Compare and Order Numbers

Essential Question  How can you compare and order numbers?

Grand Canyon National Park in Arizona had 651,028 visitors in July 2008 and 665,188 visitors in July 2009. In which year did the park have more visitors during the month of July?

- How many visitors were there in July 2008?
- How many visitors were there in July 2009?
During May 2008, the Mount Rushmore National Monument in South Dakota welcomed 138,202 visitors. A website reported that about 1 hundred thousand people visited the park during that month. Was the estimate reasonable?

An estimate tells you about how many or about how much. It is close to an exact amount. You can round a number to find an estimate.

1. What number is halfway between 100,000 and 200,000?

   ____________________________________________________________

2. How does knowing where the halfway point is help you find which hundred thousand 138,202 is closest to? Explain.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
Add Whole Numbers

Essential Question How can you add whole numbers?

Alaska is the largest state in the United States by area. Its land area is 570,374 square miles and its water surface area is 86,051 square miles. Find the total area of Alaska.

The area of Alaska is outlined in the photo above.

• Underline what you are asked to find.
• Circle the information you will use.
Mt. Bear and Mt. Bona are two mountains in Alaska. Mt. Bear is 14,831 feet tall and Mt. Bona is 16,421 feet tall. How much taller is Mt. Bona than Mt. Bear?
Hot air balloon festivals draw large crowds of people. The attendance on the first day of one festival was 17,350. On the second day the attendance was 18,925. How many more people attended the hot air balloon festival on the second day?

Use the graphic organizer to help you solve the problem.

**Read the Problem**

<table>
<thead>
<tr>
<th>What do I need to find?</th>
<th>What information do I need to use?</th>
<th>How will I use the information?</th>
</tr>
</thead>
</table>

**Solve the Problem**
Multiplication Comparisons

Essential Question: How can you model multiplication comparisons?

You can use multiplication to compare amounts. For example, you can think of $15 = 3 \times 5$ as a comparison in two ways:

- $15$ is $3$ times as many as $5$.
- $15$ is $5$ times as many as $3$.

\[
\begin{array}{c}
\text{15} \\
5 & 5 & 5 \\
3 & & \\
5 \\
\end{array}
\quad \quad
\begin{array}{c}
\text{15} \\
3 & 3 & 3 & 3 & 3 \\
3 & \\
\end{array}
\]

Carly has 9 pennies. Jack has 4 times as many pennies as Carly. How many pennies does Jack have?

• What do you need to compare?

\[
\text{Carly: 9 pennies} \\
\text{Jack: 4 times as many as Carly} \\
\]

• Explain how the equation for $4$ is $2$ more than $2$ is different from the equation for $4$ is $2$ times as many as $2$.

\[
\text{4 is 2 more than 2} \\
\text{4 is 2 times as many as 2} \\
\]

\[
\text{Explanation:} \\
\text{The first equation describes an addition.} \\
\text{The second equation describes a multiplication.} \\
\]

Remember:
The Commutative Property states that you can multiply two factors in any order and get the same product.
Multiply Tens, Hundreds, and Thousands

Essential Question  How does understanding place value help you multiply tens, hundreds, and thousands?

Each car on a train has 200 seats. How many seats are on a train with 8 cars?
UNLOCK the Problem

An elephant can reach as high as 23 feet with its trunk. It uses its trunk to pick up objects that weigh up to 3 times as much as a 165-pound person. About how much weight can an African elephant pick up with its trunk?

1. Is 200 less than or greater than 165? ________________

2. So, would the product of 3 and 165 be less than or greater than 600? ________________
UNLOCK the Problem

Properties of Multiplication can make multiplication easier.

There are 4 sections of seats in the Playhouse Theater. Each section has 7 groups of seats. Each group has 25 seats. How many seats are there in the theater?

Try This! Use mental math and properties.

A Find \((6 \times 10) \times 10\).

B Find \((4 \times 9) \times 250\).

Remember

The Associative Property states that you can group factors in different ways and get the same product. Use parentheses to group the factors you multiply first.
At the sea park, one section in the stadium has 9 rows with 18 seats in each row. In the center of each of the first 6 rows, 8 seats are in the splash zone. How many seats are not in the splash zone?

Use the graphic organizer to help you solve the problem.

<table>
<thead>
<tr>
<th>Read the Problem</th>
<th>Solve the Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do I need to find?</td>
<td></td>
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<tr>
<td>What information do I need to use?</td>
<td></td>
</tr>
<tr>
<td>How will I use the information?</td>
<td></td>
</tr>
</tbody>
</table>

- What else do you need to do to solve the problem?
A Thoroughbred racehorse can run at speeds of up to 60 feet per second. During practice, Celia’s horse runs at a speed of 36 feet per second. How far does her horse run in 3 seconds?

- Underline important information.
- Is there information you will not use? If so, cross out the information.
Crismari’s computer has 3 memory cards with 64 gigabytes of space each and 2 memory cards with 16 gigabytes of space each. The files on her computer use 78 gigabytes of space. How much memory does her computer have left?
Animation for a computer-drawn cartoon requires about 20 frames per second. How many frames would need to be drawn for a 30-second cartoon?

- The phrase “20 frames per second” means 20 frames are needed for each second of animation. How does this help you know what operation to use?

Compare the number of zeros in each factor to the number of zeros in the product. What do you notice?
The Smith family opens the door of their refrigerator 32 times in one day. There are 31 days in May. About how many times is it opened in May?

On average, a refrigerator door is opened 38 times each day. About how many fewer times in May is the Smith family’s refrigerator door opened than the average refrigerator door?

Show your work.
Multiply Using Partial Products

**Essential Question** How can you use place value and partial products to multiply 2-digit numbers?

**UNLOCK the Problem**

**CONNECT** You know how to break apart a model to find partial products. How can you use what you know to find and record a product?

**Multiply.** $34 \times 57$  **Estimate.** $30 \times 60 =$

---

**COMMON CORE STANDARD CC.4.NBT.5**

Use place value understanding and properties of operations to perform multi-digit arithmetic.
Lesson 3.6

Choose a Multiplication Method

Essential Question: How can you find and record products of two 2-digit numbers?

COMMON CORE STANDARD CC.4.NBT.5
Use place value understanding and properties of operations to perform multi-digit arithmetic.

Did you know using math can help prevent you from getting a sunburn?

The time it takes to burn without sunscreen multiplied by the SPF, or sun protection factor, is the time you can stay in the sun safely with sunscreen.

If today’s UV index is 8, Erin will burn in 15 minutes without sunscreen. If Erin puts on lotion with an SPF of 25, how long will she be protected?

Underline the sentence that tells you how to find the answer.
Circle the numbers you need to use. What operation will you use?

Sunscreen helps to prevent sunburn.
During the 2010 Great Backyard Bird Count, an average of 42 bald eagles were counted in each of 20 locations throughout Alaska. In 2009, an average of 32 bald eagles were counted in each of 26 locations throughout Alaska. Based on this data, how many more bald eagles were counted in 2010 than in 2009?

Use the graphic organizer to help you solve the problem.

**Read the Problem**

What do I need to find?

What information do I need to use?

How will I use the information?

**Solve the Problem**
Estimate Quotients Using Multiples

Essential Question: How can you use multiples to estimate quotients?

UNLOCK the Problem REAL WORLD

The bakery made 110 pumpkin muffins. They will be packed in boxes with 8 muffins in each box. About how many boxes will there be?

You can use multiples to estimate.

A multiple of a number is the product of a number and a counting number. 1, 2, 3, 4, and so on, are counting numbers.

Try This!

List the next 8 multiples of 10.
10, 20, ___________________________

List the next 7 multiples of 100.
100, 200, ___________________________
Magda has some leftover wallpaper 73 inches long. She wants to cut it into 8 pieces to use around the photos in her scrapbook. Each piece will have equal length. How long will each piece be?

When you solve a division problem with a remainder, the way you interpret the remainder depends on the situation and the question.

Try This!

Jim made 32 ounces of soup for 5 people. How many ounces will each person get?
Dustin is packing apples in gift boxes. Each gift box holds 4 apples. How many boxes can Dustin pack with 120 apples?

- **Explain** how to use a basic fact and place value to divide $4,000 \div 5$. 
A horse’s heart beats 132 times in 3 minutes. About how many times does it beat in 1 minute?

You can use compatible numbers to estimate quotients.

**Compatible numbers** are numbers that are easy to compute mentally.

- Will a horse’s heart beat more or fewer than 132 times in 1 minute?
- What operation will you use to solve the problem?
At camp, there are 5 players on each lacrosse team. If there are 125 people on lacrosse teams, how many teams are there?

- Underline what you are asked to find.
- Circle what you need to use.
- What operation can you use to find the number of teams?
Lucia and her dad will prepare corn for a community picnic. There are 3 bags of corn. Each bag holds 32 ears of corn. When the corn is cooked, they want to divide the corn equally among 8 serving plates. How many ears of corn should they put on each of 8 serving plates?

1. How many ears of corn should go on each plate? ________________

2. How can you check your answer? ___________________________________
Students in Carlo’s art class painted 32 square tiles for a mosaic. They will arrange the tiles to make a rectangle. Can the rectangle have 32 tiles arranged into 3 equal rows, without gaps or overlaps?

- Explain how you can tell if 4 is a factor of 30.
Chuck has a coin collection with 30 pennies, 24 quarters, and 36 nickels. He wants to arrange the coins into rows. Each row will have the same number of coins, and all the coins in a row will be the same. How many coins can he put in each row?

**Read the Problem**

**What do I need to find?**

**What information do I need to use?**

**How will I use the information?**

**Solve the Problem**
Toy animals are sold in sets of 3, 5, 10, and 12. Mason wants to make a display with 3 animals in each row. Which sets could he buy, if he wants to display all of the animals?

The product of two numbers is a multiple of each number. Factors and multiples are related.

$$3 \times 4 = 12$$

↑ ↑ ↑

factor factor multiple of 3
multiple of 4

- How many animals will be in each row?
- How many animals are sold in each set?
Daryl is making a pattern for a quilt. The pattern shows 40 squares. Every fourth square is blue. How many blue squares are in the pattern?

A **pattern** is an ordered set of numbers or objects. Each number or object in the pattern is called a **term**.

**Materials** ■ color pencils

1. What patterns do you see in the arrangement of the blue squares?

2. What patterns do you see in the numbers of the blue squares?
Generate Equivalent Fractions

Essential Question: How can you use multiplication to find equivalent fractions?

Patty needs $\frac{3}{4}$ cup of dish soap to make homemade bubble solution. Her measuring cup is divided into eighths. What fraction of the measuring cup should Patty fill with dish soap?

• Explain why 6 eighth-size parts is the same amount as 3 fourth-size parts.

• Is an eighth-size part of a measuring cup bigger or smaller than a fourth-size part?
Anaya is planting a flower garden. The garden will have no more than 12 equal sections. \(\frac{3}{4}\) of the garden will have daisies. What other fractions could represent the part of the garden that will have daisies?

**Essential Question** How can you use the strategy _make a table_ to solve problems using equivalent fractions?

**Read the Problem**

<table>
<thead>
<tr>
<th>What do I need to find?</th>
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<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

**Solve the Problem**

- What other fractions could represent the part of the garden that will have daisies? _Explain._ ________________

__________________________

__________________________
Compare Fractions

Essential Question  How can you compare fractions?

Every year, Avery’s school has a fair. This year, \(\frac{3}{8}\) of the booths had face painting and \(\frac{1}{4}\) of the booths had sand art. Were there more booths with face painting or sand art?
Compare and Order Fractions

Essential Question: How can you order fractions?

UNLOCK the Problem

Jody has equal-size bins for the recycling center. She filled \(\frac{3}{5}\) of a bin with plastics, \(\frac{1}{12}\) of a bin with paper, and \(\frac{9}{10}\) of a bin with glass. Which bin is the most full?

- Compare the distance between \(\frac{3}{5}\) and 0 and the distance between \(\frac{9}{10}\) and 0. What can you conclude about the relationship between \(\frac{3}{5}\) and \(\frac{9}{10}\)? Explain.

- Underline what you need to find.
- Circle the fractions you will compare.
Ms. Clark made a loaf of bread. She used \( \frac{1}{8} \) of the bread for a snack and \( \frac{5}{8} \) of the bread for lunch. How much did she use for a snack and lunch?
A rover needs to travel $\frac{5}{8}$ mile to reach its destination. It has already traveled $\frac{3}{8}$ mile. How much farther does the rover need to travel?
Mr. Fox has \(2\frac{3}{6}\) loaves of corn bread. Each loaf was cut into \(\frac{1}{6}\)-size pieces. If he has 14 people over for dinner, is there enough bread for each person to have 1 piece?

A **mixed number** is a number represented by a whole number and a fraction. You can write a mixed number as a fraction.

- **What is the size of 1 piece of bread relative to the whole?**
- **How much bread does Mr. Fox need for 14 people?**
After a party, there were $1\frac{4}{6}$ quesadillas left on one tray and $2\frac{3}{6}$ quesadillas left on another tray. How much of the quesadillas were left?

**What operation will you use?**

**Is the sum of the fractional parts of the mixed numbers greater than 1?**
Alejandro had $3\frac{4}{6}$ quesadillas. His family ate $2\frac{3}{6}$ of the quesadillas. How many quesadillas are left?
Subtraction with Renaming

Essential Question: How can you rename a mixed number to help you subtract?

Bruce, Chandler, and Chase go bike riding on weekends. On one weekend, Chase rode his bike for 3 hours, Chandler rode her bike for $2\frac{1}{4}$ hours, and Bruce rode his bike for $1\frac{3}{4}$ hours. How much longer did Chandler ride her bike than Bruce did?

1. If you have 1 fourth-size part, can you take away 3 fourth-size parts? Explain.

2. If you have 1 whole and 1 fourth-size part, can you take away 3 fourth-size parts? Explain.
The map shows four lighthouses in the Florida Keys and their distances apart in miles. The Dry Tortugas Lighthouse is the farthest west, and the Alligator Reef Lighthouse is the farthest east.

What is the distance from the Dry Tortugas Lighthouse to the Alligator Reef Lighthouse, traveling between the four lighthouses?
**Problem Solving • Multistep Fraction Problems**

**Essential Question** How can you use the strategy act it out to solve multistep problems with fractions?

A gift shop sells walnuts in $\frac{3}{4}$-pound bags. Ann will buy some bags of walnuts and repackage them into 1-pound bags. What is the least number of $\frac{3}{4}$-pound bags Ann could buy, if she wants to fill each 1-pound bag, without leftovers?

<table>
<thead>
<tr>
<th>Read the Problem</th>
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</tr>
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<tbody>
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<td><strong>What do I need to find?</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>How will I use the information?</strong></td>
<td></td>
</tr>
</tbody>
</table>
Name ________________________________

**Multiples of Unit Fractions**

**Essential Question** How can you write a fraction as a product of a whole number and a unit fraction?

---

**UNLOCK the Problem**

At a pizza party, each pizza was cut into 6 equal slices. At the end of the party, there was $\frac{5}{6}$ of a pizza left. Roberta put each of the leftover slices in its own freezer bag. How many bags did she use? What part of a pizza did she put in each bag?

- **How many slices of pizza were eaten?**
- **What fraction of the pizza is 1 slice?**

---

**Remember**

You can use multiplication to show repeated addition.

- $3 \times 4$ means $4 + 4 + 4$.
- $4 \times 2$ means $2 + 2 + 2 + 2$.

---

- **Explain** how you can write $\frac{3}{2}$ as the product of a whole number and a unit fraction.

---

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**COMMON CORE STANDARD** CC.4.NF.4a

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

---

Chapter 8  315
Jen is making 4 pans of baked ziti. For each pan, she needs \( \frac{2}{3} \) cup of cheese. Her measuring cup can scoop \( \frac{1}{3} \) cup of cheese. How many scoops of cheese does she need for the 4 pans?

**What if** Jen decides to make 10 pans of ziti? **Describe** the number of scoops of cheese she would need.
The deepest part of the Grand Canyon is about $1\frac{1}{6}$ miles deep. The deepest part of the ocean is located in the Mariana Trench, in the Pacific Ocean. The deepest part of the ocean is almost 6 times as deep as the deepest part of the Grand Canyon. About how deep is the deepest part of the ocean?
Ty is reading a book about metamorphic rocks. He has read \( \frac{7}{10} \) of the book. What decimal describes the part of the book Ty has read?

A **decimal** is a number with one or more digits to the right of the **decimal point**. You can write tenths and hundredths as fractions or decimals.

- How can you write 0.1 as a fraction? **Explain.**
Daniel spent a day hiking through a wildlife preserve. During the first hour of the hike, he drank $\frac{6}{10}$ liter of water. How many hundredths of a liter did he drink?

- Underline what you need to find.
- How can you represent hundredths?
Together, Marnie and Serena have $1.20. They want to share the money equally. How much money will each girl get?

Use the graphic organizer to solve the problem.

<table>
<thead>
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<tr>
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</tr>
</tbody>
</table>

- **Describe** another way you could act out the problem with coins.
The fourth grade classes are painting designs on tile squares to make a mural. Mrs. Kirk’s class painted $\frac{3}{10}$ of the mural. Mr. Becker’s class painted $\frac{21}{100}$ of the mural. What part of the mural is painted?

**UNLOCK the Problem**

**Essential Question** How can you add fractions when the denominators are 10 or 100?

**Try This!** Find $\frac{4}{100} + \frac{1}{10}$.

A Write $\frac{1}{10}$ as $\frac{10}{100}$.

B Add.

$$\frac{4}{100} + \frac{10}{100} = \frac{14}{100}$$

**COMMON CORE STANDARD** CC.4.NF.5
Understand decimal notation for fractions, and compare decimal fractions.
You can find patterns in fabric, pottery, rugs, and wall coverings. You can see patterns in shape, size, position, color, or number of figures.

Sofia will use the pattern below to make a wallpaper border. What might be the next three figures in the pattern?

Use the graphic organizer below to solve the problem.

---

### Read the Problem

<table>
<thead>
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<th>What do I need to find?</th>
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</tr>
</thead>
</table>

### Solve the Problem

...
The angle between two spokes on the bicycle wheel turns through $\frac{10}{360}$ of a circle. What is the measure of the angle between the spokes?

**UNLOCK the Problem**

**Real World**

The Penny Farthing bicycle was built in the 1800s.

• What part of an angle does a spoke represent? 

---

**Degrees**

**Essential Question:** How are degrees related to fractional parts of a circle?

**CONNECT** You can use what you know about angles and fractional parts of a circle to understand angle measurement. Angles are measured in units called **degrees**. Think of a circle divided into 360 equal parts. An angle that turns through $\frac{1}{360}$ of the circle measures 1 degree.

---

**Common Core Standards**  CC.4.MD.5a, CC.4.MD.5b
Geometric measurement: understand concepts of angle and measure angles.
Mr. Tran is cutting a piece of kitchen tile as shown at the right. He needs tiles with 45° angles to make a design. After the cut, what is the angle measure of the part left over? Can Mr. Tran use both pieces in the design?

Use the graphic organizer below to solve the problem.

### Read the Problem

**What do I need to find?**

**What information do I need to use?**

**How will I use the information?**

### Solve the Problem
Customary Units of Length

Essential Question  How can you use models to compare customary units of length?

You can use a ruler to measure length. A ruler that is 1 foot long shows 12 inches in 1 foot. A ruler that is 3 feet long is called a yardstick. There are 3 feet in 1 yard.

How does the size of a foot compare to the size of an inch?

Materials  ■ 1-inch grid paper ■ scissors ■ tape
Mass is the amount of matter in an object. Metric units of mass include kilograms (kg) and grams (g). Liters (L) and milliliters (mL) are metric units of liquid volume.

The charts show the relationship between these units.

<table>
<thead>
<tr>
<th>Metric Units of Mass</th>
<th>Metric Units of Liquid Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 kilogram (kg) = 1,000 grams (g)</td>
<td>1 liter (L) = 1,000 milliliters (mL)</td>
</tr>
</tbody>
</table>

Becky planted a flower garden full of bluebonnets. She used 9 kilograms of soil. How many grams of soil is that?

Becky used 5 liters of water to water her bluebonnet garden. How many milliliters of water is that?

- Are kilograms larger or smaller than grams?
- Will the number of grams be greater than or less than the number of kilograms?
- What operation will you use to solve the problem?
Essential Question: How can you use the strategy draw a diagram to solve elapsed time problems?

Dora and her brother Kyle spent 1 hour and 35 minutes doing yard work. Then they stopped for lunch at 1:20 P.M. At what time did they start doing yard work?

Use the graphic organizer to help you solve the problem.

<table>
<thead>
<tr>
<th>What do I need to find?</th>
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<th>How will I use the information?</th>
</tr>
</thead>
</table>

**What if** Dora and Kyle spent 50 minutes doing yard work and they stopped for lunch at 12:30 P.M.? What time would they have started doing yard work?
Herman is building a picnic table for a new campground. The picnic table is 5 feet 10 inches long. How long is the picnic table in inches?

Herman built the picnic table in 2 days. The first day he worked for 3 hours 45 minutes. The second day he worked for 2 hours 10 minutes. How long did it take him to build the table?

**COMMON CORE STANDARD CC.4.MD.2**
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

**Mixed Measures**

**Essential Question** How can you solve problems involving mixed measures?

---

- What if Herman worked an extra 5 minutes on the picnic table? How long would he have worked on the table then? Explain.
Lillian made the table below to relate two units of time. What units of time does the pattern in the table show?

- **Describe** the relationship between the numbers in each pair.

<table>
<thead>
<tr>
<th>Yards</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
</tr>
</tbody>
</table>

**Common Core Standard** CC.4.MD.1
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
Area

Essential Question  How can you use a formula to find the area of a rectangle?

**UNLOCK the Problem**

The base, \( b \), of a two-dimensional figure can be any side. The height, \( h \), is the measure of a perpendicular line segment from the base to the top of the figure.

Area is the number of square units needed to cover a flat surface. A square unit is a square that is 1 unit long and 1 unit wide. To find the area of a figure, count the number of square units inside the figure.

How are the base, height, and area of a rectangle related?

**Complete the table to find the area.**

<table>
<thead>
<tr>
<th>Figure</th>
<th>Base</th>
<th>Height</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Figure 1]</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>![Figure 2]</td>
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<td></td>
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<tr>
<td>![Figure 3]</td>
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<tr>
<td>![Figure 4]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. What relationship do you see among the base, height, and area?

2. Write a formula for the area of a rectangle. Use the letter \( A \) for area. Use the letter \( b \) for base. Use the letter \( h \) for height.

Formula: ____________________________
Jan is visiting a botanical garden with her family. The diagram shows two rectangular sections of the garden. What is the total area of the two sections?

Materials: grid paper

Common Core Standard: CC.4.MD.3
Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
Tanisha is painting a mural that is in the shape of a rectangle. The mural covers an area of 54 square feet. The base of the mural measures 9 feet. What is its height?

1. **What if** the mural were in the shape of a square with an area of 81 square feet? What would the height of the mural be? **Explain.**

2. **Explain** how you can find an unknown side length of any square, when given only the area of the square.
A landscaper is laying turf for a rectangular playground. The turf will cover the whole playground except for a square sandbox. The diagram shows the playground and sandbox. How many square yards of turf will the landscaper use?

Use the graphic organizer below to solve the problem.

### Problem Solving • Find the Area

**Essential Question** How can you use the strategy solve a simpler problem to solve area problems?

<table>
<thead>
<tr>
<th>Read the Problem</th>
<th>Solve the Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What do I need to find?</strong></td>
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