Bridge to Algebra

Homework Helper

Carnegie Learning™
THE COGNITIVE TUTOR® COMPANY

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Pittsburgh, PA
Phone 888.851.7094
Fax 412.690.2444

www.carnegielearning.com

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Homework Helper

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Introduction

Welcome to Carnegie Learning's Cognitive Tutor® ***Bridge to Algebra*** curriculum!
We are excited that your student will be part of our unique approach to learning mathematics.

A Better Approach to Mathematics for Your Student

Research and field tests have validated that Carnegie Learning's approach helps students to improve their course grades and overall achievement. Whether your student excels in or struggles with mathematics, the Cognitive Tutor® ***Bridge to Algebra*** curriculum will help your student strengthen skills, content knowledge, and confidence.

The curriculum uses a scientifically-researched approach based on 20 years of investigation into how students think, learn, and apply new knowledge in mathematics. Based on extensive research and design at Carnegie Mellon University, and field-tested by leading mathematics educators, our approach uses students' intuitive problem solving abilities as a powerful bridge to a more formal understanding of mathematics.

Software and Textbook Blended Curriculum

The Cognitive Tutor® ***Bridge to Algebra*** curriculum is a blended curriculum in which the software and text components complement one another. Your student will spend about 40% of class instructional time using computer-based tutorials and 60% using the *Student Text* to collaborate with peers and work with his or her teacher.

Students work at their own pace in the software component of the curriculum. The learning system is built on *cognitive models,* which represent the knowledge that a student might possess about the mathematics that they are studying. The software assesses students' prior mathematical knowledge on a step-by-step basis and presents problems tailored to their individual skill levels.

Using the Cognitive Tutor ***Bridge to Algebra*** software, your student will receive the benefits of individualized instruction, ample practice, immediate feedback, and coaching. Just-in-Time Hints, On-Demand Hints, and positive reinforcement will put your student in control of his or her own learning.

The Cognitive Tutor® ***Bridge to Algebra*** *Student Text* offers lessons that parallel and extend the development of concepts in the software. The lessons emphasize written analyses and classroom presentations. Your student will engage in problem solving and reasoning, and will communicate using multiple representations of math concepts. The *Student Text* provides an opportunity for analysis, extended investigation, and the exploration of alternate solution paths. Real-world situations are used in problems designed to emphasize conceptual understanding. The goal of the *Student Text* is to be engaging and effective so your student will have fun while "Learning by Doing."

A Closer Look at the Cognitive Tutor Bridge to Algebra Software

Skills for the Real World Because people draw on basic mathematical reasoning skills for common tasks such as cashing a paycheck, estimating the cost of a rental car, planning a garden, or choosing between long-distance telephone service carriers, these types of problems form the core of the Cognitive Tutor® ***Bridge to Algebra*** software.

Monitoring and Feedback The Cognitive Tutor ***Bridge to Algebra*** software monitors student activities as they work and provides them with feedback to individualize instruction. If a student makes an error, for example, the software will indicate why the answer is incorrect, or pose a thought-provoking question to redirect the student's reasoning. Through individualized feedback, the software keeps students on task, marks progress, and gives students a sense of accomplishment. The software also identifies areas in which a student is having difficulty and presents the student with problems that target those specific skills.

Optimizing Classroom Time By individualizing instruction and targeting each student's strengths and weaknesses, the Cognitive Tutor® ***Bridge to Algebra*** software can maximize the effectiveness of both the student's and the teacher's use of classroom time. The software immediately shows students whether their problem solving strategies and mathematical skills will be successful, allowing them to focus on correcting errors and developing skills that they find difficult. By using the diagnostic tools that accompany the software, teachers are free to interact with students on an individual basis and to target struggling students.

A Closer Look at the Cognitive Tutor Bridge to Algebra Student Text

Multiple Representations Throughout the Cognitive Tutor® ***Bridge to Algebra*** *Student Text*, deliberate connections are made between different representations in mathematics. For instance, students are shown that fractions, decimals, and percents are different ways to represent numbers, and that tables, graphs, and equations are different ways to represent functions.

Collaborative Learning Focus The *Student Text* emphasizes the collaborative learning instruction model. Icons are placed at the beginning of problems in the lessons that encourage working in partner teams and in small groups. The instructional model icons are:

- Discuss to Understand
- Think for Yourself
- Work with Your Partner
- Work with Your Group
- Share with the Class

Students Learn the Language of Mathematics As well as working collaboratively, students learn to communicate the mathematics that they learn through speaking and writing. For instance, the problems in the *Student Text* include the following types of directions:

- Use a complete sentence to explain your answer.
- Explain how you solved the problem to your partner.
- Share what your group discovered with the entire class.

Teachers will also encourage students to prepare formal presentations of their work and to present their findings. This type of communication strengthens conceptual understanding.

The Scope of the Curriculum

The Cognitive Tutor® ***Bridge to Algebra*** curriculum includes the following software units and *Student Text* chapters, covering the five mathematics strands identified in the NCTM standards and most state standards: number and operations, geometry, measurement, probability and statistics, and algebra.

- Number Sense and Algebraic Thinking
- Fractions
- Operations with Fractions and Mixed Numbers
- Decimals
- Ratio and Proportion
- Percents
- Integers
- Algebraic Problem Solving
- Geometric Figures and Their Properties
- Area and the Pythagorean Theorem
- Probability and Statistics
- Volume and Surface Area
- Linear Functions
- Number Systems
- Transformations

A Typical Week in a Cognitive Tutor Bridge to Algebra Classroom

The Cognitive Tutor® ***Bridge to Algebra*** classroom is a dynamic, adaptive environment. While no two weeks will be exactly the same in the Cognitive Tutor® ***Bridge to Algebra*** classroom, most weeks will be split between classroom activities and work in the computer lab. The number of sessions of each type that the teacher schedules depends on the teacher's preference and the availability of lab time. Carnegie Learning suggests that students spend 40% of their class time in the computer lab working with the computer and 60% with *Student Text* investigations. Below is an itinerary outlining a typical mid-semester week.

Monday

- Students complete the *Student Text* investigation started on Friday with group presentations.
- Teacher solicits questions on the completed investigation and wraps up the investigation by asking questions that lead students to reflect on the material covered.
- Students begin a new *Student Text* investigation.

Tuesday

- Students complete about half of the investigation started on Monday.
- Teacher has students respond to a writing prompt to summarize their work.

Wednesday

- Students work with the software in the computer lab.

Thursday

- Students complete the investigation started on Tuesday.
- Partners present their findings of Tuesday's investigation using a written format.
- Teacher solicits questions and comments on the completed investigation, wraps up the investigation by asking questions that lead students to apply their knowledge of the material covered.

Friday

- Students work with the software in the computer lab.

How to Use the Homework Helper

The Homework Helper includes a practice page for each lesson in your student's *Student Text*. The page includes a worked example of the skills covered in the lesson. You may review the example with your student or have the student try the example without seeing the solution, and then review the example together.

Each page of the Homework Helper also has practice exercises that your student can try. The answers to the exercises are included at the back of the Homework Helper. Encourage your student to complete the solution before looking at the answer.

You can help your student to understand important mathematics vocabulary by reviewing the key words in a lesson.

Other Ways to Help Your Student

Encourage your student to share what he or she has been doing in mathematics class by showing you the lessons of his or her *Student Text*.

Support your student in completing his or her homework regularly by creating a consistent homework time each evening.

Use praise to encourage your students that he or she will succeed through persistent effort in working on the homework assignments.

Carnegie Learning's Ongoing Support

Teacher Training Teacher Training gives educators the opportunity to understand the philosophy and application of the Carnegie Learning approach to mathematics. The training also provides important insights into the Cognitive Tutor® ***Bridge to Algebra*** curriculum's pedagogical, implementation, and assessment features.

Training sessions are conducted by Certified Implementation Specialists (CISs). Every CIS is a current or former mathematics teacher who has completed in-depth training from Carnegie Learning's staff of educators, technology specialists, and curriculum developers.

Family Math Night Carnegie Learning offers families the opportunity to become involved through special programs such as our Family Math Night, in which parents come into their student's classroom to experience first-hand how the Cognitive Tutor® ***Bridge to Algebra*** curriculum helps students learn mathematics. Students and their teachers work together to assist parents in solving mathematics problems using the Cognitive Tutor ***Bridge to Algebra*** software and *Student Text* investigation.

Contents

1.1 Money, Money, Who Gets the Money?

Introduction to Picture Algebra

Students should be able to answer these questions after Lesson 1.1:

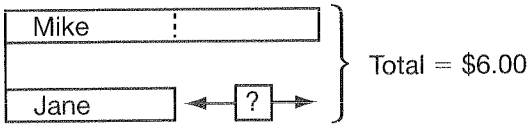
- How do you use pictures to represent a problem?
- What is the order of operations?
- How do you solve an equation?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Mike and Jane stopped at the Kwik Mart for snacks. They each bought a bottle of water. Mike also bought a sandwich for \$2.50 and Jane bought a salad for \$1.50. If their combined bill was \$6.00, what is the cost of a bottle of water?

Step 1 Draw a picture.



Step 2 Determine how much less Jane spent than Mike spent. Mike spent \$2.50 plus the cost of the water and Jane spent \$1.50 plus the cost of the water. So, Jane spent \$3.50 − \$2.50 = \$1.00 less than Mike.

Step 3 Subtract \$1.00 from \$6.00 to get \$5.00. Then divide \$5.00 by 2 to find the total amount that Jane spent. So, Jane spent \$5.00 ÷ 2 = \$2.50.

Step 4 Mike spent \$1.00 more than Jane. So, Mike spent \$2.50 + \$1.00 = \$3.50.

Step 5 Find the cost of the bottle of water by subtracting the cost of the salad from the total amount that Jane spent. So, the bottle of water cost \$2.50 − \$1.50 = \$1.00.

2. George bought 5 gallons of gasoline at ReadyGas for \$2.20 per gallon. He also bought a gallon of windshield washer fluid. The total bill was \$12.25. How much does a gallon of windshield washer fluid cost at ReadyGas?

3. Jodi is 13 years old. She is 3 years older than twice her sister Trudi's age. How old is Trudi?

1.2 Collection Connection

Factors and Multiples

1

Students should be able to answer these questions after Lesson 1.2:

- What is a factor pair?
- What is a multiple?
- What is divisibility?
- What is the Commutative Property of Multiplication?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Find all of the factor pairs of 56. Then list the unique factor pairs.

Step 1 List all of the numbers that, when multiplied together, give a product of 56. Start by listing the numbers 1 through 9. Then multiply each by another number that you think may give 56. Not all of the numbers will turn out to be factors of 56.

$1 \times \_\_\_ = 56$ $2 \times \_\_\_ = 56$ $3 \times \_\_\_ = 56$ $4 \times \_\_\_ = 56$ $5 \times \_\_\_ = 56$

$6 \times \_\_\_ = 56$ $7 \times \_\_\_ = 56$ $8 \times \_\_\_ = 56$ $9 \times \_\_\_ = 56$

Step 2 Identify the factor pairs that give a product of 56.

$1 \times 56 = 56$ $2 \times 28 = 56$ $4 \times 14 = 56$

$7 \times 8 = 56$ $8 \times 7 = 56$

Step 3 List the factor pairs of 56 from Step 2.

1, 56 2, 28 4, 14 7, 8 8, 7

These are numbers that, when multiplied together, give a product of 56.

Step 4 Use the Commutative Property of Multiplication to eliminate any pairs that are the same, except for position in the expression. This will leave the unique factor pairs of 56.

1, 56 2, 28 4, 14 7, 8 ~~8, 7~~

Factors

When you multiply two numbers to produce another number, each number that you multiply is a factor of the resulting number. A factor pair is two numbers that are multiplied together to produce another number.

2. Find the unique factor pairs of 72.

3. Find the unique factor pairs of 90.

1.3 Dogs and Buns

Least Common Multiple

Students should be able to answer these questions after Lesson 1.3:

- What is a common multiple of two or more numbers?
- What is the least common multiple of two or more numbers?
- How do you find the least common multiple?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Find common multiples of 5 and 8. Then identify the least common multiple (LCM).

Step 1 List the first ten multiples of both 5 and 8.

$5 \times 1 = 5$	$5 \times 2 = 10$	$5 \times 3 = 15$	$5 \times 4 = 20$	$5 \times 5 = 25$
$5 \times 6 = 30$	$5 \times 7 = 35$	$5 \times 8 = 40$	$5 \times 9 = 45$	$5 \times 10 = 50$
$8 \times 1 = 8$	$8 \times 2 = 16$	$8 \times 3 = 24$	$8 \times 4 = 32$	$8 \times 5 = 40$
$8 \times 6 = 48$	$8 \times 7 = 56$	$8 \times 8 = 64$	$8 \times 9 = 72$	$8 \times 10 = 80$

Step 2 Look for common multiples.

$5 \times 1 = 5$	$5 \times 2 = 10$	$5 \times 3 = 15$	$5 \times 4 = 20$	$5 \times 5 = 25$
$5 \times 6 = 30$	$5 \times 7 = 35$	$5 \times 8 = (40)$	$5 \times 9 = 45$	$5 \times 10 = 50$
$8 \times 1 = 8$	$8 \times 2 = 16$	$8 \times 3 = 24$	$8 \times 4 = 32$	$8 \times 5 = (40)$
$8 \times 6 = 48$	$8 \times 7 = 56$	$8 \times 8 = 64$	$8 \times 9 = 72$	$8 \times 10 = 80$

Step 3 Identify the least common multiple from the common multiples you identified. For 5 and 8, the LCM is 40.

Multiples

When a multiple of one number is also a multiple of another number, the multiple is a common multiple. The smallest common multiple is called the least common multiple (LCM).

2. Find the first ten common multiples of 4 and 6. Then identify the LCM.

3. Find the first ten common multiples of 15 and 18. Then identify the LCM.

1.4 Kings and Mathematicians

Prime and Composite Numbers

1

Students should be able to answer these questions after Lesson 1.4:

- What is a prime number? How do you identify a prime number?
- What is a composite number? How do you identify a composite number?
- What is the multiplicative identity?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Which of the following numbers are prime numbers? How do you know?

18, 29, 61, 69, 87

Step 1 Use any method you choose to find factors for all of the numbers.

$3 \times 6 = 18$; So, 18 is a composite number.

$3 \times 23 = 69$; So, 69 is a composite number.

$3 \times 29 = 87$; So, 87 is a composite number.

Step 2 The numbers that are left have no whole number factors except the number itself and 1.

$1 \times 29 = 29$ $1 \times 61 = 61$

So, 29 and 61 are prime numbers.
When the number 1 is multiplied by any number, the product is the number. Because of this special property, the number 1 is called the multiplicative identity.

Prime and Composite Numbers

Numbers greater than 1 with exactly two whole number factors, 1 and the number itself, are called prime numbers. Numbers that have more than two whole number factors are called composite numbers. The number 1 is a special case and is called the multiplicative identity.

2. Which of the following numbers are prime numbers?

27, 41, 51, 55, 63

3. Which of the following numbers are prime numbers?

83, 97, 99, 119, 127, 189

1.5 I Scream for Ice Cream

Prime Factorization

Students should be able to answer these questions after Lesson 1.5:

- What is a prime factor?
- What is prime factorization? How is it used?
- What is a factor tree?
- What is the Associative Property of Multiplication?

Directions

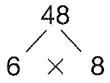
Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Use a factor tree to find the prime factorization of 48.

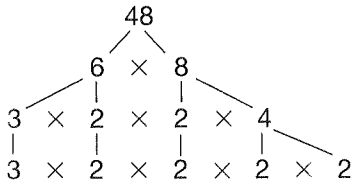
Step 1 Write 48 at the top of the tree.

48

Step 2 Pick any pair of whole number factors of 48. Draw a branch from 48 to each factor.



Step 3 If both of the factors are prime, you're finished. If not, use branches to write a factor pair for any composite factors.



Step 4 Rewrite the number as the product of all of the prime factors that you have identified.

$3 \times 2 \times 2 \times 2 \times 2 = 48$

2. Use a factor tree to find the prime factorization of 72.

3. Use a factor tree to find the prime factorization of 63.

1.6 Powers That Be

Powers and Exponents

1

Students should be able to answer these questions after Lesson 1.6:

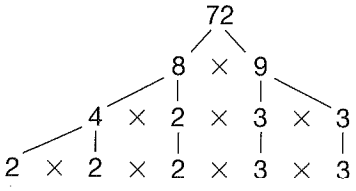
- What is a power? What is a base?
- What is an exponent?
- How can you use powers and exponents to write repeated multiplication?
- How can you use powers and exponents to write the prime factorization of a number?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Write the prime factorization of 72 using powers.

Step 1 Use any method you wish to find the prime factorization of 72. A factor tree is shown.



Step 2 Look at your prime factorization. Ask yourself whether any prime factors appear more than once.

$2 \times 2 \times 2 \times 3 \times 3$

Step 3 Raise each number that appears more than once to a power. The correct exponent is the number of times the number appears in the factorization. In this example, 2 appears three times. So, the correct power is 2^3. The number 3 appears two times. So, the correct power is 3^2.

Step 4 Express the powers as prime factors.

$2^3 \times 3^2 = 72$

Powers and Exponents

Powers, bases, and exponents are a way of expressing repeated multiplication. The base is the factor. The exponent is the number of times the factor is repeated. Together, the two parts are called a power. For instance, in the expression 3^2, 3 is the base and 2 is the exponent. It is read "three squared," "three to the second power," "the second power of three," or "three raised to the second power."

2. Write the prime factorization of 54 using powers.

3. Write the prime factorization of 272 using powers.

1.7 Beads and Baubles

Greatest Common Factor

Students should be able to answer these questions after Lesson 1.7:

- What is the greatest common factor (GCF) of two or more numbers?
- How can you find the greatest common factor?

Directions

Read Question 1 and its solution. Then complete Questions 2 and 3.

1. Identify common factors of 16, 56, and 72. Then identify the greatest common factor.

Step 1 Find all of the factors of each number. Begin by finding all of the unique factor pairs for each number.

$16 = 1 \times 16$, 2×8, and 4×4

$56 = 1 \times 56$, 2×28, 4×14, and 7×8

$72 = 1 \times 72$, 2×36, 3×24, 4×18, 6×12, and 8×9

Greatest Common Factor

A common factor is a whole number that is a factor of two or more numbers. The greatest common factor is the greatest whole number that is a common factor of two or more numbers.

Step 2 List the unique factors for each number. Arrange the factors in order from least to greatest.

16 = 1, 2, 4, 8, 16

56 = 1, 2, 4, 7, 8, 14, 28, 56

72 = 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

Step 3 Compare the unique factors for each number and identify the greatest factor. The GCF of 16, 56, and 72 is 8.

16 = 1, 2, 4, (8) 16

56 = 1, 2, 4, 7, (8) 14, 28, 56

72 = 1, 2, 3, 4, 6, (8) 9, 12, 18, 24, 36, 72

2. Identify common factors of 65 and 117. Then identify the greatest common factor.

3. Identify common factors of 45, 54, and 108. Then identify the greatest common factor.

2.1 Comic Strips

Dividing a Whole into Fractional Parts

Students should be able to answer these questions after Lesson 2.1:

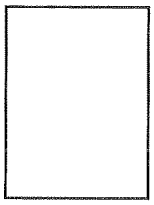
- How can you use fractions to represent parts of a whole?
- What does each digit in a fraction represent?
- How can you use pictures to represent a fraction?

Directions

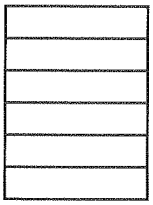
2 **Read Question 1 and its solution. Then, for Questions 2 and 3 draw a picture to represent the fraction. Finally, write the fraction to answer the question.**

1. The school newspaper will print 6 comic strips on a page. You have created 5 comic strips. How much of the page is going to have your work?

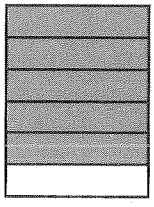
Step 1 Draw a rectangle to represent a page.



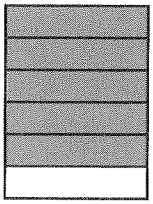
Step 2 Divide the rectangle into 6 equal parts.



Step 3 Shade the amount of the page that will contain your work.



Step 4 Write the fraction to answer the question.



Five out of the 6 parts, or $\frac{5}{6}$, of the page will be your work.

2. The newspaper will print 3 different stories on each page. You wrote 1 story. How much of the page will contain your work?

3. The newspaper will have 8 ads on a page. You put in 3 ads—one ad for your tutoring business, one ad to sell candy for the Spanish club, and one ad to sell your bicycle. How much of the page shows your ads?

2.2 Dividing Quesadillas

Dividing More Than One Whole into Parts

Students should be able to answer these questions after Lesson 2.2:

- How can you use fractions to divide more than one whole into equal parts?
- How can you tell whether a given solution is reasonable?

Directions

Read Question 1 and its solution. Then, for Question 2 evaluate the reasonableness of the solution and answer the question.

1. For an international foods festival, Mia wants to make beef satay—Indonesian shish kabobs. She has 50 sticks and 5 pounds of steak. Mia determines that she will put 1 pound of meat on each stick. Is she correct?

Step 1 Decide: Does Mia's answer seem reasonable? To determine its reasonableness, estimate the answer. What is the equation?

5 pounds divided by 50 sticks $= 5 \div 50$

Does $5 \div 50 = 1$? No, it is less than 1.

Mia's answer is not reasonable. Because Mia's answer is not reasonable, you need to find the true answer.

Step 2 Draw a diagram to represent the situation. Draw a rectangle to represent each pound of meat.

Step 3 Divide the meat evenly so there are 50 parts. $5 \div 50 = 0.1$ or $\frac{1}{10}$.
Divide each pound into 10 equally-sized pieces.

Step 4 Determine whether your method and solution are reasonable.

Is it reasonable to think that Mia will have the same amount of meat on 50 sticks if she puts $\frac{1}{10}$ of a pound on each stick? Yes, the sticks get the same amount and each piece is the same size. Mia needs to put $\frac{1}{10}$ of a pound of steak on each stick to make 50 sticks of satay.

2. Mia did not know how popular satay would be! At the festival, 150 people want to try her 50 sticks of satay. Mia decides that she will have to break each stick into thirds to feed everyone. Is Mia correct that everyone will get $\frac{1}{3}$ of a stick of satay?

2.3 No "I" in Team

Dividing Groups into Fractional Parts

Students should be able to answer these questions after Lesson 2.3:

- How can you use fractions to represent portions of a whole?
- How can diagrams help you solve problems with fractions?

Directions

Read Question 1 and its solution. Then, for Question 2 draw a diagram to represent the information in the problem. Finally, answer the questions.

1. The science club has several teams for different competitions. Each member of the club is on one team. The robotics team has 5 boys and 3 girls, the inventors team has 5 boys and 6 girls, the chemicals team has 3 boys and 4 girls, and the problem-solving team has 8 boys and 7 girls. How many students are in the science club? What fraction of the club members are girls?

Step 1 Make an organized list to represent the boys and girls on each team. The first letter represents the team, the second letter represents boy or girl.

RB RB RB RB RB RG RG RG IB IB IB IB IB IG IG IG IG IG IG CB CB CB CG CG CG CG PB PB PB PB PB PB PB PB PG PG PG PG PG PG PG

Step 2 To find the total number of students in the science club, add the number of students.

$5 + 3 + 5 + 6 + 3 + 4 + 8 + 7 = 41$

There are 41 students in the science club.

Step 3 To find the fraction of the club members that are girls, add all of the girls on the different teams.

$3 + 6 + 4 + 7 = 20$

Step 4 Then, write the number of girls as the numerator and the total number of students as the denominator.

So, $\frac{20}{41}$ are girls.

2. A track team has a girls team and a boys team. Each team member has one specialization. Four girls and 4 boys are relay runners, 4 girls and 6 boys are distance runners, and 3 girls and 2 boys do the long jump. Make an organized list of the team.

What fraction of the team does the long jump?

What fraction of the team are boys?

What fraction of the girls do relay or distance running?

2.4 Fair Share of Pizza

Equivalent Fractions

Students should be able to answer these questions after Lesson 2.4:

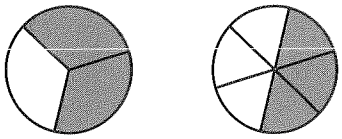
- What are equivalent fractions?
- How can you find equivalent fractions?

Directions

Read Question 1 and its solution. Then, for Questions 2 and 3 draw a picture to represent the fraction. Finally, write the fraction to answer the question.

1. Amber ate $\frac{2}{3}$ of a pizza. Bob had $\frac{3}{6}$ of another pizza. Did they eat the same amount?

Step 1 Draw a diagram of each person's pizza.



Amber Bob

Step 2 The figures represent different amounts. To check your work, write $\frac{2}{3}$ as an equivalent fraction with a denominator of 6.

$$\frac{2}{3} = \frac{2 \times \square}{3 \times \square} = \frac{\square}{6}$$

Step 3 Multiply the denominator, 3, by 2 to get the new denominator, 6. Multiply the numerator by 2 to complete the equivalent fraction.

$$\frac{2}{3} = \frac{2 \times \boxed{2}}{3 \times \boxed{2}} = \frac{\boxed{4}}{6}$$

Step 4 Determine whether the amounts of pizza are the same or different.

$$\frac{4}{6} > \frac{3}{6}$$

So, $\frac{4}{6} = \frac{2}{3}$ is greater than $\frac{3}{6}$. Amber ate more pizza.

2. After the pizza party, there was $\frac{3}{12}$ of a pepperoni pizza left. Of the mushroom pizza, only $\frac{1}{4}$ was left. Are the amounts of pizza the same or different?

3. After the pizza party, there was $\frac{8}{15}$ of a cheese pizza left and $\frac{4}{5}$ of a supreme pizza left. Are the amounts of pizza the same or different?

2.5 When Twelfths Are Eighths

Simplifying Fractions

Students should be able to answer these questions after Lesson 2.5:

- What are simplest terms?
- How can you tell whether a fraction is in simplest form?

Directions

Read Question 1 and its solution. Then, for Questions 2 through 4 write the fraction in a complete sentence to answer the question.

1. Erika said that she planted her family's garden and $\frac{45}{60}$ plants are tomato plants.

This may tell you how many plants she had, but it's hard to imagine $\frac{45}{60}$ of a garden. Write the fraction in simplest form.

Step 1 Choose a method of simplifying and then set up the equation. Here we chose the method of finding the greatest common factor (GCF).

$$\frac{45}{60} = \frac{45 \div \square}{60 \div \square} = \frac{\square}{\square}$$

Step 2 Find the GCF of 45 and 60.

factors of 45: 1, 3, 5, 9, (15), 45

factors of 60: 1, 2, 3, 4, 5, 6, 10, 12, (15), 20, 30, 60

The GCF of 45 and 60 is 15.

Step 3 Divide the numerator and the denominator by the GCF.

$$\frac{45}{60} = \frac{45 \div \boxed{15}}{60 \div \boxed{15}} = \frac{\boxed{3}}{\boxed{4}}$$

Erika's garden is $\frac{3}{4}$ tomato plants.

2. Erika decided to plant $\frac{5}{60}$ of her garden with green peppers. Write the fraction in simplest form.

3. After a flood, $\frac{18}{45}$ of Erika's tomato plants died. Write the fraction in simplest form.

4. Erika discovered that a rabbit had eaten $\frac{3}{60}$ of her plants. Write the fraction in simplest form.

2.6 When Bigger Means Smaller

Comparing and Ordering Fractions

Students should be able to answer these questions after Lesson 2.6:

- What is the least common denominator (LCD)?
- How can you use the LCM to rewrite fractions?

Directions

Read Question 1 and its solution. Then, for Questions 2 through 4 use the greater than symbol > or the less than symbol < to compare the fraction pair.

1. Courtney bought new fish for her tank. Now $\frac{1}{4}$ of Courtney's fish are red. In Tasha's tank, $\frac{1}{3}$ are red. Who has a greater fraction of red fish?

Step 1 Compare the denominators to see whether they are the same. If so, compare the numerators. If not, go to Step 2.

$\frac{1}{4}$ $\frac{1}{3}$

Step 2 Find the least common multiple (LCM).

multiples of 4: 4, 8, (12), 16, 20, 24, 28, 32, 36, 40

multiples of 3: 3, 6, 9, (12), 15, 18, 21, 24, 27, 30

The LCM of 4 and 3 is 12.

Step 3 Use the LCM as the denominator for each fraction. Rewrite each fraction as equivalent fractions. The least common denominator (LCD) is the LCM of two or more denominators.

$\frac{1 \times 3}{4 \times 3} = \frac{3}{12}$ $\frac{1}{3} = \frac{1 \times 4}{3 \times 4} = \frac{4}{12}$

Step 4 Compare the equivalent fractions. Use > for "greater than" and < for "less than."

$\frac{3}{12} < \frac{4}{12}$ So, $\frac{1}{4} < \frac{1}{3}$.

Because $\frac{1}{4}$ is less than $\frac{1}{3}$, Tasha has a greater fraction of red fish.

2. $\frac{2}{3}$ ___ $\frac{3}{5}$

3. $\frac{1}{6}$ ___ $\frac{2}{9}$

4. Courtney remembers to feed her fish $\frac{7}{8}$ of the time. Tasha remembers to feed her fish $\frac{3}{4}$ of the time. Who remembers a greater fraction of the time?