

MATH/SCIENCE
EDITION

2

Microsoft[®]

productivity in the classroom

A curriculum-based workbook to integrate computer applications into the math and science classroom

Microsoft Office 97 • Word 97 • PowerPoint 97 • Microsoft Excel 97 • Access 97



Microsoft Office 97 • Word 97 • PowerPoint 97 • Microsoft Excel 97 • Access 97

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 SCHOLASTIC

<http://www.microsoft.com/education/kt2/ctsource/lessons.htm>

From the Editor of *Instructor/Electronic Learning in Your Classroom*

Dear Technology Leader:

What you're holding in your hands is a tool for bringing together three of your school's most pressing instructional priorities – math, science, and technology – in a way teachers are sure to love: well-crafted, classroom tested lesson plans.

The eight lesson plans in this workbook use today's most popular desktop applications, such as *Microsoft Office 97* (with *Microsoft Word 97*, *Microsoft Excel 97*, *Microsoft PowerPoint 97* and *Microsoft Access 97*), *Microsoft Internet Explorer 4.0*, *Microsoft Publisher 97*, and *Microsoft Encarta 98 Deluxe Encyclopedia*. These lessons include step-by-step instructions for using this software, which will add to the guidance teachers and students already get from the intuitive new Office Assistant and other Help functions Microsoft is known for.

Developed by the editors of *Instructor* and *Electronic Learning in Your Classroom* in partnership with Microsoft, this workbook is meant to be used as a resource for staff development and as a working idea bank for classroom teachers.

We hope that you and the teachers you work with find lots to be excited about within the covers of this book, and that it sparks a wave of technology-based lesson planning in your classrooms.

Sincerely,



Mickey Reveaugh

Editor, *Instructor/Electronic Learning in Your Classroom*

P. S. More teacher activity guides for Microsoft products are available online at:

www.microsoft.com/education/k12/resource/lessons.htm

Acknowledgements

Microsoft would like to thank all of the educators from the United States and Australia who provided tested lesson plans for this book.

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productivity in the classroom

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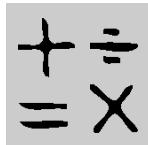


productivity in the classroom

Lessons at-a-Glance

LESSON	GRADE LEVELS	TIME ALLOTTED
IT'S IN THE (CHOCOLATE) CHIPS	Intermediate/Middle School	Two class periods
ENDANGERED SPECIES	Intermediate/Middle School	One week
THREE SQUIRRELS AND A PILE OF NUTS	Middle School	One or two class periods
SPACE CASE	Middle School	Three to four class periods
CODE CRACKERS MATH GAME	Middle School	One class period
TRAITS R US!	High School	Three to five class periods
SOLVING POLYNOMIAL EQUATIONS	High School	Two class periods
CAMPAIGN HOT BUTTONS	High School	Three to six class periods

Curriculum Connection Icon Key



Math

















Science



Language Arts



Social Studies

SOFTWARE NEEDED	PAGE	CURRICULUM CONNECTION
Microsoft Excel 97 Microsoft Word 97 Microsoft PowerPoint 97	6	 
Microsoft Encarta 98 Encyclopedia Deluxe Microsoft Encarta Virtual Globe, 1998 Edition Microsoft Internet Explorer 4.0 Microsoft Word 97 Microsoft PowerPoint 97	9	 
Microsoft Excel 97 Microsoft Word 97 or Microsoft Publisher 97	12	
Microsoft Encarta 98 Encyclopedia Deluxe Microsoft Publisher 97 Microsoft PowerPoint 97	16	 
Microsoft Excel 97	19	
Microsoft Access 97	21	 
Microsoft Excel 97	24	
Microsoft Excel 97 Microsoft Word 97 Microsoft PowerPoint 97	27	  



INTERMEDIATE/ MIDDLE SCHOOL

REQUIRED SOFTWARE

- ◆ MICROSOFT® EXCEL 97
- ◆ MICROSOFT® WORD 97
- ◆ MICROSOFT® POWERPOINT® 97

IT'S IN THE (CHOCOLATE) CHIPS

Teacher Guide

SUMMARY

Students will investigate which brand of chocolate chip cookies contains the most chocolate; they analyze and compare data using *Microsoft Word* and *Microsoft Excel*, and then use *Microsoft PowerPoint* to communicate their findings.

OBJECTIVES

- ◆ To provide students with hands-on practice in the scientific process: establishing hypotheses, investigating, recording data, comparing, and writing conclusions
- ◆ To help students make the connection between the study of math and science and their real-life concerns (such as making consumer choices)
- ◆ To build students' communications skills

PREREQUISITE SKILLS

- ◆ Understanding of the concept of mass and the use of metric weights
- ◆ Basic familiarity with *Microsoft Office* tools, including *Word*, *Excel* and *PowerPoint*

HANDS-ON MATERIALS NEEDED

- ◆ Chocolate chip cookies from two different brands, five cookies per team
- ◆ Paper towels
- ◆ Food scale or other scale to weigh in grams

TIME ALLOTTED

Two class periods

HOW TO BEGIN

Ask students which brand of chocolate chip cookies they consider best and why. Consider different criteria for determining the best cookie:

Is it taste? Size? Amount of chocolate? Explain that today the class will investigate two brands (A and B) of chocolate chip cookies to determine which contains the most chocolate. Half the class will experiment with Brand A and the other half with Brand B.

Before you organize the class into teams, tell students they will be conducting their experiment using the *Office* tools. They will use *Word* to write their hypothesis and results; *Excel* to analyze their data; and *PowerPoint* to present their findings in a slide show and on the Web.

Microsoft Excel - CHOC1a.XLS					
	A	B	C	D	E
1	SuperChips Deluxe Chocolate Chip Cookies				
2	Total Mass	Mass of Chocolate	Mass of Cookie	Number of Chips	Mass of Towel
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

Student Activity

DESCRIPTION

What's your favorite brand of chocolate chip cookies? Is it the one with the most chocolate per bite? In this activity, you will uncover the chocolate quotient in several popular cookie brands.

STEP A

Preparing Your Spreadsheet

SOFTWARE: Microsoft Excel

WHAT TO DO: You'll be using a spreadsheet to track and analyze your chocolate chip data. Here's how to set it up:

1. Open *Excel* and create a new worksheet, and save it under a unique file name.
2. In cell A1, type the name of the brand you're investigating.
3. In cells A2 through E2, type these column headings, respectively: Total Mass, Mass of Chocolate, Mass of Cookie, Number of Chips, and Mass of Towel.
4. Highlight A2:E2. On the Format menu, click Cells, choose Alignment, then check Wrap Text. Save again.

STEP B

Making Your Hypothesis

SOFTWARE: Microsoft Word

WHAT TO DO: Scientists begin their investigations

	A	B	C	D	E
1	SuperChips Deluxe Chocolate Chip Cookies				
2	Total Mass	Mass of Chocolate	Mass of Cookie	Number of Chips	Mass of Towel
3	50	10	40	23	5
4	49	8	41	19	5
5	52	11	41	20	5
6	50	12	38	21	5
7	48	10	38	19	5
8	49.8	10.2	39.6	20.4	5
9					
10					
11					
12					
13					

with an educated guess called a "hypothesis," which they then test against real data. Here's how to create your own hypothesis:

1. Open *Word*, create a new document, and save it as Hypothesis.
2. Choose an average cookie from your set and estimate how much of it is chocolate.
3. Record your estimate as a hypothesis: "Our team hypothesizes that Brand X cookies contain an average XX proportion of chocolate per cookie." Express your estimate as a fraction, a percentage, or a ratio.
4. Add notes about how you reached your estimate. To include a sketch, pull down the View menu, click Toolbars, choose Drawing, and use the oval AutoShape. Save your file.

STEP C

Collecting Data

SOFTWARE: Microsoft Excel

WHAT TO DO: Now roll up your sleeves and get ready for lab work. Here's what to do:

1. Choose one cookie, weigh it to find its mass, and enter this figure into spreadsheet cell A3.
2. Weigh a sheet of paper towel, and enter this mass in E3. Since this figure will be the same for every cookie, select E3, click on the "fill handle" in the corner of the cell, and pull down to cover as many cells as you have cookies. When you release, the figure will fill each cell.
3. On a towel, pick out the chocolate chips from the cookie.
4. Place the chips on another towel and weigh them. In cell

B3, create a formula, =X-E3. Replace X with the weight of the chocolate you just found, press Enter, and the true Mass of Chocolate will appear.

5. Now let *Excel* calculate the Mass of Cookie based on the other figures you've entered. Go to cell C3 and type =A3-B3. Press Enter. Copy the formula by clicking on the fill handle on the corner of the cell and dragging down through C7. When data is entered for each cookie, Mass of Cookie will automatically be calculated.

6. Count the chips and enter this number in cell D3.

7. Repeat steps 1-6 for all five cookies. Save all your piles of chips and crumbs, labeling the towels to keep each cookie's data separate.

8. Weigh each pile of crumbs and see if this mass matches what you've calculated in column C. How do you explain any differences you see?

STEP D

Crunching Your Data

SOFTWARE: Microsoft Excel, Microsoft Word

WHAT TO DO: Here's how to make sense of your data.

1. Calculate the average of each of your cookie columns. To do this, click cell A8 and type in this formula: =Average(A3:A7). Press Enter. Click on the fill handle and drag through cell E8.
2. Make a pie chart that shows Mass of Chocolate and Mass of Cookie as percentages of the Total Mass. To do this,
 - ◆ Highlight cells B8:C8.
 - ◆ Hold down the CTRL key, and highlight B2:C2.
 - ◆ On the Insert menu, click Chart, choose Pie Chart, and select a type.
 - ◆ Click Next two times to go to Step 3 of the Chart Wizard.
 - ◆ Click the Titles tab, and type Chocolate Quotient.

◆ Click Data Labels tab and choose Show Percent. Click Finish.

3. Select the whole chart and Copy it. Then open your Hypothesis *Word* document and Paste the chart there. Compare results to your estimate.

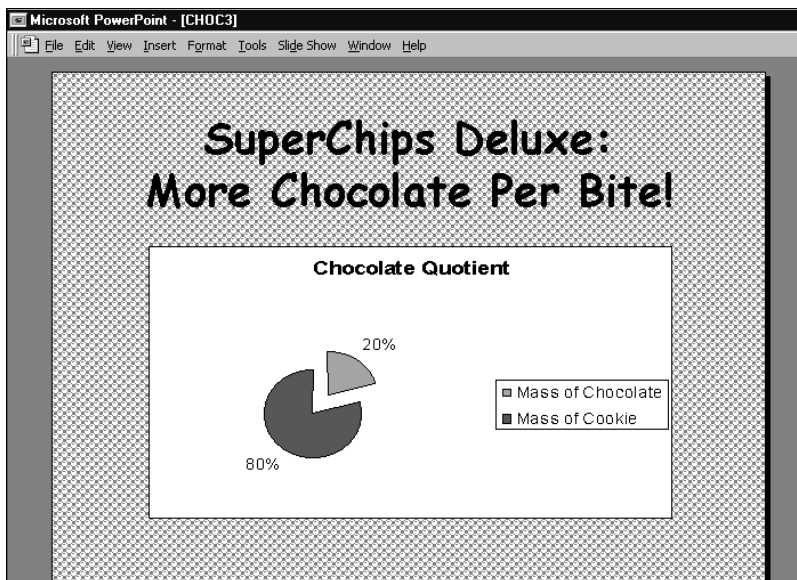
STEP E

Comparing and Communicating

SOFTWARE: Microsoft PowerPoint

WHAT TO DO: You're about to decide once and for all which cookie brand has the highest chocolate quotient – and then tell the world! Here's how:

1. Compare your results with those of the other teams analyzing the same brand. If results differ significantly, reweigh and recalculate.
2. Put together a *PowerPoint* presentation summarizing your results. Import spreadsheet data and graphs, or create new ones as needed. For extra dazzle, try the *PowerPoint* Animation option.
3. Make your presentation to the other half of the class; they'll do the same. Which cookie brand rules?
4. Combine your results into a whole-class *PowerPoint* presentation that you can deliver to other classes or the entire school.
5. Save your team and class *PowerPoint* presentations as HTML documents to post on your school or classroom Web page.





INTERMEDIATE/ MIDDLE SCHOOL

ENDANGERED SPECIES

Teacher Guide

SUMMARY

In this cross-curricular activity, students will research the issue of species endangerment by exploring threatened animals, their habitats, and the environmental challenges associated with them.

OBJECTIVES

- ◆ To explore the relationships between living things and their environment
- ◆ To guide students toward understanding of the causes of species endangerment
- ◆ To build students' research and communications skills

PREREQUISITE SKILLS

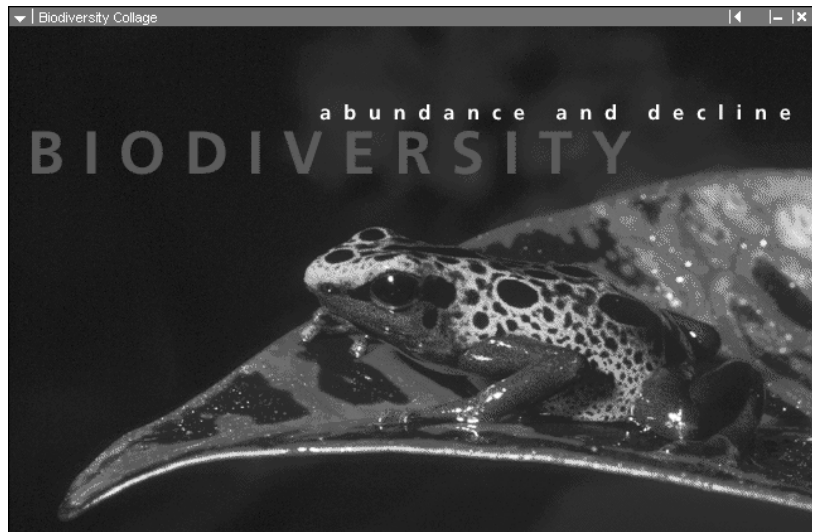
- ◆ Basic research skills
- ◆ Basic computer skills

TIME ALLOTTED

Approximately one week

HOW TO BEGIN

Start by asking your students what they know already about endangered species. Ask for a volunteer to record the class's thoughts on the board. Most likely, students will list a number of specific species; ask



The Biodiversity collage in *Encarta 98* offers a vivid overview.

your volunteer to circle these with guidance from the class. Then ask: What are some of the reasons these species are threatened? Answers should include: human encroachments on natural habitats; pollution damage to habitats; oversupply of natural predators; poaching and hunting.

Next, using a PC viewer display system or large monitor, open *Microsoft Encarta 98 Encyclopedia Deluxe*. Click on MEDIA FEATURES and choose BIODIVERSITY under COLLAGES. Discuss the meaning of biodiversity with your class. Then click on some of the "jumps"

and explore different aspects of life on Earth.

Finally, guide students to *Microsoft Encarta Virtual Globe* for an overview of habitats. From the home page, click the LEARN ABOUT THE EARTH heading. Scroll though to WORLD THEMES, then to ENVIRONMENTAL CHALLENGES. Choose HABITAT AND WILDLIFE DESTRUCTION to show the wealth of articles, videos, and related material there.

Now divide the class into groups of three or four, and tell students they will be developing a research project about one endangered species.

REQUIRED SOFTWARE

- ◆ MICROSOFT® ENCARTA 98 ENCYCLOPEDIADELUXE
- ◆ MICROSOFT® ENCARTA VIRTUAL GLOBE
- ◆ MICROSOFT® INTERNET EXPLORER
- ◆ MICROSOFT® WORD 97
- ◆ MICROSOFT® POWERPOINT® 97

OPTIONAL SOFTWARE

- ◆ MICROSOFT® GREETINGS WORKSHOP

Student Activity

DESCRIPTION

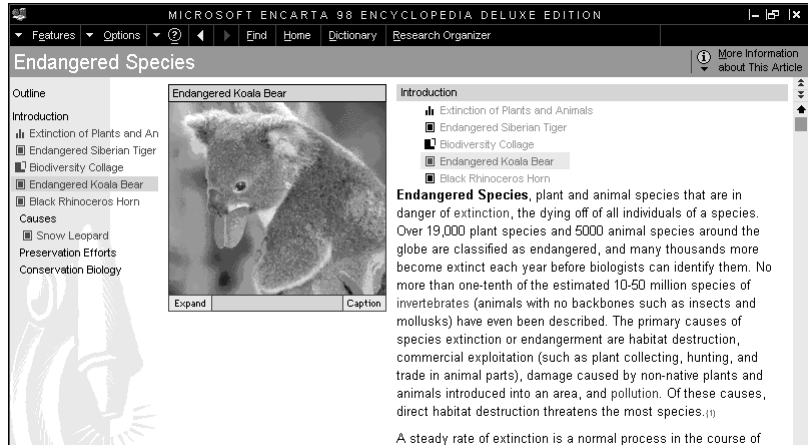
In this activity, you will work in a group to research one endangered animal species. You'll find out and explain why it is endangered and recommend measures humans can take to protect the species from extinction.

STEP A

Selecting Your Species

SOFTWARE: Microsoft Encarta 98 Encyclopedia Deluxe, Microsoft Word

WHAT TO DO: With your group, pick two or three endangered animals you're particularly interested in (use the list on the board if you need ideas). You'll be finding out a little more about each one before you make your final choice for your research project. Here's how:



Start your research with the **Endangered Species** article in *Encarta 98*.

1. Open a new *Word* document, go to the Table menu, and choose **Insert Table** to create a quick table for listing your endangered species possibilities. Record what your group knows about each species and what factors threaten its existence. Save your document.
2. Next, open *Encarta 98*, go to **Encyclopedia Articles**, choose **Find**, and type "endangered species" into the **Pinpointer**

tool. Explore several articles about different animals; use the **Pinpointer** to track down additional choices.

3. Talk about various species, and choose one to research.

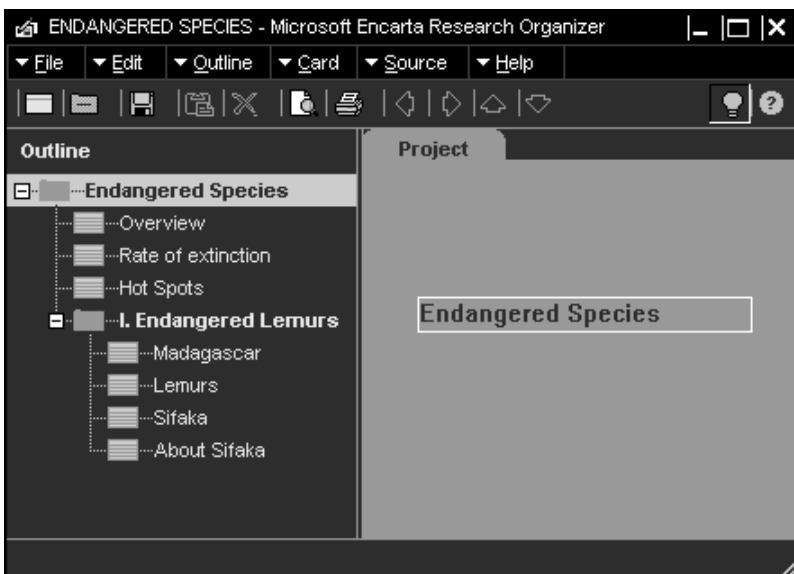
STEP B

Doing Your Research

SOFTWARE: Microsoft Encarta 98 Deluxe (or Encarta 98 plus Microsoft Word), Microsoft Encarta Virtual Globe, Microsoft Internet Explorer

WHAT TO DO: Start digging into your research and recording your findings.

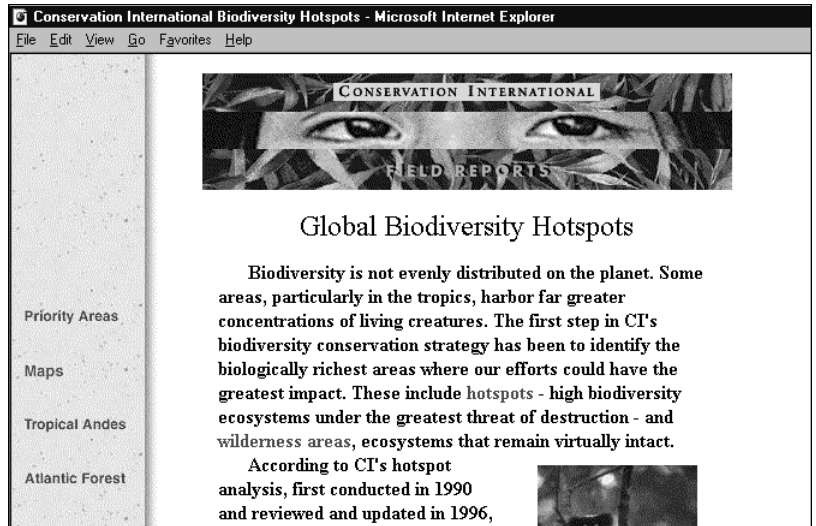
1. In *Encarta 98 Deluxe*, go to **Encyclopedia Articles**. Choose **Research Organizer** from the toolbar. Open a **New Project**, Save it, and create a card for each piece of information (text, pictures, your own notes) you find. **Research Organizer** will ask you to



name each card and cite its source. It will add the card to an outline you can organize any way you want. (If you don't have the Deluxe version of *Encarta 98*, you can copy and paste notes into your *Word* document.)

2. Focus your research on questions like these: How do the needs of this species conflict with those of humans? What other factors are endangering this species? Here are some other angles to explore for research:

- ◆ Use the InterActivities Population section of *Encarta 98* to study how the human and animal/plant populations have changed. Create a graph in *Excel* to show population patterns in your species' location.
- ◆ Using *Virtual Globe*, locate your species' habitat. Import maps for your report.
- ◆ In *Encarta 98*, use the More Information button to connect to related Internet resources



such as the Conservation International Web site above (<http://www.conservation.org>).

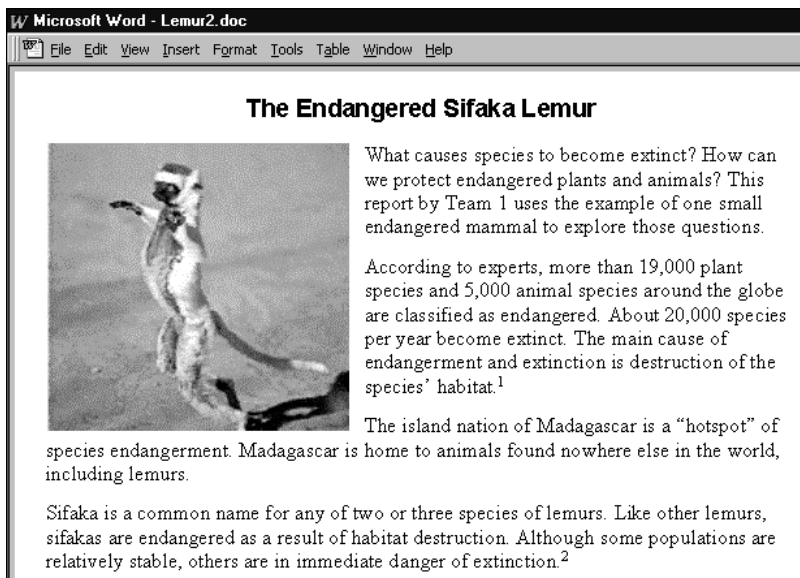
STEP C Presenting Your Findings

SOFTWARE: Microsoft Encarta 98 Deluxe, Microsoft Word, Microsoft PowerPoint, Microsoft Greetings Workshop (optional)

WHAT TO DO: Go back to Research Organizer and make

sure you have all the data you need. Reorganize your outline if necessary. Then go to File and Export as an RTF file. Do one of the following:

- ◆ Open your *Word* document from Step A, import your Research Organizer material, and use it to write a report in your own words. Include graphics, maps, and charts. End with recommendations for preserving the species.
- ◆ Open a new *PowerPoint* presentation, select Outline View, and import your Research Organizer RTF file. Edit the material to create a slide presentation. Be very selective about what you'll show on screen, and copy the rest into Notes View as your script.
- ◆ Save either your *Word* or *PowerPoint* file as HTML to create a class Web site on endangered species.
- ◆ Open *Greetings Workshop* and choose Cards; create a design and text that tell the world about your species and how it can be saved.





- ◆ MICROSOFT® EXCEL 97
- ◆ MICROSOFT® WORD 97
or MICROSOFT® PUBLISHER 97

THREE SQUIRRELS AND A PILE OF NUTS

Teacher Guide

SUMMARY

Students learn to solve story problems using a spreadsheet in combination with various problem-solving strategies.

OBJECTIVES

- ◆ To provide students with an engaging opportunity to exercise problem-solving skills
- ◆ To demonstrate *Microsoft Excel* as a problem-solving tool
- ◆ To provide a model for solving and constructing story problems

PREREQUISITE SKILLS

- ◆ Familiarity with various problem solving strategies, including trial and error
- ◆ Basic understanding of how to use *Excel*

HANDS-ON MATERIALS NEEDED

- ◆ Six dozen nuts in the shell (optional)

TIME ALLOTTED

One or two class periods

HOW TO BEGIN

Review problem-solving strategies, then pose a simple

story problem. For example: Sami has twice as many CDs as Maria. Jamal's CD collection is one-and-a-half times the size of Sami's and three times as big as Maria's. If Maria could load her 6-CD changer three times without repeating, how many CDs does Jamal have?

Ask the class: What are the unknowns? What information does the problem give us?

$$s=2m \quad j=1.5s \quad m=6 \times 3$$

With your class, set up algebraic equations based on the problem's unknowns and givens; for example: $j=1.5 \times (2m)$. Have half the class solve the problem algebraically, while the other half uses trial and error, plugging in and

testing out numbers for different variables. (Answer: Jamal has 54 CDs.)

Now tell students they are about to tackle a much trickier story problem, but that they can use the computer and *Excel* software to help them find solutions. Note that you also have manipulatives (in this case, nuts) for hands-on problem solving.

Divide your class into teams of three, and give each team a copy of the Student Activity pages. Assign one third of your teams to start with Strategy X (trial-and-error; see answer key below), one third with Strategy Y (algebra), and the last third with Strategy Z (hands-on).

Microsoft Excel - Squir1				
File Edit View Insert Format Tools Data Window Help				
	A	B	C	D
1		No. of nuts in pile	No. of nuts after s/he eats 1	No. of nuts s/he leaves behind
2	Squirrel 1	?	=B2-1	=(C2/3)*2
3	Squirrel 2	=D2	=B3-1	=(C3/3)*2
4	Squirrel 3	=D3	=B4-1	=(C4/3)*2

Here are the formulas students should figure out. One answer for B2 is 25.

Student Activity

DESCRIPTION

How many ways can three sneaky squirrels divvy up one pile of nuts? The story problem below will give you a chance to find out. It will also give you practice using different strategies for solving problems, and show you how you can use the computer and *Excel* to help solve them. In the end, you'll have a chance to make up and trade fun story problems of your own.

STEP A

Analyzing the Problem

SOFTWARE: None

WHAT TO DO: Your first step in solving any story problem is to analyze it – in other words, take it apart, and make sure you understand all of its pieces. Look carefully at the "Three Squirrels and a Pile of Nuts" problem below, and have one member of your team read it out loud. Then:

1. Take turns stating the problem in your own words. If you and your teammates have different ideas about what the problem is asking for, talk it over until you can agree.
2. On a piece of scrap paper, jot down the unknowns in this problem. What don't you know? What is the problem asking for?
3. Next, write down any bits of specific information the problem may give you. What do you know?

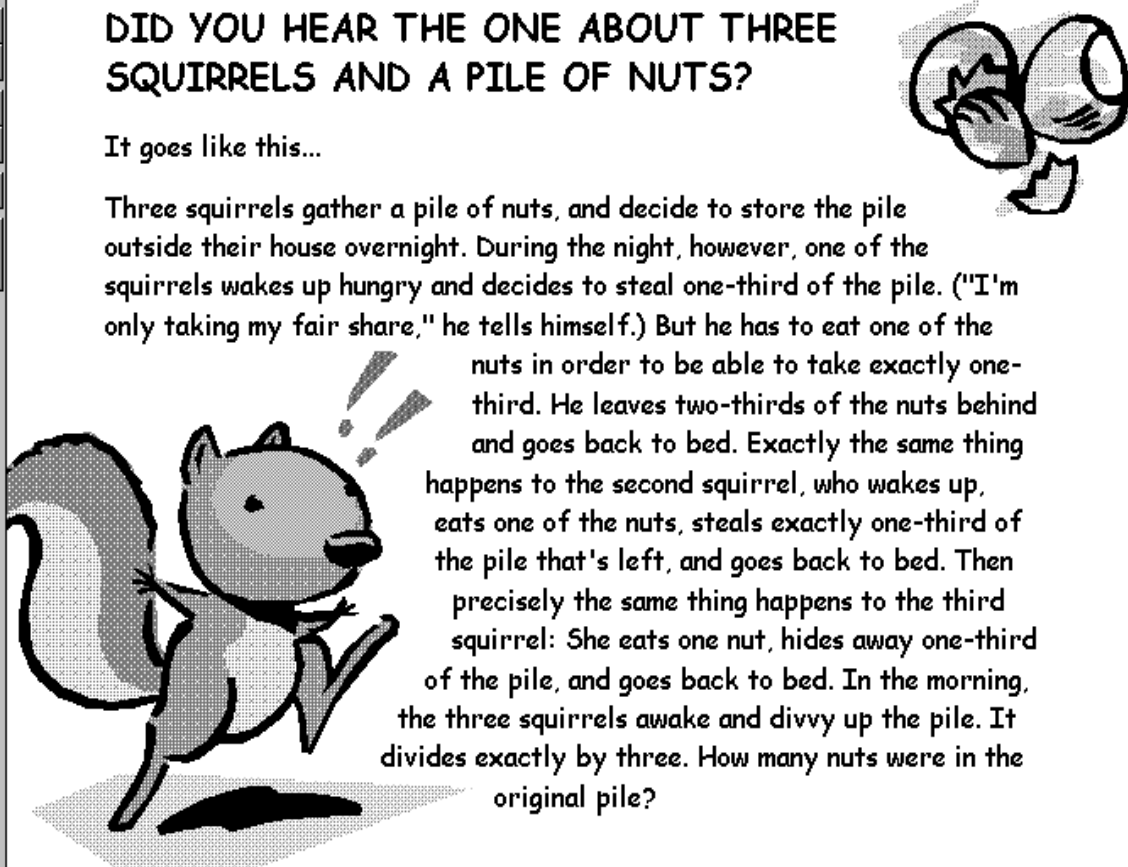
squirrel_story.pub - Microsoft Publisher

File Edit View Insert Format Tools Arrange Table MailMerge Help

DID YOU HEAR THE ONE ABOUT THREE SQUIRRELS AND A PILE OF NUTS?

It goes like this...

Three squirrels gather a pile of nuts, and decide to store the pile outside their house overnight. During the night, however, one of the squirrels wakes up hungry and decides to steal one-third of the pile. ("I'm only taking my fair share," he tells himself.) But he has to eat one of the nuts in order to be able to take exactly one-third. He leaves two-thirds of the nuts behind and goes back to bed. Exactly the same thing happens to the second squirrel, who wakes up, eats one of the nuts, steals exactly one-third of the pile that's left, and goes back to bed. Then precisely the same thing happens to the third squirrel: She eats one nut, hides away one-third of the pile, and goes back to bed. In the morning, the three squirrels awake and divvy up the pile. It divides exactly by three. How many nuts were in the original pile?



THREE SQUIRRELS AND A PILE OF NUTS

Now you're ready to move on to a problem-solving strategy. All the teams in your class will be trying Strategies X, Y, and Z, but not necessarily in that order. Ask your teacher which strategy you should start with.

STRATEGY X

Trial and Error

SOFTWARE: Microsoft Excel

WHAT TO DO: In this step, you'll be setting up a spreadsheet that will let you try out various combinations of numbers to solve the problem.

1. Following the sample below, label your rows for Squirrel 1, Squirrel 2, and Squirrel 3. Label your columns "No. of nuts in pile," "No. of nuts after s/he eats 1," and "No. of nuts s/he leaves behind."
2. Highlight cells B1:D1, go to the Format menu, choose Cells, click on the Alignment tab, and check Wrap Text. Then adjust the cell width so the text fits on two lines.

3. Now, figure out formulas for all the cells that will let you plug in and test out numbers. Remember to make each cell relative to the others, so that a number you plug into one cell's formula will affect the rest. Here are a few hints:

- ◆ The formula in cell C2 should be =B2-1, because the squirrel eats one nut from the pile in B2.
 - ◆ The formula for D2 is =(C2/3)*2, because Squirrel 1 leaves two-thirds of the pile behind.
 - ◆ The formula for B3 is =D2, because Squirrel 2 finds the pile the way Squirrel 1 leaves it.
4. Once all your formulas are in place, test out your spreadsheet by plugging a

TIP: Remember, to enter a formula in a spreadsheet cell, always type in an equal sign (=) first.

	A	B	C	D
1		No. of nuts in pile	No. of nuts after s/he eats 1	No. of nuts s/he leaves behind
2	Squirrel 1			
3	Squirrel 2			
4	Squirrel 3			

number into B2. You may end up with a lot of weird-looking fractions – and you know these squirrels aren't going to settle for anything less than whole nuts! Keep trying numbers until you find one that gives you whole numbers throughout. What patterns do you see?

5. Print your spreadsheet twice, once showing the formulas and once with your whole-number solution in place. (Ask Office Assistant for help if you need it.) Then move on to another strategy.

STRATEGY Y

Algebra Power

SOFTWARE: Microsoft Excel

WHAT TO DO: With this problem-solving strategy, you'll be setting up an algebra equation to solve.

1. Open the *Excel* worksheet used for Strategy X, go to the Edit menu, and choose Move or Copy sheet, and click Create A Copy. In your new worksheet, highlight B2:D4 and press Delete, leaving the column and row headings. Now you have plenty of room to create a table for defining your variables (see sample, next page).

2. The variables you most need to solve for are:

- x= nuts in original pile
- y= number of nuts each squirrel gets in the end.

Record these at the bottom of your worksheet.

3. Here are some hints: Put in

Microsoft Excel - Squir1				
File Edit View Insert Format Tools Data Window Help				
	A	B	C	D
1		No. of nuts in pile	No. of nuts after s/he eats 1	No. of nuts s/he leaves behind
2	Squirrel 1			
3	Squirrel 2			
4	Squirrel 3			
5	$x = \text{nuts in original pile}$			
6	$y = \text{number of nuts each squirrel gets in the end}$			

x as Squirrel 1's "No. of nuts in pile." When it comes to solving for y, remember that it is one-third of however many nuts are left in the end, so $y=1/3$ (last entry in table).

4. After you fill in your table, put together an equation. You can type this in your worksheet below your table. Show steps for simplifying the equation. Then test it out with several numbers.

5. Make sure your worksheet shows all the steps you followed to write and solve the equation. Then move on to another strategy.

STRATEGY Z

Hands-On Thinking

SOFTWARE: Microsoft Word

PLUS: 3 dozen nuts

WHAT TO DO: With this strategy, you'll be solving the problem the way a squirrel would – one nut at a time!

1. Count out the number of nuts your group would like to start with (not necessarily all

you have). Put these in your starter pile. Open a *Word* document and make a note of the number.

2. Make one member of your team Squirrel 1, and have him or her tackle the pile of nuts the way the first squirrel in the story did. Warning: No fractions of nuts allowed! Let Squirrel 1 take several tries until she or he ends up with whole amounts after each step. Record these numbers.

3. Now the teammate who's playing Squirrel 2 should work through the steps. Again, no fractions – so both Squirrel 1 and 2 may need to go back and adjust their piles. Record the numbers that work.

4. Finally, Squirrel 3 should take his or her turn. Adjust as needed, and record the results in your *Word* document.

5. When Squirrel 3 is through, divide the nuts that are left. If the pile doesn't divide by three, adjust all the way back through the problem. Record your tries and your final answers.

6. From all your notes, write

several sentences (with pictures if you'd like) describing the steps and numbers that finally gave you the right answer. Then move to another strategy (by the end of this activity, you will have tried all three!).

STEP B

Create a Problem!

SOFTWARE: Microsoft Publisher or Microsoft Word

WHAT TO DO: Here's your chance to make up a story problem as tricky as "Three Squirrels and a Pile of Nuts."

1. With your team, think of a problem that has at least three steps and requires at least two of the four basic math operations (addition, subtraction, multiplication, division).

2. Create a story to go with the problem. For extra zip, use your classmates' names and some familiar settings, like your classroom or school cafeteria.

3. Solve the problem on a separate sheet of paper, and check your work.

4. Launch *Microsoft Publisher*, choose the Flyer PageWizard, and type in your problem. (As an alternative, you can use *Word*.) Add graphics and a few hints to help people solve the problem. Print and proofread.

5. Make a separate flyer with the solution. Print it and proof it, then hide it away!

6. Exchange problems with another team. Stump or be stumped!



- ◆ MICROSOFT® ENCARTA 98 ENCYCLOPEDIA
- ◆ MICROSOFT® PUBLISHER 97
- ◆ MICROSOFT® POWERPOINT® 97

- ◆ MICROSOFT® WORD 97

SPACE CASE

Teacher Guide

SUMMARY

This activity asks students to design, write, edit, and publish a brochure to "sell" a space research project.

OBJECTIVES

- ◆ To build understanding of the social impact of scientific advances
- ◆ To inspire students to "design" and "sell" a space mission that will advance the overall cause of space exploration
- ◆ To develop students' skills in written, visual, and oral presentations

PREREQUISITE SKILLS

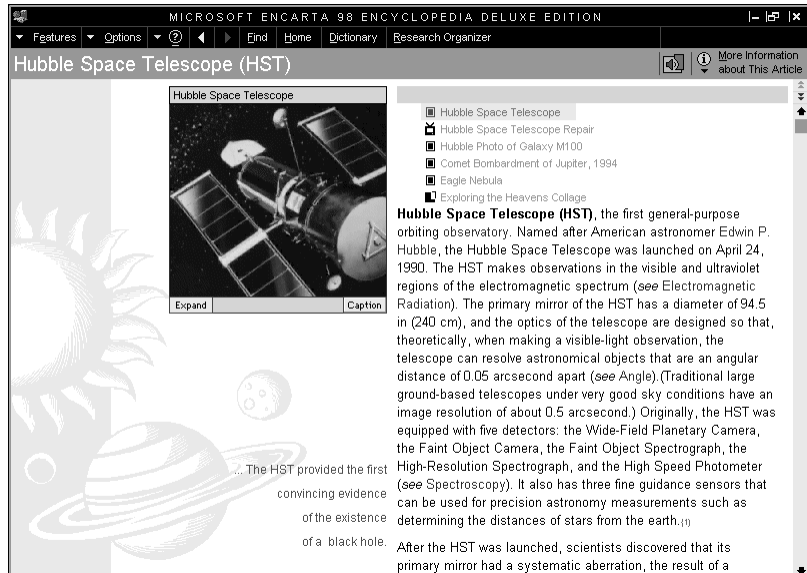
- ◆ Basic research skills
- ◆ Basic knowledge of *Microsoft Publisher* and *Microsoft PowerPoint*

TIME ALLOTTED

Three to four class periods

HOW TO BEGIN

Use *Microsoft Encarta 98 Encyclopedia* along with a PC attached to an overhead projection device to take a journey through the history of space exploration, from the Sputnik days of the 1960s through the Apollo moon mis-



From the "Exploring the Heavens" collage in *Encarta 98*, you can launch into multimedia articles on key topics in space exploration.

sion to the Challenger disaster to the recent remote-robot exploration of Mars.

Talk about how public sentiment has changed over the decades of space exploration. Why might people's interest wax and wane? Does the public have a clear sense of the "why" of space travel today? How important do your students think the space program is?

As a class, brainstorm a list of three to six objectives for space exploration in the 21st century. What new frontiers should we be aiming for? What social problems could be solved through successful space missions? What side

benefits might we see in terms of technology advances and product development? Encourage students to think imaginatively but also to remember the monumental challenges of space travel in terms of cost, time, distance, and technical capacity.

Next, have students pair up into space mission planning teams. Assign each team to conceptualize a mission that would accomplish both scientific and social goals – one that the public could enthusiastically support, with the right encouragement. Then have students follow the steps on the next two pages to "sell" their space mission.

Student Activity

DESCRIPTION

People jump on the science bandwagon when they understand its relevance to their lives. Successful scientists offer ideas that count, and they communicate their ideas to the public. In this activity, you and your partner will imagine an important space mission and communicate with the public about it in a persuasive, informational brochure and presentation.

STEP A

Planning Your Brochure

SOFTWARE: Microsoft Word
WHAT TO DO: With your partner, make some decisions about your imaginary space mission. What are the goals of your mission? What are its

WEB SITES TO CHECK OUT

The Space Center

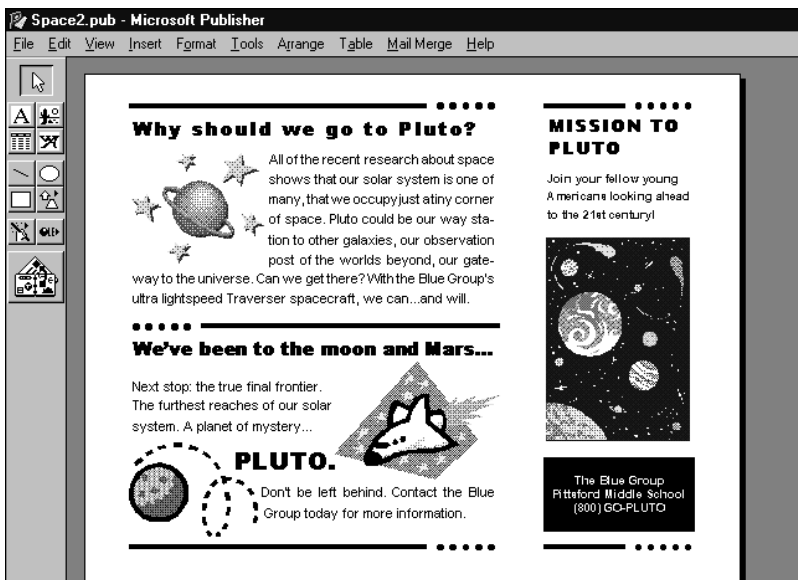
<http://www.imasof.com/tsc/tscmain.html>
A fascinating look at the past, present, and future of space exploration, with links to photos, videos, illustrated time line, and a very cool space shop.

Explore Space with SEE

<http://www.sni.net/explore>
Billions and billions of links to the who, what, when, where, and how of space exploration. If you've ever worn a pocket protector, you'll love this site.

National Space Society

<http://www.nss.com>
Want to help shape a spacefaring future? Beam up to this site and make your voice heard. Or just listen.



Create a *Microsoft Publisher* brochure that makes your space case.

most exciting features? What are its vital statistics: time frame, mechanical requirements, personnel, costs? How will the project benefit science and the public?

Open a *Word* document, answer these questions and outline what you'll want to say about the mission in your brochure. Decide what main points the text should cover, and what graphics and other visuals you'll need. Then split up the work of creating and assembling these materials.

STEP B

Creating a Draft

SOFTWARE: Microsoft Publisher or Microsoft Word

WHAT TO DO: Use the Brochure PageWizard in *Publisher* to create your basic brochure layout, or *Word*.

1. Choose the format you think will best get your message across, then fill in information as PageWizard asks you for it. Substitute your team name and school address for the business name and address.

2. In the spaces provided, create persuasive headlines and text that sells. Replace graphics with selections from the Science and Technology category of the Clip Art Gallery, or import some from *Encarta 98*.

3. Inside your brochure, create messages that explain your mission, promote its benefits, and lay out its vital statistics. You and your partner should swap off writing and editing.

4. Decide what action you want the public to take to show support for your mission. Should citizens write to their Congressional represen-

tatives? Should they plan a trip to witness the launch? Should they send fan e-mail to mission control? Whatever your call to action, use the back cover of the brochure to clearly communicate it.

5. Print out a draft of your brochure, proofread it, then fine-tune it before printing a final version. If your teacher approves, you may want to make copies to hand out to your classmates.

TIP: By saving your brochure as an HTML document, you can post it on your school's intranet or Internet Web site.

STEP C

Presenting Your Mission

SOFTWARE: Microsoft PowerPoint

WHAT TO DO: Now it's time to bring your brochure to life as a persuasive, attention-getting *PowerPoint* slide show.



1. Reread your brochure and pick out three or four of your most important points. These will form the basis of your slide show.

2. Open *PowerPoint*, select the Outline view, and type in your key points as slide headings, beginning with the name of your mission and team name.

3. Go to your title slide and highlight your team name.

Under the Insert menu, choose Hyperlink, and link to your brochure file.

4. On one of your slides, add a picture from *Encarta 98* by going to the encyclopedia article, selecting the picture, pulling down the Options menu, and selecting Copy Image. Paste it into your *PowerPoint* slide.

5. Continue adding text, and try WordArt to create eye-catching titles. Insert graphics from the *Office 97* Clip Gallery, charts, and more. Just remember not to put too much information on each slide.

6. When your slides are complete, go to Slide Sorter view and add Transitions, such as a slow dissolve or a quick wipe. Save your work.

7. Now show your finished *PowerPoint* slide show to the public (your classmates) and get ready for the countdown to launch!





CODE CRACKERS MATH GAME

Teacher Guide

SUMMARY

This engaging and challenging math game provides students with opportunities to work with math operations and simple algebraic equations by creating a spreadsheet-based "rule machine."

OBJECTIVES

- ◆ To build students' skills in math operations and algebraic thinking
- ◆ To put spreadsheets in students' hands as problem-solving tools
- ◆ To promote cooperative math learning

PREREQUISITE SKILLS

- ◆ Understanding of *Microsoft Excel* spreadsheet use
- ◆ Fluency in math operations and basic algebraic thinking

TIME ALLOTTED

One class period

HOW TO BEGIN

Introduce the game by demonstrating how math operation "rules" work. On an overhead or the chalkboard/whiteboard, write the following headings:

	A	B	C
1	Code Crackers		
2	IN	OUT	RULE
3			
4			
5			
6			
7			

In, Out, Rule. Tell students that what you've created is an old-fashioned Code Cracker math machine. Write the number 2 under In; under Out, write 14; leave Rule blank for now.

Ask students for three or four possible formulas you might have used to get from 2 to 14; when they all call out 2×7 , tell them that your formula, or rule, uses two math operations, not just one. Write their guesses under Rule.

Next, write several other Ins and Outs based on the same rule, such as 4, 24 and 7, 39. Ask students to keep guessing until they figure out that your rule is $5 \times (\text{In}) + 4$.

Give students a few minutes to write and test their own rules, then ask for volunteers

to try stumping the class using your old-fashioned Code Cracker.

Then, using a large monitor or LCD projector, demonstrate how to set up a modern Code Cracker using *Excel*. (Follow the model above, and check the Student Activity directions on the next page for set-up details.) Run through a few practice rules, showing students how to create and copy the formula in column B and what happens when you type different variables in column A. Ask students: How is Code Cracking different with this machine?

Have each student choose a partner, hand each team a copy of the Student Activity page, and let the code cracking begin!

Student Activity

DESCRIPTION

With this math game, you and your partner will take turns posing math rules and trying to guess them using a worksheet "machine" you create with *Excel*. Whoever guesses the most rules quickest, wins!

STEP A

Make Your Machine

SOFTWARE: Microsoft Excel

WHAT TO DO: With your partner, decide who should go first. Partner 1 should then follow these steps while Partner 2 is not looking.

1. Launch *Excel*, open a new worksheet, and save it.
2. Follow instructions in the Tip box, below, to set up your Code Cracker machine.
3. Type a number in cell A3.

TIP

To set up your spreadsheet:

1. Type **Code Crackers** in cell A1.
2. Highlight cells A1:C1.
3. On the Format menu choose Format Cells.
4. Click on Alignment, choose Merge Cells, then click OK.
5. Click the Center button to center the text across columns A:C.
6. In cell A2, type **IN**. In cell B2, type **OUT**. In cell C2, type **RULE**.
7. Select cells A2:C2 and Center your text.

	A	B	C	D	E
1	Code Crackers				
2	IN	OUT	RULE	TALLY	
3	4	13	4*3+1, 4*4-3	Robert	8
4	7	19		Martha	5
5	5	15			
6	11	27			
7	8	21			

Create and hide rules in column B for your partner to guess!

4. In cell B3, type a rule (formula) that uses the number in cell A3. Remember to start your formula with an equal (=) sign. Use at least two but not more than three math operations in your rule.

5. Select your rule, click on the fill handle in the corner of the cell, and drag to copy it in B4:B7.

6. Type a different number in each of cells A4 through A7; cells B4 through B7 will show values that represent your rule. Save your work.

7. Hide your rules by clicking on the View menu and deselecting Formula Bar.

STEP B

Crack the Code!

SOFTWARE: Microsoft Excel

WHAT TO DO: Now Partner 2 will try to guess the rule Partner 1 has devised. Your time limit: two minutes!

1. Look carefully at the numbers in columns A and B.

What rule, using more than one math operation, could turn A into B? Click cell C3 and type in your main guess plus some other guesses

2. Click on cell A4, and replace that number with any one you choose. What do you see in B4? Review and revise your guesses if necessary.

3. Try out more numbers in column A until you feel absolutely sure of the rule, or until your time's up.

STEP C

Tally and Switch

SOFTWARE: Microsoft Excel

WHAT TO DO: Partner 1 can now reveal the rule by clicking on cell B3. Did Partner 2 guess correctly? If so, she or he gets 5 points – plus 1 additional point for every other workable rule. Tally the points in an empty place on your worksheet, then switch places so Partner 2 creates rules for Partner 1 to guess. Whoever reaches 50 points first, wins!



TRAITS R US!

Teacher Guide

SUMMARY

In this supplement to your study of genetics, students learn more about heredity by collecting and analyzing information about their own and their classmates' characteristics (such as hair color and height) and traits (such as ability to roll tongue or raise one eyebrow). As the activity progresses, students will be amazed to discover the genetic diversity within their own classroom!

OBJECTIVES

- ◆ To deepen students' understanding of heredity through analysis of characteristics and traits in their peer group
- ◆ To provide practice creating and using a *Microsoft Access* database, including hands-on experience in collecting, analyzing, and reporting data

PREREQUISITE SKILLS

- ◆ Fundamental understanding of genetic principles
- ◆ Familiarity with basic database design and terminology, with special focus on *Microsoft Access*

TIME ALLOTTED

Three to five class periods

HOW TO BEGIN

Ask the class: How many of you can roll your tongues? Raise one eyebrow? Take a quick tally. Ask: Why do some people have these traits while others do not? Guide students toward understanding that these traits are hereditary, passed along the same way that hair and eye color are. Note that other hereditary traits include left- and right-handedness and the ability to whistle.

Tell students that they will be creating a database of genetic characteristics and traits in their own classroom. Using a large monitor or a PC Viewer, open *Access*. Then:

1. From the File menu, choose New Database, then a Blank Database. Name and Save it.

2. In the next screen, click the Table tab. Choose New, click DesignView, then OK.

3. With your students' help, type field names in the Table design (see sample below).

4. For each field with a set number of choices (such as Left-/Right Handed), create a pull-down menu for easy data entry. Click on the Data Type cell and then down arrow. Select LookupWizard, click the "type in values" option, then click Next. Enter your choices under Col 1. Click Next, and name your lookup column with the same name as the related field. Click Finish.

5. Save and close your table.

6. Divide your class into teams. Teams will work separately on Step A and combine forces for the remaining steps.

Field Name	Data Type	Description
Name	Text	
Age	Text	
M/F	Text	
Height	Text	
Hair color	Text	
Eye color	Text	
Left-/Right-handed	Text	
Special traits1	Text	
Special traits2	Text	

Student Activity

DESCRIPTION

Are you the only “lefty” among your friends? How many kids in your class could wiggle their ears if you asked them to? With this activity, you and your classmates will create a database of your own genetic traits and characteristics. You'll compare your classroom results with statistics from “the real world,” and then look for other patterns in your data. Some students may also want to look for characteristics and traits among members of their families.

STEP A

Create Your Data Form

SOFTWARE: Microsoft Access

WHAT TO DO: With your teacher, you've already



Compete with other teams to design the best database form.

defined the fields in your database. Now you will work in a team to develop the form that you and your classmates will fill out on the computer to enter data into your database. Other teams in your class are working on form designs, too. When all are complete, the whole class will pick its favorite form and data entry can begin.

1. Open the empty database your class created with the teacher, click on the View menu, and choose Database Objects.
2. In the submenu, select Forms. Click the New button and choose the FormWizard option. Choose the Table you and your classmates just created with your teacher, then click OK. Then from the Available Fields listed below, choose the ones you most want classmates to fill in (which could be all of them) and add them to the list of Selected Fields in the order you want them to appear.
3. Now work through the remaining steps of Form Wizard. At the last step, give your form your team name, and select the option that lets you Modify the Form's Design if you'd like to fine tune it;



then click Finish. Be sure to Save when you are done tinkering!

4. Each team should present its finished form on the overhead viewer. Vote on a favorite, and go to the View menu. Choose Design View if you need to modify it. Then Save as CLASS FORM.

STEP B

Enter Your Data

SOFTWARE: Microsoft Access

WHAT TO DO: You and your classmates will now go to the computer one at a time and:

1. Launch the class database and open the Class Form. At the bottom of the form (in Form View), click on New Record and type in your data. Everyone else in class will do the same.
2. For an extra touch, scan in a photo of yourself. Hint: Ask the Office Assistant how to add an unbound picture.

STEP C

Analyze the Data

SOFTWARE: Microsoft Access

WHAT TO DO: When all of your class's data has been entered, your team should decide on one main variable to explore. For example, you might want to focus just on the boys in your class, and then find out what character-

The screenshot shows a Microsoft Access report window titled "Microsoft Access - [Report2]". The report has a title "It's a Guy Thing!" and a table with the following data:

M/F	Height	Lefty/Righty	Special trait
M	5'10"	Right	Roll tongue
M	5'6"	Right	Wiggle ears
M	5'6"	Right	
M	5'8"	Right	
M	5'9"	Left	Whistle
M	6'0"	Left	Whistle

Use the Query and Report functions in Access to explore various combinations of genetic characteristics and traits in your class.

istics and traits they have. Here's how:

1. On the View menu, choose Datasheet Views. Under the M/F field, click in a record that contains Male (or M). On the Records menu, choose Filter, then choose Filter by selection. Those records will appear on the screen.
2. Next, choose several sub-variables, such as: How many boys in your class are left-handed? What is the range of heights among the boys? Choose the correct columns one at a time, click on Records, and Sort.
3. When you find a pattern worth noting, create a printed report on it. On the Window

Menu, choose the name of your database. Click the Reports tab, then click New. Click the Report Wizard and your query or table. Select the variables you want to focus on, such as Gender (M/F) or Left-/Right-Handedness (see sample, above). Then let Report Wizard guide you through creating a report based on that Query. Share with your classmates, and conduct additional Queries.

4. Use the Chart Wizard to present some of your data visually. Post your findings on a bulletin board, and find answers (from the library and your science teacher) to questions the data raises about genetics.



SOLVING POLYNOMIAL EQUATIONS

Teacher Guide

SUMMARY

In this modeling activity, students will learn how to use spreadsheets as a sophisticated tool for analyzing, visualizing, and solving mathematical problems.

OBJECTIVES

- ◆ To aid students in graphically visualizing polynomial equations, beginning with cubic equations
- ◆ To model for students how *Excel* spreadsheets can be used as problem-solving tools
- ◆ To introduce students to advanced *Excel* spreadsheet functions

PREREQUISITE SKILLS

- ◆ Basic familiarity with spreadsheeting
- ◆ Fundamental grasp of cubic equations and other polynomial equations

TIME ALLOTTED

Two class periods

HOW TO BEGIN

1. Start this lesson by talking about spreadsheets and how students may have used them. Explain that they will be learn-

ing about several functions of the *Excel* spreadsheet that will help them solve polynomial equations.

2. On a large monitor or an LCD projector, open *Excel* and choose a new worksheet.

3. Show students how to define a series of cells as variables in an equation. In the A column, type x into A1, then enter a sequence of numbers from -3 to 3 starting in cell A2. Select the entire column of cells, press CTRL + SHIFT +F3, and specify in the dialog box that you want the name this series x; create the name in the top row. Next, go to cell B1 and type y. In cell B2 create an equation using x, such as x^2 (x to the power of 2). Copy this formula and paste it in cells B3:B8. Point out to students how the value of the B cells change. Select B1:B8 and name the series y.

4. Next, walk through *Excel's* advanced graphing features. Select cells A1 through B8, and choose ChartWizard from the Insert menu. Choose the XY scatter chart function. Explore the results.

5. Finally, introduce students to

the Goal Seek function, which allows the user to indicate a desired ending value and ask the spreadsheet to return a variable that meets it. Choose cell B3, then go to Tools and click on Goal Seek. In the dialog box, specify B3 as the cell you want to set; give it a different value, and specify A3 as the cell that should change to meet it. Close the dialog box and note the result.



6. Hand out the Student Activity pages. Show students that they will be using all three of the functions you just introduced to help solve their cubic equations.

Student Activity

DESCRIPTION

Here's your chance to use *Excel* to help you solve those tricky cubic equations.

STEP A

Define Your Coordinates

SOFTWARE: Microsoft Excel

WHAT TO DO: Set up your *Excel* spreadsheet to reflect a cubic equation. The equation we'll be modeling in this lesson is $2x^3 + 6x^2 - 18x + 6 = 0$.

1. Open a new worksheet. In A1, type this text: **Graph of $y = 2x^3 + 6x^2 - 18x + 6$** . To position the exponents (such as ³) correctly in the text, highlight each one, go to the Format menu, choose Cells, click on the Font tab, and click Superscript. Decrease the font size slightly. **Note:** In spreadsheet formulas, as opposed to text, designate exponents by preceding them with the ^ sign.

2. In cell A2, type **x**. In cell B2, type **y**.

3. In cells A3:A11, enter a sequential series of values from -5 through 3 (see above).

4. Select A2:A11, press CTRL + SHIFT + F3, and name this column **x** (see above).

5. In cell B3, enter the formula for **y**, which is $=2*x^3+6*x^2-$

The screenshot shows a Microsoft Excel spreadsheet titled "Poly1.xls". The spreadsheet has columns A through F and rows 1 through 12. In cell A1, the text "Graph of $y = 2x^3 + 6x^2 - 18x + 6$ " is displayed. In cell A2, the text "x" is displayed. In cell B2, the text "y" is displayed. In cells A3 through A11, the values -5, -4, -3, -2, -1, 0, 1, 2, and 3 are displayed. In cells B3 through B11, the values -4, 46, 60, 50, 28, 6, -4, 10, and 60 are displayed. A "Create Names" dialog box is open over the spreadsheet. The dialog box has a title bar "Create Names" and a close button. It has a "Create names in" section with four options: "Top row" (checked), "Left column", "Bottom row", and "Right column". There are "OK" and "Cancel" buttons.

$18*x+6$. Copy this formula and paste it in cells B4:B11.

6. Look at the values now showing up in column B. Do you see any patterns? Save your work.

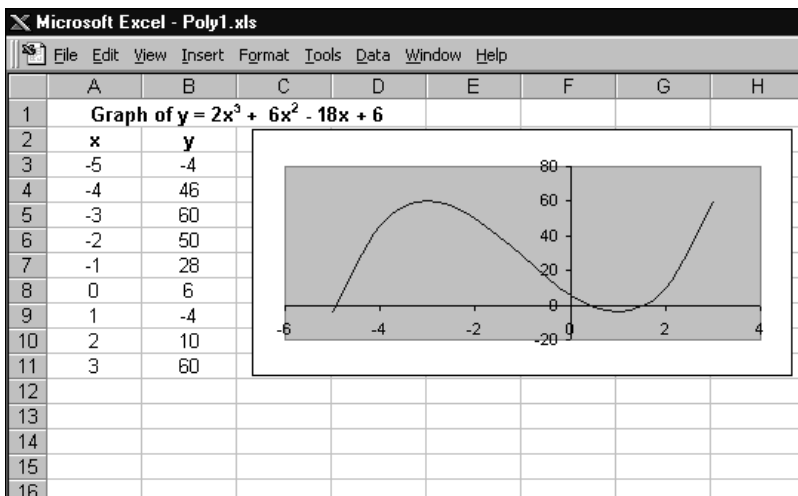
STEP B

Graph the Equation

SOFTWARE: Microsoft Excel

WHAT TO DO: Now you'll want to visualize the equation by making a graph.

1. Highlight A2:B11.
2. Create an XY scatter function graph by using the ChartWizard on the Insert menu. Save your work.
3. Note from the value of coordinates (above) and from this graph that the value of **y** changes sign between $x=-5$ and $x=-4.5$ (represented by



SOLVING POLYNOMIAL EQUATIONS

cell B3), between $x=0$ and $x=1$ (cell B8), and between $x=1$ and $x=2$ (cell B9). That means that the solutions to the cubic equation must lie between those values.

STEP C

Seek Your Goal

SOFTWARE: Microsoft Excel

WHAT TO DO: Now comes the part where the spreadsheet really shines.

1. Select cells A3, A8, and A9, click on Format menu, choose Cells, and format as Numbers to four decimal places; format B3, B8, and B9 as Numbers to two decimal places.

2. Click on B3. This is your first Goal cell.

3. On the Tools menu, choose Goal Seek. You should see B3 in the Set Cell box.

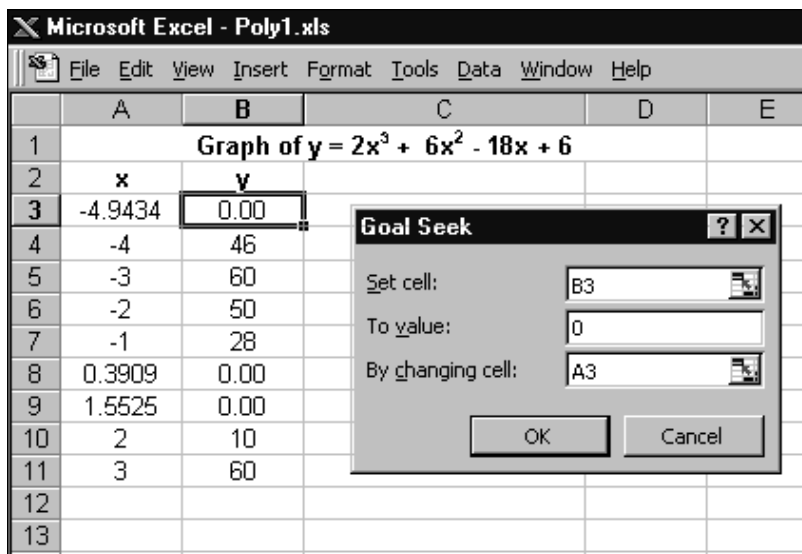
4. Remember that the equation you are solving is $2x^3 + 6x^2 - 18x + 6 = 0$, so you'll want to enter 0 in the To Value box.

5. The cell you want to change to reach that value is the variable you're solving for, x . In the By Changing Cell box, type A3.

6. Click OK on the Goal Seek Status box, which should return a value of 0.

7. The value in cell B3 should also now read 0.00, while cell A3 reads -4.9434. This is one of your solutions for x .

8. Repeat this process for cells B8 and B9 to reach the



other two valid values for x .

9. Save your work.

STEP D

Now Try These!

SOFTWARE: Microsoft Excel

WHAT TO DO: Now that you

know how to set up your spreadsheet to solve cubic equations, try it out on the equations below using the specified domains (ranges of numbers). Make up equations with a friend and test them out. Then see if you can find a way to use spreadsheets to solve other kinds of equations, such as quadratic.

Equation

Domain

$$x^3 - 4x^2 - 5x + 14 = 0$$

-3, 6

$$x^3 - x^2 - 10x + 10 = 0$$

-4, 5

$$x^3 - 4x^2 - 2x + 4 = 0$$

-2, 4

$$x^3 - 3x^2 - x + 1 = 0$$

-1, 4

$$x^3 - 2x^2 - 3x + 5 = 0$$

-3, 5

$$x^3 - 7x^2 - 11x + 3 = 0$$

-2, 6

$$3x^3 - x^2 - 40x + 48 = 0$$

-5, 4

$$x^3 - 5x^2 - 5x + 3 = 0$$

-2, 4

$$x^3 - 4x^2 - 3x + 2 = 0$$

-2, 5

$$x^3 - 27x - 27 = 0$$

-3, 6



HIGH SCHOOL

REQUIRED SOFTWARE

- ◆ MICROSOFT® EXCEL 97
- ◆ MICROSOFT® WORD 97
- ◆ MICROSOFT® POWERPOINT® 97

CAMPAIGN HOT BUTTONS

Teacher Guide

SUMMARY

This simulation activity asks students to work as staffers for a politician (played by you). They are assigned to design, administer, and analyze a simple poll on an important community issue; to develop a position statement based on poll results; and to persuasively present the candidate's stand on the issue.

OBJECTIVES

- ◆ To sharpen understanding of the role of public opinion polling in the political process
- ◆ To develop data design, collection, and analysis skills using spreadsheet tools
- ◆ To provide practice with persuasive writing and public speaking

PREREQUISITE SKILLS

- ◆ Basic understanding of *Microsoft Excel*
- ◆ Familiarity with *Microsoft Word*
- ◆ Ability to create basic slides using *Microsoft PowerPoint*

TIME ALLOTTED

Three to six class periods; partners may supplement with work sessions outside of class

HOW TO BEGIN

Introduce the topic by bringing into class several press reports about proposals by the President, your state's governor, or a local politician on important public issues. Ask students how they think such proposals are developed, and what role public opinion plays.

Introduce this simulation activity by telling students that you will be playing the role of a local politician and that they are your staff. Say that you are very interested in

the problem of water pollution in your local area, and that you think your community needs a water purification program. (If there is another "hot button issue" actually being discussed in your community right now, you might want to substitute that for water quality.) But without a carefully developed campaign to win public support, nothing will happen on this issue. Tell students that you need their help in finding out how citizens feel about water quality and then in building a campaign based on their concerns.

Divide your class into pairs, and set deadlines for them to present their work to you after each step in the Student Activity.

Extension Activities

- ◆ Have students use *Microsoft Publisher 97* to create pamphlets, posters, or ads based on their work in this activity.
- ◆ Have your students choose their own hot button issue to address in a repeat of the activity.
- ◆ Ask students to analyze survey results that they read in the news. How were the questions framed? Who was chosen to answer? Why are certain highlights chosen? If possible, send away for the actual survey report and take a closer look.

Student Activity

DESCRIPTION

For better or worse, politics has become entwined with public opinion polling. Politicians and their staffs work hard to identify "hot button issues"—topics that voters care passionately about – and craft positions and programs accordingly. For this activity, imagine you and your partner are key policy strategists for a local politician (played by your teacher). This politician has a hunch that water quality is an issue of great concern to citizens in your town, and that they might support a proposal to build small-scale water-purification plants at strategic locations. But similar proposals have failed in the past. It's up to you to make the difference.

STEP A

Brainstorming Poll Questions

SOFTWARE: None

WHAT TO DO: Your candidate believes her water-purification proposal would have three important benefits: the protection of sources of drinking water, the rehabilitation of wildlife habitats, and the creation of a swimming and recreation area on the outskirts of your town. Your poll should help determine how the public feels about these three goals, and what problems they might foresee with your boss's proposal.

The key is to design your questions so they can be analyzed statistically. That means asking questions that can be answered Yes or No; providing a scale for answers, such as 1 to 5, with 1 being Strongly Agree and 5 being Strongly Disagree; or providing multiple choice answers.

You'll also want to gather data about the people who will answer your poll, to help you better analyze your results. For example, you might want to record their age and gender, so you could later report that "new recreation facilities are especially important to males ages 14-16."

With your partner, brainstorm a list of at least three questions you'll want to ask.

STEP B

Designing Your Poll Form

SOFTWARE: Microsoft Excel

WHAT TO DO: You will be creating a basic spreadsheet document that you can print out for conducting your poll and then enter your collected data into. Here's how:

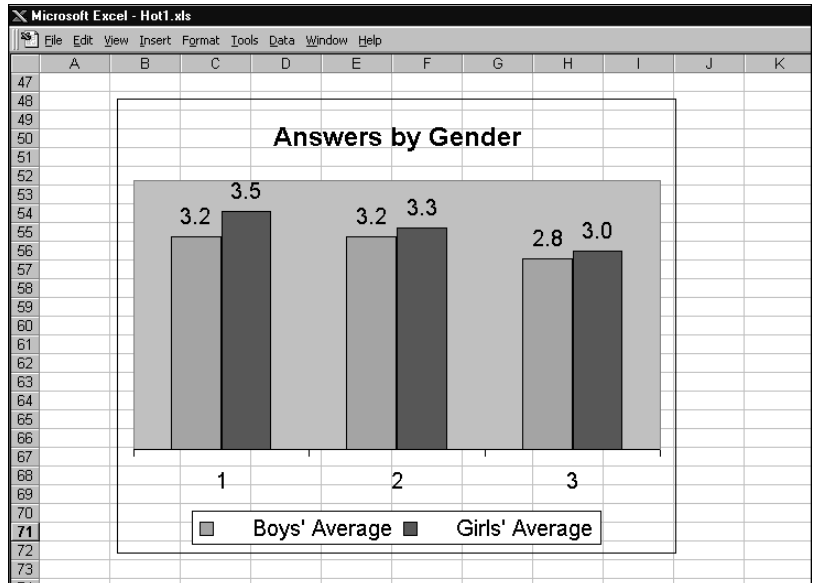
1. Open *Excel*. In cell A1 of the blank worksheet, enter a title such as "Poll on Water Quality" (see sample below). Select cells A1:F1 and click the Merge and Center button on the Formatting toolbar.
2. Skip a row, then type in your survey questions and the answer scale (for example, 1 = not at all, 5 = extremely).

Microsoft Excel - Hot1.xls						
File Edit View Insert Format Tools Data Window Help						
	A	B	C	D	E	F
1	Poll on Water Quality					
2						
3	On a scale of 1 to 5, with 1= not at all and 5 = extremely,					
4	Q1: How important is having pure drinking water?					
5	Q2: How important is rehabilitation of wildlife habitats?					
6	Q3: How important is a new swimming pool/recreation area?					
7						
8	First Name	Age	M/F	Q1: 1-5	Q2: 1-5	Q3: 1-5
9						
10						
11						
12						
13						
14						
15						
16						
17						

Use printouts of a blank *Excel* worksheet to collect data in a poll of your classmates and peers on your chosen hot topic.

You'll be using a copy of this worksheet as a script when you survey, so make certain your wording is clear.

3. Type in column headings for the data you want to gather from each participant (such as Name, Age, M/F, and the numerical answer for each question).
4. Use Format to adjust the row heights and column widths to make it easier to write in while you're polling.
5. Highlight the answer area, go to the Format menu, choose Cells, and click on the Borders tab. Select inside and outline borders to create a neat grid (see page 28).
6. Save and print.
7. Now poll your classmates. Pencil in the information under each heading, including the numerical answer to each of your survey questions.



STEP C

Analyzing Your Data

SOFTWARE: Microsoft Excel

WHAT TO DO: When your polling is complete, follow these steps:

1. Open your worksheet.

Enter and save your data.

2. To find the average answer to your questions, select a blank cell at the bottom of each column and type = to indicate a formula. Go to the Insert menu, choose Function, and select Average. Highlight the range of cells, for example, =AVERAGE(D9:D18). Press Enter. Drag the fill corner to F19 to copy this formula.

3. To find the percentage represented by each answer, first find the total number of answers by having *Excel* count them. Select a cell below any column of numbers – for example, B19 – and type the formula =COUNT(B9:B18). On a separate area of your worksheet, set up a table that shows the frequency of each answer from 1 to 5 for Question 1, and have *Excel* divide each frequency by your total number of answers (such as =4/B19).

4. Create a graph of your percentages by selecting your

Poll on Water Quality--TOTALS						
First Name	Age	M/F	Q1: 1-5	Q2: 1-5	Q3: 1-5	
Maggie	13	F	4	3	2	
Eddie	14	M	3	3	4	
Tyler	14	M	4	4	4	
Kate	15	F	3	3	5	
Ramon	13	M	5	4	3	
Spencer	15	M	2	2	2	
Patrice	15	F	3	5	1	
Michael	16	M	1	1	1	
Junior	13	M	4	5	3	
Marlena	14	F	4	2	4	
Average	14.2		3.3	3.2	2.9	

percentage cells, choose ChartWizard button on the toolbar (see sample results at top of previous page).

5. To experiment with other ways of analyzing your data – by respondents' gender and age – use the Filter function under Data. Highlight the label cell on any column, go to the Data menu, select Filter, and choose AutoFilter. This creates a pulldown menu of all the variables in your data (such as M and F for gender). When you select a filter, *Excel* will show only the rows that match. You can then average these subsets, find their percentages, or create charts for them using the same steps you followed above.

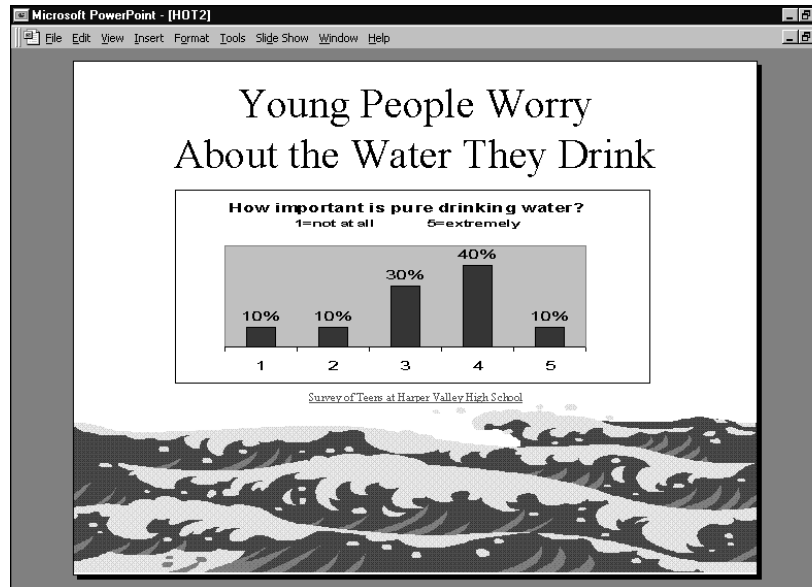
STEP D

Developing a Briefing Paper

SOFTWARE: Microsoft Word, Microsoft Excel

WHAT TO DO: Your next task is to brief your boss, the politician, on the results of your poll and how best to present the water-purification proposal to the public. Review your data and decide which two or three conclusions are most important – and what strategies you recommend as a result.

For example, if a large percentage of your respondents are very concerned about water quality, you'll want to suggest emphasizing this when talking to the public and



the press. If more males than females seem to care about protecting wildlife, the politician may want to create a special "save the animals" pamphlet targeting males.

Write up your recommendations in a two-page briefing paper; import spreadsheet data and charts as needed.

STEP E

Presenting Your Campaign

SOFTWARE: Microsoft PowerPoint

WHAT TO DO: Congratulations! Your boss, the politician, was very impressed with your poll and analysis. She even agreed with all of your recommendations! Now she wants to take her water-purification campaign public. She has scheduled a press conference and asked you to create a presentation. You'll need at least one *PowerPoint* slide for

each recommendation.

1. Launch *PowerPoint*, open a new file, and choose Blank Presentation.
2. Go to the Format menu, click on Apply Design, and see if any of the styles there fit your message. Or you could look through clip art files from *Office 97* and *Microsoft Publisher* for a water-related graphic that you could import into the Master slide as a motif that appears on all of the slides in your presentation.
3. To create eye-catching graphic headlines, go to Insert, choose Picture, and click on WordArt.
4. Bring in graphs from the *Excel* worksheets you developed in Steps A-C. This creates a Hyperlink to take viewers back to the *Excel* files.
5. Use the Animation function to create lively, attention-getting sounds and transitions from slide to slide.

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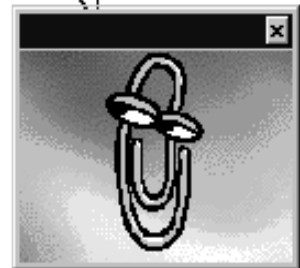
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