EXPLORATIONS

Activity 7

Hat Trick

- Multiplication
- Division
- Fractions
- Measurement
- Money
- Problem-solving
- Prerequisite: understanding of π, circumference, and diameter

- TI–15 calculators
- Paper, pencils
- Poster paper for visual display
- Chart-sized grid paper (optional for visual display)
- Markers
- Overhead projector or chalkboard

Overview

Students will work in cooperative groups to solve a real-world economics problem. Each group's final product will be a visual and oral presentation to a fictional hat company. Each individual will write an explanation about the processes that the group used to solve the problem.

Focus

Using a show of hands, ask the students the following questions:

- *How many of you like chocolate ice cream?*
- *If you had a choice between chocolate ice cream and strawberry ice cream, how many would choose chocolate ice cream? How many would choose strawberry?*
- *If you had a choice between chocolate ice cream, strawberry ice cream, and cookies and cream ice cream, which one would you choose?*

Calculate the percentage of students who preferred chocolate ice cream in each survey. Discuss with the students the differences in the data from the three surveys.

Ask the following questions:

♦ *If the cafeteria manager used the results from our survey, what kind of ice cream should he or she buy?*

♦ *Do you suppose other classes would have similar or different results if they did the same survey? Would the results be the same from two different classes, such as a first-grade class and a sixth-grade class?*

Discuss with the students how surveys often use a sample of people rather than asking all of the people involved. Decisions are often based on the results of a sample.

Presenting the Problem

1. Have the students read the *Hat Trick Problem* page. Have them discuss how the three surveys on ice cream could help them set up the surveys they need to create.

2. Review the four steps of the problem-solving process:

   – understanding the problem

   – making a plan

   – carrying out the plan

   – evaluating the solution

3. Discuss with the students the parameters of the final product. Suggest that they consider their visual product as a way to sell their group's ideas to the Top Knot Hat Company board of directors. The teacher will serve as the chairman of the board for the final presentations.

4. If groups have difficulty starting, use the *Things to Consider* page. This page provides guiding questions to help students complete the problem-solving steps.

5. Have students present their ideas and visual display to the class and the chairman of the board.

Evaluating the Results

1. Write the specifications of the project on the board or overhead, using the *Hat Trick Problem* page for the specifications. Have the students in the class evaluate each presentation and visual display for each part of the specifications.

2. After all of the presentations are complete, ask the students to compare the numbers used.

   ♦ *Did all groups use the same numbers?*

   ♦ *Why do you think this is so?*

3. Ask students to determine the reasonableness of the results.

    ♦ *Did each group answer the question?*

    ♦ *Did each group meet all of the parameters?*

4. Ask students to describe all of the ways they used the calculator during the project.

    ♦ *When the calculator was used in different ways, how did the results compare?*

    ♦ *How did the groups analyze the results for reasonableness?*

5. Ask them to extend their thinking.

    ♦ *What other kinds of hats could the Top Knot Hat Company make?*

Name _____

Date _____

Activity 7

Hat Trick

The Problem: What kind of sports team hats should the Top Knot Hat Company manufacture? How many of each kind should they make?

The marketing department of the Top Knot Hat Company has hired your team to gather information about students in your grade. They need to know favorite colors, typical hat sizes, and favorite sports teams so they can manufacture hats that will be good sellers.

The Facts

♦ You can use a survey to find information about a group of people.

♦ Some surveys do not ask every person in a group. They ask a sample of people. Your class can be the sample of students in your grade.

♦ Hat size is the diameter of a person's head to the nearest 1/8". The diameter of a head can be found by measuring the circumference and dividing by π (3.14 or $^{22}/_7$).

The Task

1. Your team will create a visual display showing:

   ♦ The results of your survey showing favorite colors, typical hat sizes, and favorite sports teams by percent

   ♦ Any other results you think are important to the Top Knot Hat Company

   ♦ Your team's recommendations to the Top Knot Hat Company about the number of hats they should make in each size, color, and logo

2. Each person on the team will write an explanation of the team's solution. This explanation will answer these questions:

   ♦ What surveys did your team make?

   ♦ What steps did your team follow to compute the numbers needed for your final report? Did the steps give reasonable answers? How do you know?

   ♦ What recommendations did your team make to the Top Knot Hat Company? Did the recommendations make sense? How do you know?

Things to Consider

Understanding the Problem

Read the *Hat Trick Problem* page and then answer these questions.

♦ Why does the Top Knot Hat Company want to know the favorite colors, the typical hat size, and the favorite sports teams for your grade?

♦ How can your team go about finding out that information?

♦ What is a sample?

Making a Plan

♦ What questions will be on your survey? Who will take the survey?

♦ How will you find out hat sizes? How many people do you need to measure to find out the right hat sizes for your grade?

♦ Your recommendations need to be specific. How will you decide how many of each kind of hat the company should make?

♦ How will you present your survey results?

Carrying Out the Plan

Before you begin your visual display, answer these questions:

♦ What does your visual display need to show? Do you have all of the necessary information? What other calculations do you need to make?

♦ How will you display your information? If you are trying to convince the board of directors to follow your team's advice, how can your display help? What other information might be helpful?

Evaluating the Solution

♦ Did you answer the questions on the *Hat Trick Problem* page? How do you know?

♦ Does your answer make sense? How did your team use the results of the surveys?

♦ Do the calculations for the hat sizes make sense? The hat size times 3 should be about the same as the circumference of the head.

♦ Did everyone in the group write an explanation?

Hat Trick: Using π

The Greek letter pi (π) is used to represent the numerical relationship between the circumference of a circle and its diameter. If you know either the circumference or the diameter, you can use π to find the other. For example, if you know the diameter of a circle, you can multiply it by π and find the circumference. If you know the circumference, how can you find the diameter?

Try these problems with the calculator:

1. Hai is in charge of a taste test for several different soft drinks. He needs to cover the cans with paper so no one knows which soft drink is in each can. He knows each can has a diameter of about 7 cm. He needs to know the circumference in order to cut the paper.

Press:	The display shows:
7 ⊠ π Enter	
F↔D to change the display to a number	

If the can is 15 cm high, what size rectangle does Hai need to cut to cover the cans?

2. Delbert is in charge of the Basketball Throw at the school carnival. He is going to use small basketballs for the event. He needs to find a ring the right size for the basketball hoop. Unfortunately, the rings are sold by diameter size. He knows the small basketball has a circumference of 36 cm. What size ring should he buy?

Press:	The display shows:
36 ÷ π Enter	

Do you need to use the F↔D key? If the number is the diameter of the basketball, what size ring should Delbert buy?

Sometimes it is helpful to use the fractional equivalent of π.

For the next problem, use $^{22}/_7$ as π.

3. The On-Time Clock Company needs to buy boxes for their clocks. The Deluxe Model Clock has a circumference of 24 inches. The square boxes come in the following sizes: 7 inches, 7¼ inches, 7 ½ inches, 7 ¾ inches, and 8 inches. The clock needs to fit snugly in the box for shipping. Which box would be the best for the clock?

Press:	The display shows:
24 ÷ 22 ⏹ 7 ⏹ Enter	

Does the display show a mixed number? Is it in simplest terms? How can you tell?

(When the answer is in simplest terms, it has a denominator of 11.)

How will you decide which box to use? How would your answer be different if you used the ⏹ key?