performance Indicators (Grades 6-8)*** 5. Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration and learning throughout the curriculum. 6. Design, develop, publish and present product (e.g., web pages, videotapes) using technology to demonstrate and communicate curriculum concepts. 7. Collaborate with peers, experts and others using telecommunication and collaborative tools to investigate curriculum-related problems, issues and information and to develop solutions. 8. Select and use appropriate tools and technology to problem solve and accomplish a variety of tasks. ***ISTE Performance Indicators (Grades 9-12)*** 7. Routinely and efficiently use online resources to meet collaboration, research, publications, communications and productivity needs.
Check performance indicators to ensure that the desired skills are met.	8. Select and apply technology for research, information analysis, problem solving and decision making in content learning. 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.
Analyze whether additional technology applications will enhance the effectiveness of the project.	Students can use a projector for their presentations to the class, addressing NCTM Standard 4:

Additional technology applications, continued.	*Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.* They also will be expected to turn in a hard copy of their resources in correct bibliographic form, prepared in *Microsoft Word*.
Present at least one technology enhancement of the project to foster further learning.	Have students keep a "timesheet" in *Excel* 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." Lead a discussion to examine time spent and results achieved to explore methods students can use to improve their next projects.
Consider ways to extend the project by using related ideas for discussion or development.	Have students create their own *PowerPoint* projects with templates, a teacher guide and a student handout for another math-related topic they will study. Students can exchange, develop, present and critique each other's projects.
Review and evaluate the effectiveness of the proposed project. Consider the questions listed on the right.	❑ Will the students be able to follow the handout successfully without the use of a template? ❑ 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? ❑ Does the project allow for sufficient student creativity? Will it engage student interest? ❑ Other comments?

Mathematics 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 mathematics learning objectives will the students 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.

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 completion of Grade 8, students:

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:

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 completion of Grade 12, students:

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 managing and 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 floppy disk(s). In most Microsoft programs, such files can be saved as templates with extensions that describe them. To save the file as a template, choose the MICROSOFT OFFICE button and select SAVE AS. In *Publisher* and *SharePoint Designer*, choose FILE → SAVE AS. 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:

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

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. Students will 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 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: _____

Performance Criteria	1 Unsatisfactory	2 Needs Practice	3 Satisfactory	4 Mastered	5 Superior
Mathematics Skills ▪ Strengthens targeted skills ▪ Achieves stated lesson objectives ▪ Understands how specific lesson fits into the larger whole					
Computer Skills ▪ Effectively navigates ribbons and menus, and executes commands ▪ Understands software application functions ▪ Selects appropriate software to complete a given task ▪ Demonstrates facility with hardware					
Participation and Teamwork ▪ Actively participates in class discussions ▪ Works cooperatively with classmates ▪ Collaborates with partner					
Project Completion ▪ Follows activity directions ▪ Completes all steps in an activity ▪ Fulfills project requirements					

Comments: _____

_____

_____

_____

_____

Project Self-evaluation Rubric

Name:_____

Date: _____ Project Title: _____

Evaluation Criteria	1 Unsatisfactory	2 Needs Work	3 Satisfactory	4 Strong	5 Superior
Goals and Objectives ▪ Purpose clearly articulated ▪ Learning objectives achievable through project ▪ Relevance of project to mathematics content					
Software ▪ Appropriate software applications utilized ▪ Software capabilities enhance project					
Content Enhancement ▪ Critical thinking skills emphasized ▪ Creative and original approach to content or skills established ▪ Active interaction with content necessary					
Student Involvement ▪ Strong encouragement of originality and creativity ▪ Engagement of student interest and enthusiasm ▪ Potential for further exploration					
Integration of Technology ▪ Technology essential to achieve learning objectives ▪ New perspectives resulting from technology use ▪ Strengthening of student technology skills					

Comments:_____

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 use 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 also 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 MetaCrawler search engine. If any of the listed keywords are clicked, the search results for those keywords will be displayed.

Note: Because 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 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 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^3) is available at the ISTE site:

http://www.iste.org/

National Council of Teachers of Mathematics

The National Council of Teachers of Mathematics (NCTM) is devoted to improving the teaching of mathematics at all levels of education. Since 1920, the NCTM 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 Mathematics:

http://www.nctm.org/

National Council for Accreditation of Teacher Education

The National Council for Accreditation of Teacher Education (NCATE) is the profession's forum 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:

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

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

Mathematics Lesson Plans on the Web

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

An array of mathematics lesson plans
http://712educators.about.com/od/mathematics/Mathematics.htm

Approximately 3,500 lesson plans and worksheets for all grade levels
http://lessonplanz.com/Lesson_Plans/Mathematics/

Created by the director of Rice University's Center for Equity and Excellence
http://math.rice.edu/~lanius/Lessons/

Mathematics lesson plans in more than 130 categories
http://www.awesomelibrary.org/Library/Materials_Search/Lesson_Plans/Math.html

Teacher-generated lesson plans presented by the Columbia Education Center
http://www.col-ed.org/cur/#Math

Presents a good cross-section of mathematics lesson plans
http://www.lessonplanspage.com/Math.htm

A limited but interesting high school math site from Columbia Teachers College
http://www.columbia.edu/~umk1/

Lesson plans geared to primary grades
http://www.kn.pacbell.com/wired/bluewebn/

Technology Integration Activities

The following Web sites provide useful resources and information for general technology integration in the classroom:

Internet classroom projects from The Kentucky Educational Network Internet
http://www.ket.org/Education/IN/projects.html

University of Virginia School of Education site on integrating technology and teaching
http://www.teacherlink.org/

Educational Development Center site on teaching and technology
http://main.edc.org/newsroom/closer-look/edtech.asp

Commercial site with a range of school technology news from Eschoolnews.org
http://www.eschoolnews.org/

Further reading and links from the University of Alberta in Canada
http://www.quasar.ualberta.ca/edpy485/edtech/

Interesting group of Web sites by UNESCO Regional Office for Asia and the Pacific
http://www.unescobkk.org/index.php?id=171

Professional Development Sites on the Web

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

Site by Jamie McKenzie, author of "How Teachers Learn Technology Best"
http://staffdevelop.org/

A professional development site from Apple Computers
http://www.apple.com/education/professionaldevelopment/

National Staff Development Council Web site
http://www.nsdc.org/

Because We Care Education Society in Canada on professional growth and mentorship
http://www.2learn.ca/profgrowth/index.html

The Clearinghouse on Reading, English and Communications at Indiana University
http://reading.indiana.edu

Teachers Helping Teachers Web site has a variety of useful resources
http://www.pacificnet.net/~mandel/index.html

Teachnet.org is another helpful teacher-centered resource site
http://www.teachnet.com/

National School Boards Association page focused on technology-related information
http://www.nsba.org/sbot/toolkit/tne.html

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's Net
http://www.teachers.net/forum/

Teacher Talk Forums
http://www.iub.edu/~cafs/ttforum/ttforum.html

Teacherfocus Forums
www.teacherfocus.com/

ListServs

ListServs 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.

About.com: a source of newsletters about various educational issues and trends
http://home.about.com/education/index.htm?PM=59_0204_T

CataList: 56,236 public lists out of 447,595 LISTSERV lists
http://www.lsoft.com/lists/listref.html

Community Learning Network WWW home page. CLN is designed to help K-12 teachers integrate technology into their classrooms
http://www.cln.org/lists/home.html

Operating Systems: Hardware Basics

Hardware: Physical components that comprise a computer system.

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

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.

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.

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.

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.

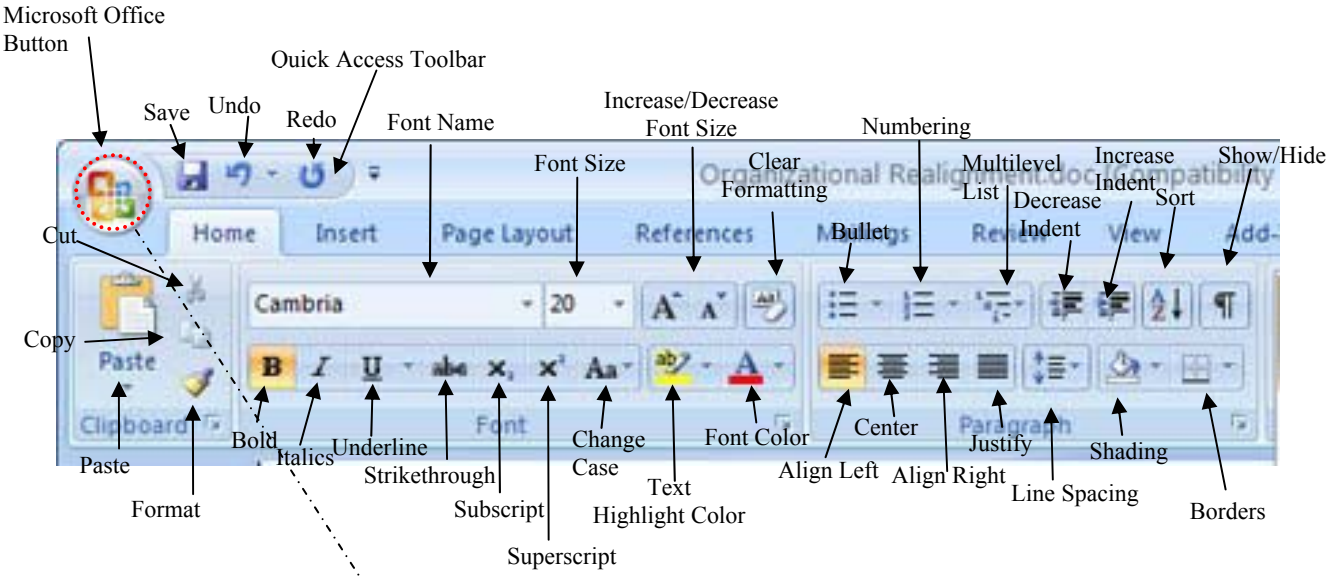
A **footnote** is a note of reference or a comment that appears at the bottom of a page. An **endnote** is a note of reference or a comment that appears at the end of the document. To let readers know that a footnote or an endnote exists for a particular section of body text, superscript numbers (or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

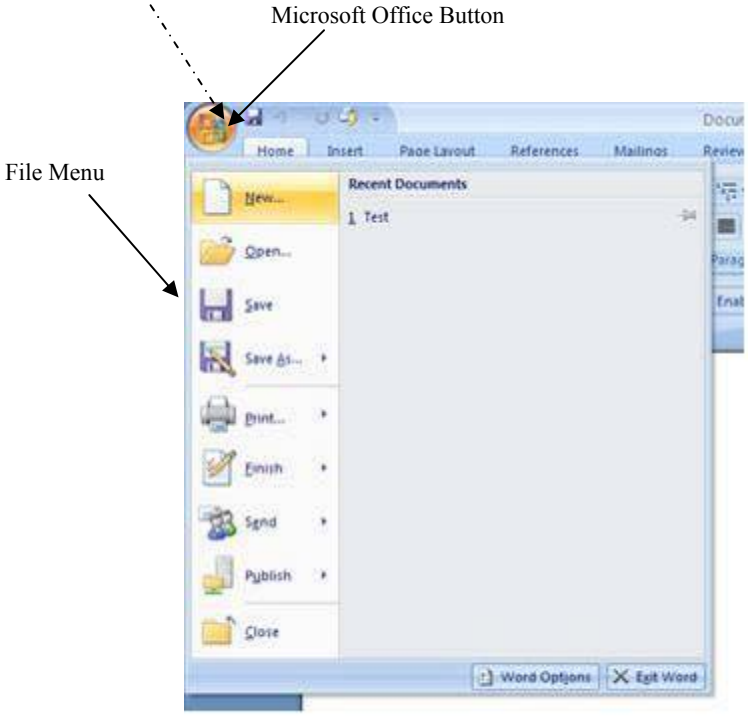
Clip art is a collection of previously created graphics that can be added to documents.

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. 150%
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.

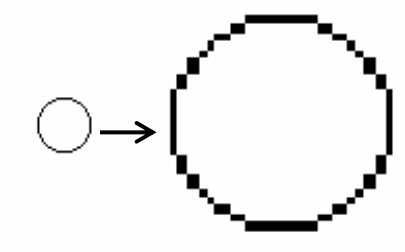
Drawing Programs:

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.

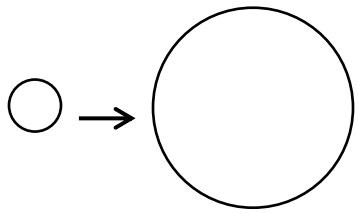
1. Images are known as object-oriented graphics (or vector graphics).
2. The directional lines (vectors) that constitute a graphic are stored as mathematical formulas.
3. Graphics are treated as separate objects.

Graphics Basics [continued]

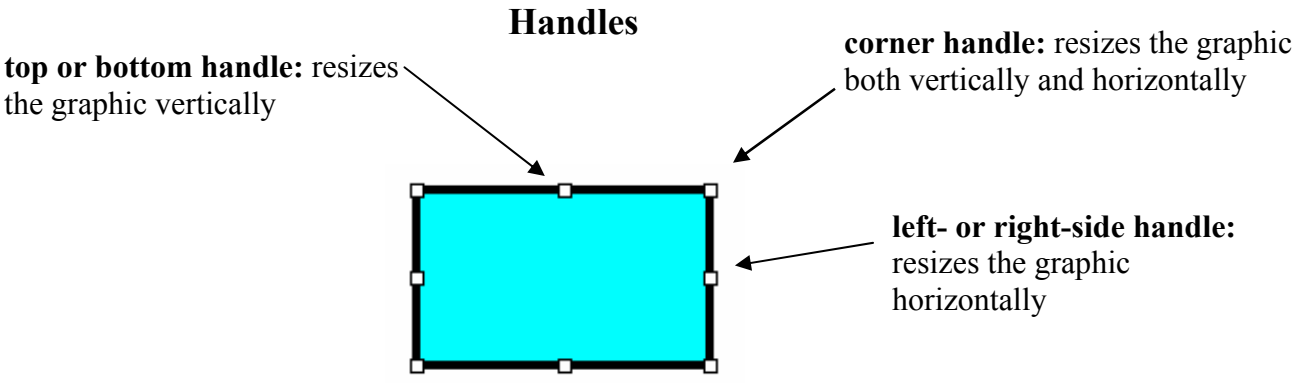
1. Graphics can be grouped and manipulated as one object or ungrouped and manipulated as separate objects.
2. Graphics are created in separate layers that can be reordered.
3. Graphics can be easily modified at any time.
4. Lines and shapes of various thickness and color can be created.
5. Objects can 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

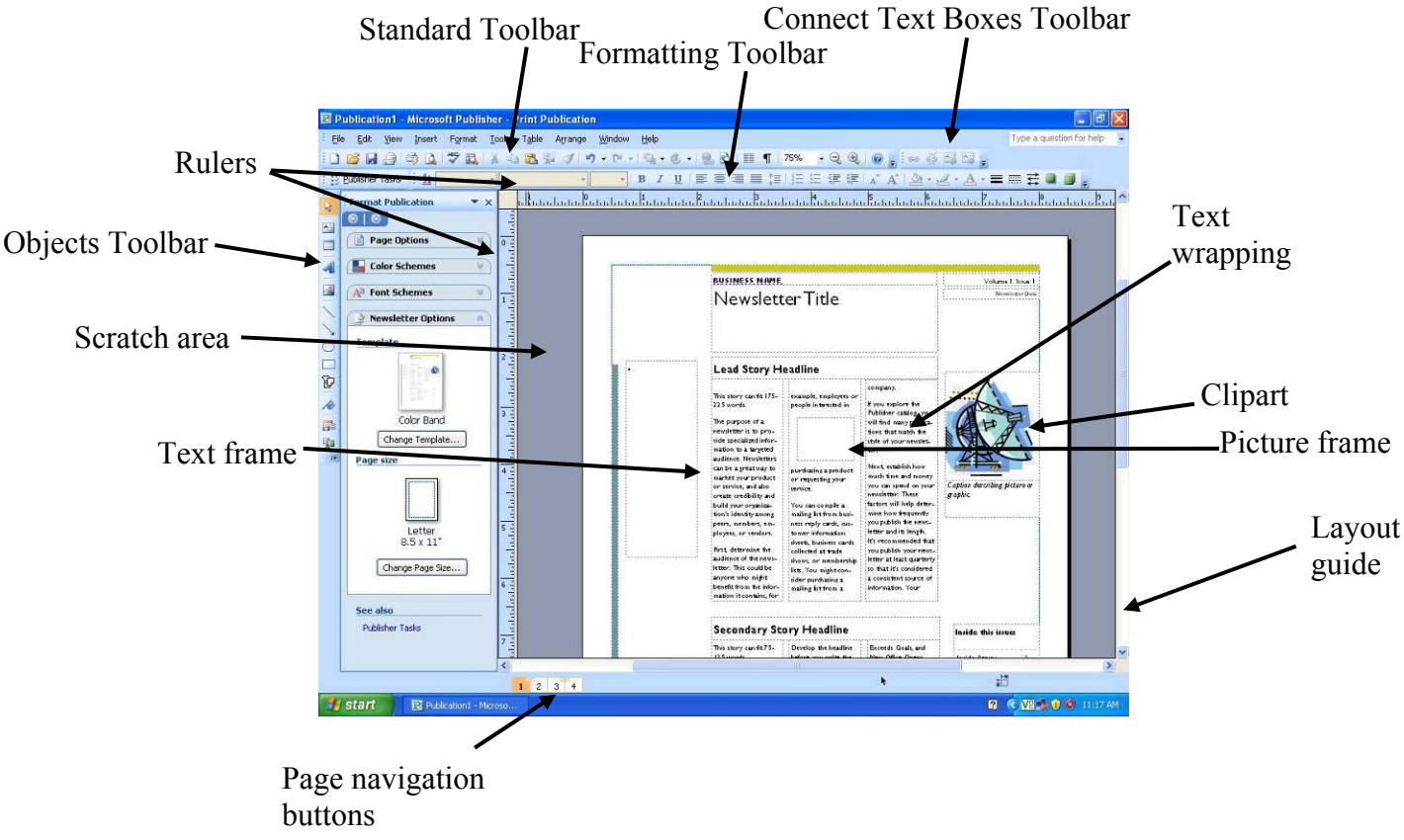
Clip Art is previously created digital artwork intended to be integrated into documents. A collection of clip art is known as a clip art library. To make it easier for users to browse and locate specific images, graphics in clip art libraries are often grouped in such categories as animals, food, household, 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

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

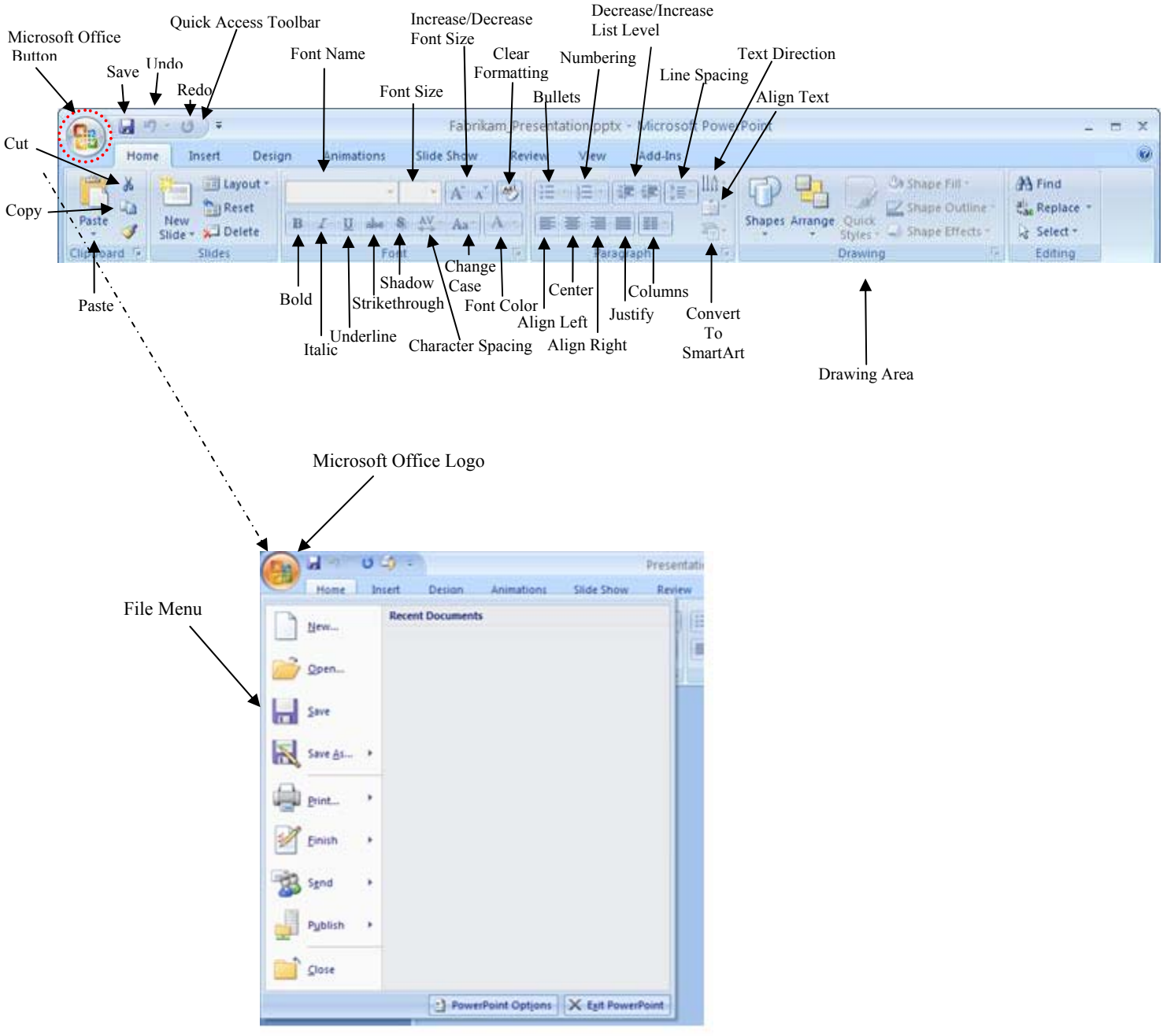
stereo: sound that is recorded and played back on two or more channels

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

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

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.

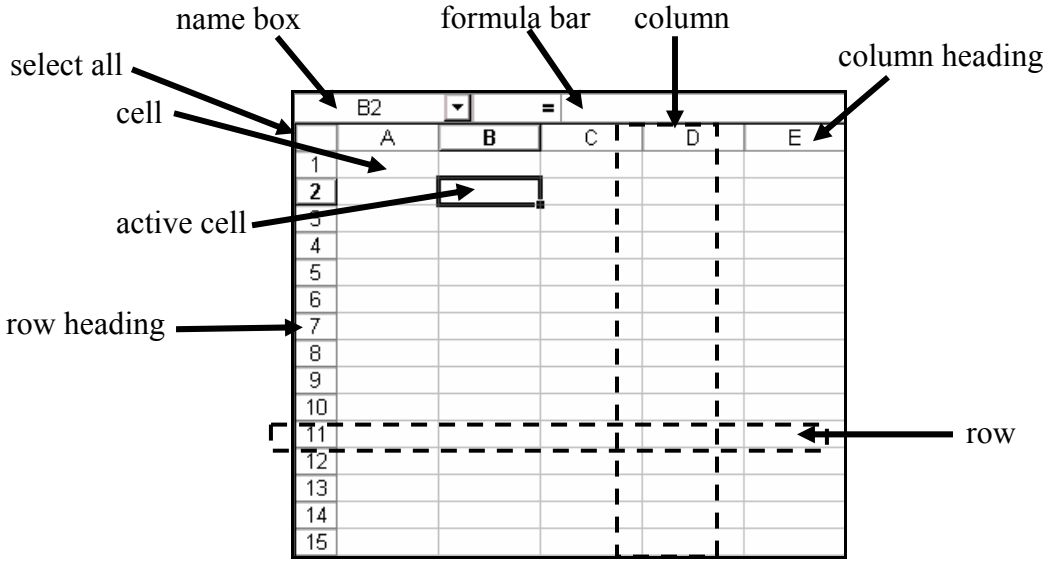
To print a presentation:

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

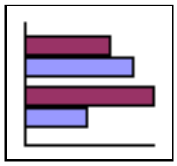
legend: the part of a chart in which the colors or patterns used in the chart are displayed with the items they represent

series: the basic unit of information in a chart, often contained in a single row or column.

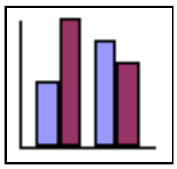
values: numeric entries within a spreadsheet

X series: the labels and data charted along the X axis, or horizontal axis

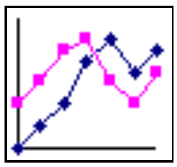
Y series: the labels and data charted along the Y axis, or vertical axis



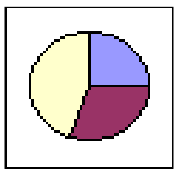
Bar chart: compares data or values horizontally without reference to trends over time



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

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 Σ 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 Σ 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

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.

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.

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.

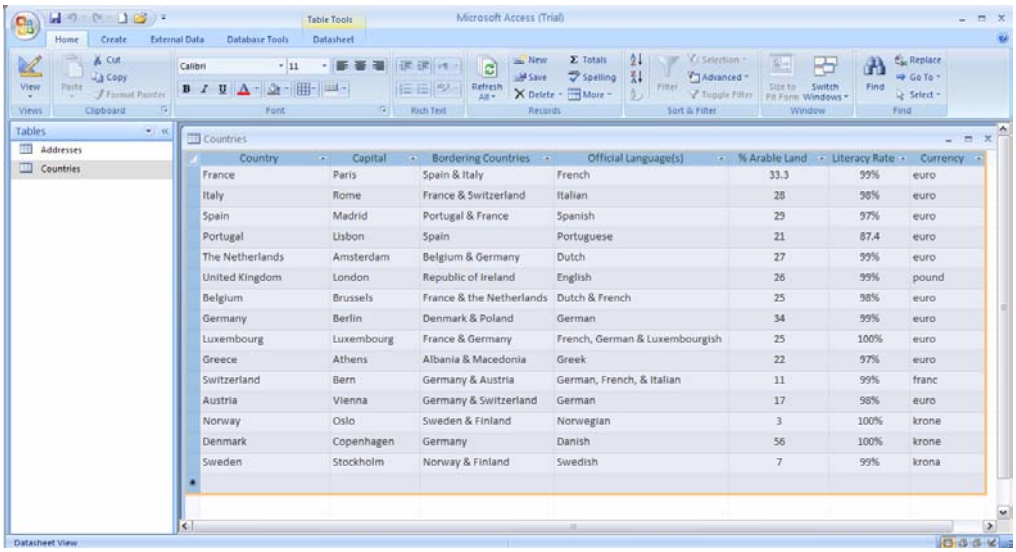
A **filter** is a set of criteria applied to records to show a subset of the records. Mathematical operations can be applied to build the criteria, including greater than (>), less than (<), greater than or equal to (>=), less than or equal to (<=) and not equal to (<>). *And, or* and *not* are **Boolean 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.

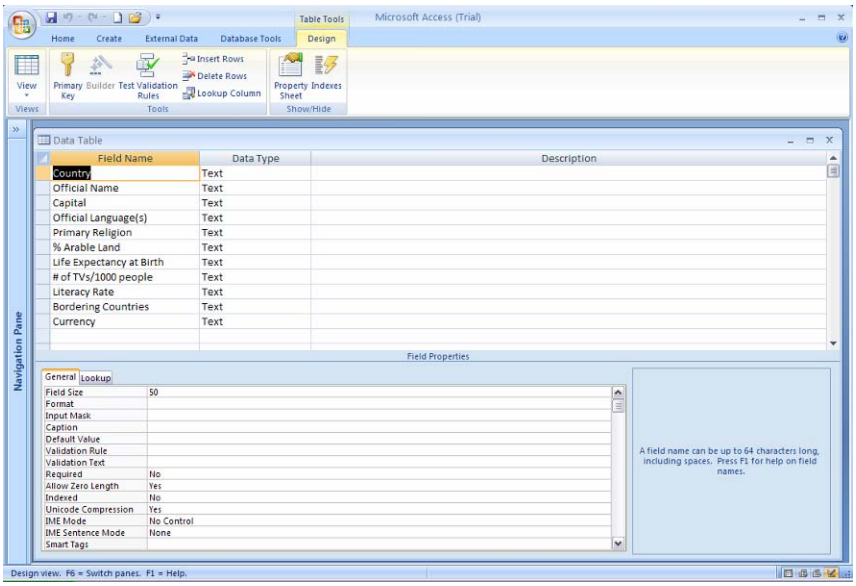
Mail merge allows information in a database to be inserted into a word processing document to create individualized letters, envelopes and labels. The most common way that mail merge is used is to personalize form letters.

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

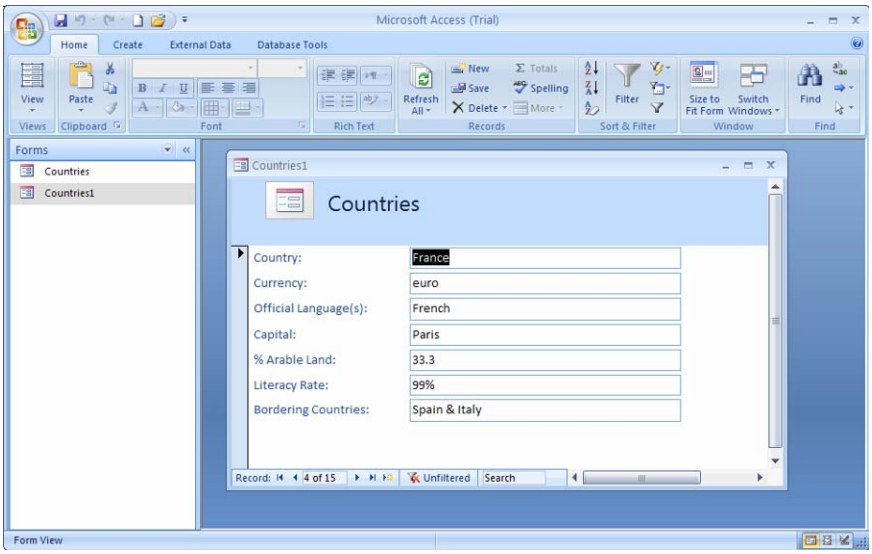


A table in Datasheet View can be used to add, edit or view the data in a table. Also in this view, it is possible to print the table, to sort or filter the records, to modify the appearance of the data and to insert or delete columns (fields) and rows (records).

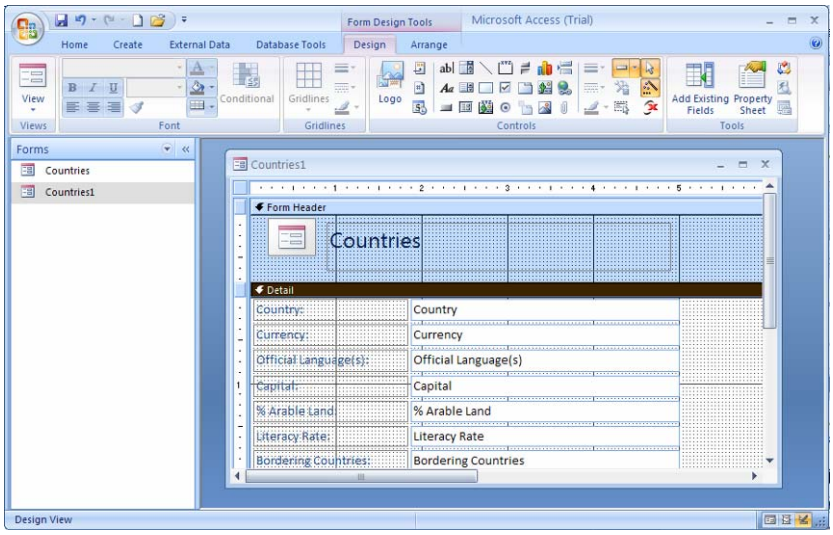


In Design View, an existing table's fields can be added, deleted or customized. Also, a new table can be created from scratch.

Using Microsoft Access 2007 [continued]

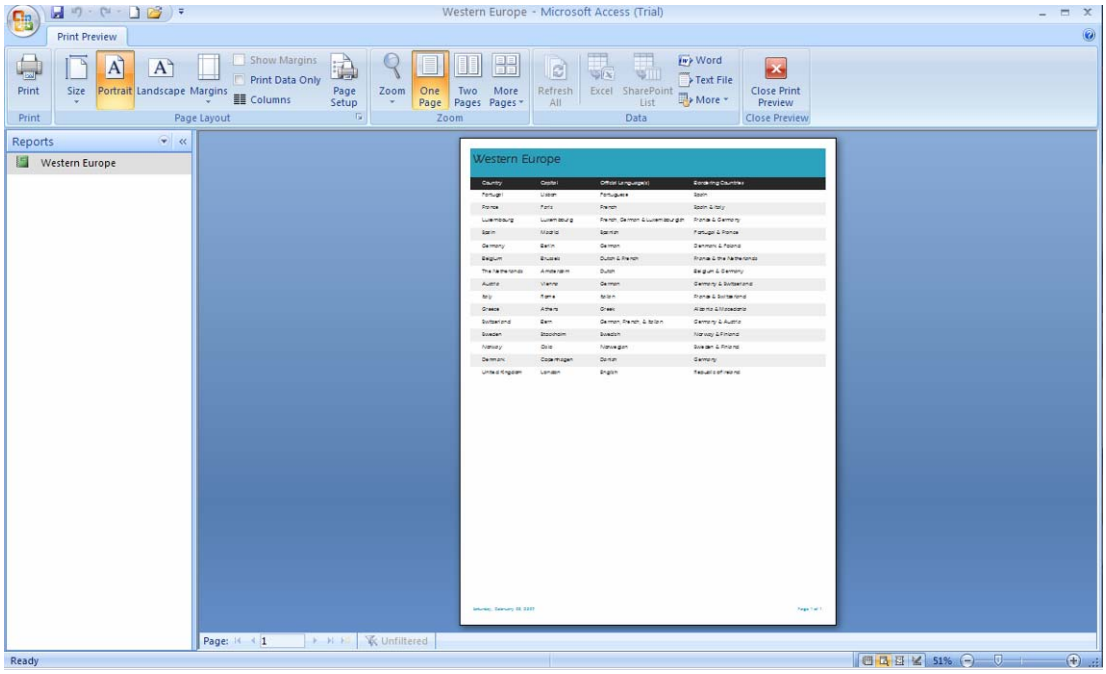


A form in Form View displays one record at a time, and this view is often used to enter and edit information within a database. In Form View it is also possible to sort and filter records.

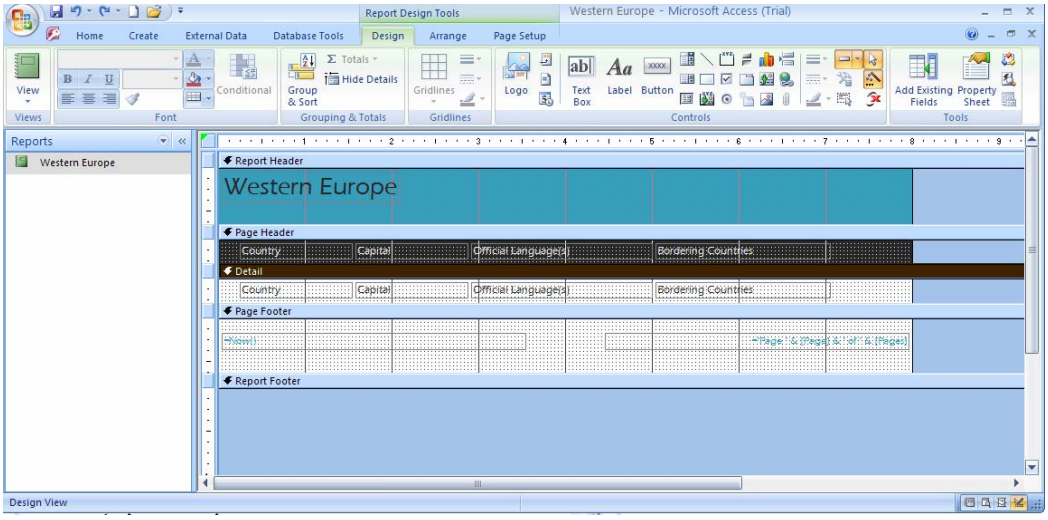


The appearance of a form can be modified in Design View. The label text can be edited and formatted. Fields can be added, moved and resized. Text color, background colors and graphics can be added, and header and footer text can be inserted.

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

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.

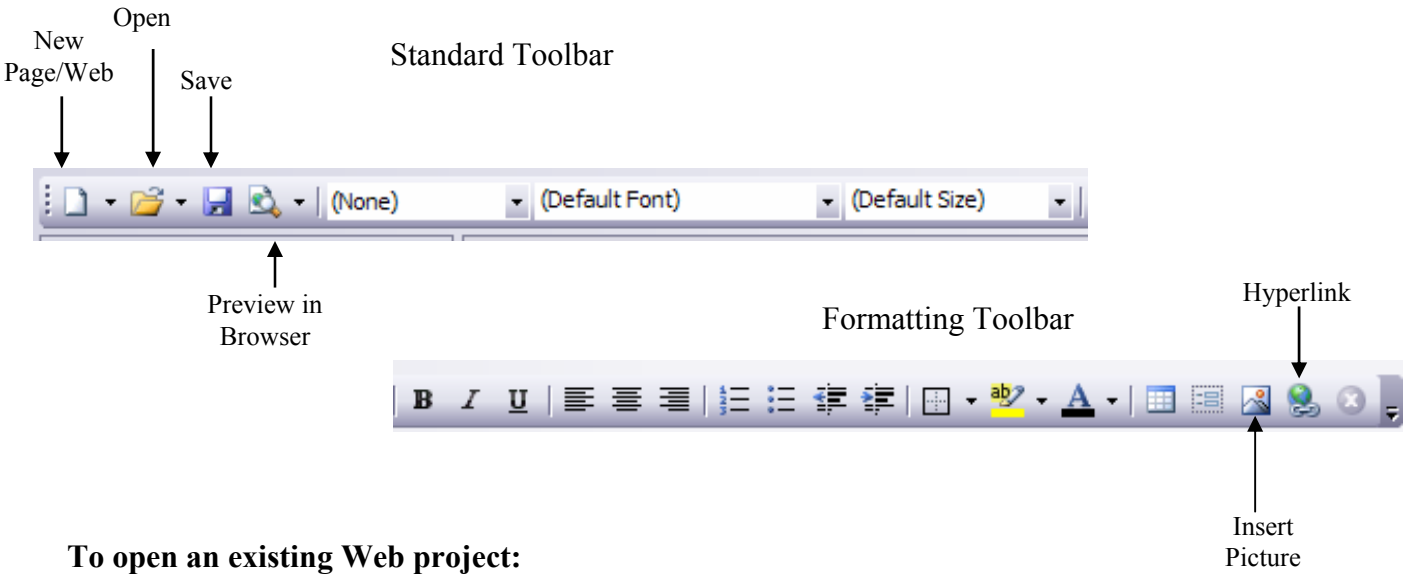
To add merge fields to the mail merge document:

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

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

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

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

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

