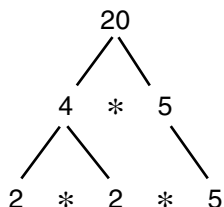


# Factor Trees



1. Make factor trees and find the prime factorization for the following numbers.

**Example:** 20



$$20 = 2 * 2 * 5$$

**a.** 66

**b.** 72

$$66 = \underline{\hspace{2cm}}$$

$$72 = \underline{\hspace{2cm}}$$

2. Write each fraction in simplest form. Use factor trees to help you. Show your work.

**a.**  $\frac{20}{66} = \underline{\hspace{2cm}}$

**b.**  $\frac{66}{72} = \underline{\hspace{2cm}}$

**c.**  $\frac{20}{72} = \underline{\hspace{2cm}}$

3. Find the prime factorization for 250.  $\underline{\hspace{2cm}}$

4. **a.** Circle the number that has the most prime factors.

63

32

49

100

- b.** Which has the fewest prime factors?  $\underline{\hspace{2cm}}$

5. Simplify the fraction to the right.  $\frac{150}{225} = \underline{\hspace{2cm}}$

## Practice

6.  $\frac{1}{4} * 36 = \underline{\hspace{2cm}}$

7.  $0.25 * 360 = \underline{\hspace{2cm}}$

8.  $\frac{1}{3} * 90 = \underline{\hspace{2cm}}$

9.  $33\frac{1}{3}\% \text{ of } 90 = \underline{\hspace{2cm}}$



**LESSON**  
**12•1**
**The Division Method for Prime Factorization**


Use the method below to find the prime factorization of the following numbers.

**Example:** Find the prime factorization for 732.

**Step 1** Divide, using the smallest prime factor of the number as the divisor.

**Step 2** The quotient becomes the dividend. Use the smallest prime factor as the divisor, and continue dividing until the quotient is a prime number.

$$2 \overline{) 732}$$

$$\text{Divide: } 732 \div 2 = 366$$

$$2 \overline{) 366}$$

$$\text{Divide: } 366 \div 2 = 183$$

2 is not a factor of 183.

The next smallest prime factor is 3.

$$3 \overline{) 183}$$

$$\text{Divide: } 183 \div 3 = 61$$

$$\underline{61} \text{ 61 is a prime number.}$$

The prime factorization of 732 is

$$2 * 2 * 3 * 61$$

**Step 3** Write the divisors as a multiplication expression.

$$\underline{732 = 2 * 2 * 3 * 61}$$

This is the prime factorization of 732.

Use the division method to find the prime factorizations. Show your work.

**1.** 1,056

\_\_\_\_\_

**2.** 3,190

\_\_\_\_\_

**3.** 24,598

\_\_\_\_\_

**LESSON**  
**12•1****Factor Trees and Adding Fractions**

1. Make factor trees and write the prime factorization for each number below.

a. 12

b. 42

c. 32

12 = \_\_\_\_\_ 42 = \_\_\_\_\_ 32 = \_\_\_\_\_

2. Add the following fractions. Use the factor trees above to help you find the least common multiple of the denominators. Use this least common multiple as a common denominator.

a.  $\frac{5}{12} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$   
 $+\frac{7}{32} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$   
 \_\_\_\_\_

b.  $\frac{41}{42} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$   
 $+\frac{1}{12} = \frac{\boxed{\phantom{00}}}{\boxed{\phantom{00}}}$   
 \_\_\_\_\_

3. Use factor trees or some other method to find a common denominator for the fraction pairs below. If you do not use factor trees, explain how you found the least common denominators.

a.  $\frac{5}{14}$  and  $\frac{2}{21}$  \_\_\_\_\_

b.  $\frac{7}{18}$  and  $\frac{16}{36}$  \_\_\_\_\_

c.  $\frac{9}{24}$  and  $\frac{21}{64}$  \_\_\_\_\_

**STUDY LINK**  
**12•2**

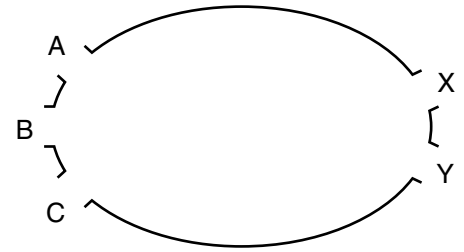
# Probability Investigations



## Multiplication Counting Principle

Suppose you can make a first choice in  $m$  ways and a second choice in  $n$  ways. Then there are  $m * n$  ways to make the first choice followed by the second choice. Three or more choices can be counted in the same way, by multiplying.

1. A person can enter the stadium shown at the right through any gate and can exit through any gate. In how many different ways can a person enter and exit the stadium?



$$\frac{\text{_____}}{\text{(ways to enter)}} * \frac{\text{_____}}{\text{(ways to exit)}} = \frac{\text{_____}}{\text{(total ways to enter and exit)}}$$

2. Draw a **tree diagram** to show all possible ways to enter and exit the stadium.

Entry gate: \_\_\_\_\_

Exit gate: \_\_\_\_\_

3. Do you think that all the ways to enter and exit are equally likely? \_\_\_\_\_

Explain your answer. \_\_\_\_\_

4. How many ways are there to enter and exit the same stadium if a person may not leave by the same gate through which he or she entered? \_\_\_\_\_

5. Sally takes a quiz with three true or false questions. She does not know the answer to any of the questions, so she guesses on all three.

- On the back of this page, draw a tree diagram to show Sally's possible results.
- What is the probability that she will get all three questions correct? \_\_\_\_\_



**LESSON**  
**12•2****Chance and Probability**

Things that happen are called **events**. For some events, you can be sure that they will or will not happen. For example, you can be sure that water will freeze at the North Pole, and you can be just as sure that tropical plants will not grow there.

When a number between 0 and 1 is used to tell the likelihood of something happening, the number is called a **probability**. The closer a probability is to 1, the more likely it is that the event will happen.

For many events, you cannot be sure that they will or will not happen, but you feel there is a chance. If Susan is a good soccer player, you might say, “Susan has a good chance of scoring in the soccer game.” If she is not one of the better players, you might say, “Susan does not have a good chance of scoring in the game.”

For the events below:

- ◆ Write C if you feel there is a chance that the event may or may not happen, but you cannot be sure.
- ◆ Write P if you feel you could assign a probability to the chance that the event may or may not happen.

1. You study for a test and feel you are prepared. What is the likelihood that you will pass the test? \_\_\_\_\_
2. You ask an adult for permission to go to a movie with friends and the answer is “maybe.” What is the likelihood that you will be able to go to the movie? \_\_\_\_\_
3. What is the likelihood that a die will land on 1 or 2? \_\_\_\_\_
4. What is the likelihood that next year, every student in your class will have a new baby brother? \_\_\_\_\_
5. You have 4 pairs of white socks and 2 pairs of blue socks in a drawer. What is the likelihood that the first sock you pull from the drawer will be blue? \_\_\_\_\_

Describe an event for each type.

6. C: \_\_\_\_\_  
\_\_\_\_\_

7. P: \_\_\_\_\_  
\_\_\_\_\_

**STUDY LINK**  
**12•3**

# Ratios



Ratios can be stated or written in a variety of ways. Sometimes a ratio is easier to understand or will make more sense if it is rewritten in another form.

**Example:** In a group of 25 students, 16 students walk to school and 9 take a bus. The ratio of students who take a bus compared to all students in the group can be expressed in the following ways:

- ◆ With words: Nine out of twenty-five students take a bus.
- ◆ With a fraction:  $\frac{9}{25}$  of the students take a bus.
- ◆ With a percent: 36% of the students take a bus.
- ◆ With a colon between the two numbers being compared: The ratio of students who take a bus to all students in the group is 9:25 (nine out of twenty-five).

Revise the above statements to express the ratio of students who walk to school to all students.

1. With words: \_\_\_\_\_ students walk to school.
2. With a fraction: \_\_\_\_\_ of the students walk to school.
3. With a percent: \_\_\_\_\_ of the students walk to school.
4. With a colon: The ratio of students who walk to school to all students is \_\_\_\_\_.

In each problem, fill in the ovals next to each correct ratio.

5. Fifty cars drove past in 10 minutes. Twenty-three cars were blue.

☐ 23:50 of the cars were blue.

☐ 23% of the cars were blue.

☐ 0.46 of the cars were blue.

6. In a group of 9 people, 6 were swimmers.

☐  $\frac{2}{3}$  of the people were swimmers.

☐ 6:9 of the people were swimmers.

☐  $66\frac{2}{3}\%$  of the people were swimmers.

7. In a sports shop, 35 of the 40 caps sold the day before the World Series were baseball caps.

☐ 7 out of 8 caps sold were baseball caps.

☐ 35% of the caps sold were baseball caps.

☐ 35:40 of the caps sold were baseball caps.











































**LESSON**  
**12•3**


# Picturing Ratios




The following pictograph shows how the 785 students at Windward Academy responded to a survey about the activities they thought were the most summer fun.

**Pictograph of Summer Fun Data**

Swimming	       
Traveling	              
Organized Sports	       
Bike Riding	   
Reading	 
Other	  

Each  represents 20 students.

Use the pictograph to answer the questions.

1. How many  would represent 100 students? \_\_\_\_\_
2. Which activity is the most popular for students at Windward Academy? \_\_\_\_\_
3. Which activity is about  $\frac{1}{2}$  as popular as traveling? \_\_\_\_\_
4. Which activity is five times more popular than reading? \_\_\_\_\_
5. Explain how using a pictograph to solve simple ratio problems is different from using only numbers. Use an example to support your explanation.

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**LESSON**  
**12•3****Imagining 10 Times More or 10 Times Less**

On a separate sheet of paper, write a story about what your life might be like if suddenly . . .

- ◆ everything became 10 times larger or 10 times more;

*or*

- ◆ everything became 10 times smaller or 10 times less.

Use your imagination, but be specific. Give counts and measurements. Compare the way things are now with the way they would change. Give at least five examples of how things would be different.

**Example:** If everything were 10 times less, I could get to school in 2 minutes instead of the 20 minutes it takes me now. There would be only 3 people on the bus instead of the usual 30. My lunch would cost 30 cents instead of \$3.00.

**LESSON**  
**12•3****Imagining 10 Times More or 10 Times Less**

On a separate sheet of paper, write a story about what your life might be like if suddenly . . .

- ◆ everything became 10 times larger or 10 times more;

*or*

- ◆ everything became 10 times smaller or 10 times less.

Use your imagination, but be specific. Give counts and measurements. Compare the way things are now with the way they would change. Give at least five examples of how things would be different.

**Example:** If everything were 10 times less, I could get to school in 2 minutes instead of the 20 minutes it takes me now. There would be only 3 people on the bus instead of the usual 30. My lunch would cost 30 cents instead of \$3.00.

**LESSON**  
**12•3****More Ratios**

1. There are 12 children on a bus. In all, 50 people are on the bus. Express the ratio of children to all people on the bus.
  - a. With words: \_\_\_\_\_ people on the bus are children.
  - b. With a fraction: \_\_\_\_\_ of the people on the bus are children.
  - c. With a percent: \_\_\_\_\_ of the people on the bus are children.
  - d. With a colon: The ratio of children to all people on the bus is \_\_\_\_\_.
  
2. In Mrs. Horton's fifth-grade class, 6 students own a cat. In all, 20 students own pets. Express the ratio of cat owners to all pet owners in the class.
  - a. With words: \_\_\_\_\_ pet owners are cat owners.
  - b. With a fraction: \_\_\_\_\_ of all pet owners are cat owners.
  - c. With a percent: \_\_\_\_\_ of all pet owners are cat owners.
  - d. With a colon: The ratio of cat owners to all pet owners is \_\_\_\_\_.
  
3. In a survey about favorite flavors of ice cream, 8 people said they liked chocolate ice cream best. A total of 24 people were surveyed. Express the ratio of people who chose chocolate ice cream as their favorite to all the people surveyed.
  - a. With words: \_\_\_\_\_ people surveyed prefer chocolate.
  - b. With a fraction: \_\_\_\_\_ of the people surveyed prefer chocolate.
  - c. With a percent: \_\_\_\_\_ of the people surveyed prefer chocolate.
  - d. With a colon: The ratio of people who prefer chocolate to all the people surveyed is \_\_\_\_\_.

**STUDY LINK**  
**12•4**

# Ratio Problems



1. Draw 20 tiles so that 2 out of 10 tiles are white and the rest are shaded.

- a. How many tiles are white? \_\_\_\_\_ tiles
- b. How many tiles are shaded? \_\_\_\_\_ tiles

2. Draw 9 shaded tiles.

Add white tiles until 2 out of 5 tiles are white.

How many tiles are there in all? \_\_\_\_\_ tiles

3. Imagine 48 tiles. If 4 out of 12 tiles are white, how many tiles are white? \_\_\_\_\_ tiles
4. There are 24 players on the soccer team. Two out of every 3 players have not scored a goal yet this year. How many players have scored a goal this year? \_\_\_\_\_ players
5. For every 8 spelling tests Justine took, she earned 3 perfect scores. If Justine earned 12 perfect scores this year, how many spelling tests did she take? \_\_\_\_\_ tests

**Practice**

6.  $92 \overline{)9,054} \rightarrow$  \_\_\_\_\_

7.  $98 * 92 =$  \_\_\_\_\_

8.  $90.16 + 0.38 =$  \_\_\_\_\_

9.  $90.54 * 10^2 =$  \_\_\_\_\_



**LESSON**  
**12•4****Writing Ratios**

Some **ratios** compare part of a collection of things to the total number of things in the collection. The statement *6 out of 24 fifth graders have a pet* compares the number of fifth graders who have pets to the total number of fifth graders. This ratio can be expressed in several ways.

In *words*: For every 24 fifth graders, 6 have a pet. Six in 24 fifth graders have a pet. The ratio of fifth graders who have pets to the total number of fifth graders is 6 to 24.

With a *fraction*:  $\frac{6}{24}$  of fifth graders have a pet.

A ratio is in simplest form if, when expressed as a fraction, the fraction is in simplest form. For example, the ratio *9 out of 36 fifth graders wear braces on his or her teeth* can be expressed in simplest form as  $\frac{1}{4}$  of fifth graders wear braces.

Express each ratio below with a fraction, using the simplest form.

1. Eighteen out of 24 fifth graders do not have a pet.

\_\_\_\_\_

2. There are 18 water birds in the pond and 3 are swans.

\_\_\_\_\_

3. Of the 54 tropical fish in the school aquarium, 27 are tiger fish.

\_\_\_\_\_

4. For every 6 hot dogs sold at the ballpark, 4 are chili dogs.

\_\_\_\_\_

**LESSON**  
**12•4****Ratios**

Solve the following ratio problems. Use the Square Tiles from *Math Journal 2*, Activity Sheet 7 to help you.

1. Place 20 tiles on your desk so that 3 out of 4 tiles are white and the rest are shaded.

How many tiles are white? \_\_\_\_\_

How many tiles are shaded? \_\_\_\_\_

2. Place 25 tiles on your desk so that 3 out of 5 tiles are white and the rest are shaded.

How many tiles are white? \_\_\_\_\_

How many tiles are shaded? \_\_\_\_\_

3. Place 4 white tiles on your desk. Add some tiles until 1 out of 5 tiles is white and the rest are shaded. How many tiles are there in all? \_\_\_\_\_

4. Place 9 white tiles on your desk. Add some tiles until 3 out of 8 tiles are white and the rest are shaded. How many tiles are there in all? \_\_\_\_\_

5. Imagine 28 tiles. If 4 out of 7 are white, how many are white? \_\_\_\_\_

6. Imagine 24 tiles. If 5 out of 6 are white, how many are white? \_\_\_\_\_

7. Place 18 tiles on your desk so that 6 are white and the rest are shaded.

One out of \_\_\_\_\_ tiles is white.

8. Place 30 tiles on your desk so that 20 are white and the rest are shaded.

Out of 3 tiles, \_\_\_\_\_ are white.

9. Make up a ratio number story for a partner to solve.

\_\_\_\_\_  
\_\_\_\_\_

Answer: \_\_\_\_\_

**LESSON**  
**12•4**

# Permission Slip



We plan to examine the effect of exercise on heart rate in an upcoming math class. Students will find their heart rates after stepping up onto and down from a chair 5, 10, 15, 20, and 25 times.

Although the activity is not especially strenuous, we ask that you complete and return this form giving permission for your child's participation.

The data we collect will be used to teach graphing and other statistical skills.

I give permission for \_\_\_\_\_ to participate in the heart-rate activity described above.

Signature \_\_\_\_\_ Date \_\_\_\_\_

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**LESSON**  
**12•4**

# Permission Slip



We plan to examine the effect of exercise on heart rate in an upcoming math class. Students will find their heart rates after stepping up onto and down from a chair 5, 10, 15, 20, and 25 times.

Although the activity is not especially strenuous, we ask that you complete and return this form giving permission for your child's participation.

The data we collect will be used to teach graphing and other statistical skills.

I give permission for \_\_\_\_\_ to participate in the heart-rate activity described above.

Signature \_\_\_\_\_ Date \_\_\_\_\_

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**STUDY LINK**  
**12•5**

# Ratio Problems



Find the missing number.

1.  $\frac{1}{5} = \frac{x}{40}$      $x =$  \_\_\_\_\_

2.  $\frac{2}{3} = \frac{16}{y}$      $y =$  \_\_\_\_\_

3.  $\frac{5}{6} = \frac{m}{54}$      $m =$  \_\_\_\_\_

4.  $\frac{1}{4} = \frac{15}{n}$      $n =$  \_\_\_\_\_

5.  $\frac{5}{8} = \frac{f}{32}$      $f =$  \_\_\_\_\_

6.  $\frac{13}{50} = \frac{g}{100}$      $g =$  \_\_\_\_\_

Write a number model for each problem. Then solve the problem.

7. Of the 115 students in the sixth grade, 2 out of 5 belong to the Drama Club. How many students are members of the Drama Club?

Number model: \_\_\_\_\_ Answer: \_\_\_\_\_ (unit)

8. Three out of 4 students at Highland School ordered a hot lunch today. There are 156 students at the school. How many students ordered a hot lunch?

Number model: \_\_\_\_\_ Answer: \_\_\_\_\_ (unit)

9. Gina and the other members of her troop sell cookies for \$3 a box. For each box they sell, the troop earns \$1.50. One week, Gina's troop sold \$90 worth of cookies. How much did the troop earn?

Number model: \_\_\_\_\_ Answer: \_\_\_\_\_

10. 30% of the tickets sold by a movie theater for the Friday night show were children's tickets at \$4 each. The rest of the tickets were sold at the full price of \$8.50. The movie theater collected \$360 just for the children's tickets. How many tickets did they sell in all?

Number model: \_\_\_\_\_ Answer: \_\_\_\_\_ (unit)

**Practice**

11.  $6^3 =$  \_\_\_\_\_

12.  $3^6 =$  \_\_\_\_\_

13.  $6^3 * 10^2 =$  \_\_\_\_\_



**LESSON**  
**12•5****Solving Ratio Problems with Cross Multiplication**

**Cross multiplication** is a strategy for solving ratio problems that is based on the quick common denominator.

**Example:**

Josie tosses a penny 32 times.  
It lands heads up 5 out of 8 times.  
How many times does the penny land heads up?

Number Model:

$$\frac{5}{8} = \frac{x}{32}$$

Cross multiply:

$$5 * 32 = 8 * x$$

Solution:

$$\begin{aligned} 8 * x &= 160 \\ x &= 20 \end{aligned}$$

Answer:

$$\frac{20 \text{ times}}{\text{(unit)}}$$

Use cross multiplication to solve the following problems. Let the variable  $x$  represent the missing number in each problem.

1. Jeremy received 3 votes for every 5 votes cast. If he received 18 votes, how many votes were cast?

Number model: \_\_\_\_\_ Solution: \_\_\_\_\_

Cross multiply: \_\_\_\_\_ Answer: \_\_\_\_\_  
(unit)

2. The restaurant at the mall sold 324 lunches. For every 9 lunches served, 3 were fish plates. How many fish plates were served?

Number model: \_\_\_\_\_ Solution: \_\_\_\_\_

Cross multiply: \_\_\_\_\_ Answer: \_\_\_\_\_  
(unit)

3. The Nature Center has a total of 87 amphibians on display. For every 6 amphibians, 2 are types of salamanders. How many salamanders are there?

Number model: \_\_\_\_\_ Solution: \_\_\_\_\_

Cross multiply: \_\_\_\_\_ Answer: \_\_\_\_\_  
(unit)

4. Write a ratio number story for your partner to solve using cross multiplication.

**LESSON**  
**12•5****Solving Ratio Number Stories**

Write a number model for each problem. Include key words for the numerators and denominators. Then solve the problem.

1. Of the 90 fifth-grade girls at Lincoln School, 1 out of 6 reported that they jumped rope 3 times last week. How many girls jumped rope 3 times last week?

Number model: \_\_\_\_\_

Answer: \_\_\_\_\_  
(unit)

2. The 175 seniors at Kennedy High School voted for the color of caps and gowns they would wear at the graduation ceremony. Six out of 7 voted for silver. How many students voted for silver?

Number model: \_\_\_\_\_

Answer: \_\_\_\_\_  
(unit)

3. Melissa's brother, Sidney, was explaining his college food budget to her. He told Melissa that he budgeted \$160 a month for restaurants, but he spent 3 out of every 4 dollars at the campus pizza parlor. How much did he spend at the pizza parlor?

Number model: \_\_\_\_\_

Answer: \_\_\_\_\_  
(unit)

4. A survey was conducted at Sidney's college to find out how the 640 students budgeted their food money. Five out of 8 students reported that they spent less than \$160 a month on food. How many students spent less than \$160 on food?

Number model: \_\_\_\_\_

Answer: \_\_\_\_\_  
(unit)

**STUDY LINK**  
**12•6**

# Rates



Complete each table using the given information. Then answer the question below each table.

1. It would take 27,000 spiders, each spinning a single web, to produce a pound of spider webs.

a.

<b>Number of Spiders</b>	27,000	54,000			
<b>Pounds of Spider Webs</b>	1	2	3	4	5

- b. At this rate, how many spiders, each spinning a single web, would be needed to produce 10 pounds of spider webs? \_\_\_\_\_ spiders

2. It used to be thought that the deer botfly flies so fast that it is almost invisible to the human eye. It has since been tested, and scientists found that it actually flies about 25 miles per hour.

a.

<b>Miles</b>	25				
<b>Hours</b>	1	2	3	4	5

- b. At this rate, about how far could a deer botfly travel in 1 minute? \_\_\_\_\_ mile(s)

Solve the following rate problems. Make a table if it will help you.

3. About 50 gallons of maple sap are needed to make 1 gallon of maple syrup. How many gallons of maple sap are needed to make 20 gallons of maple syrup?

About \_\_\_\_\_ gallons

4. For 186 days a year, the sun is not visible at the North Pole. During a 5-year period, about how many days is the sun not visible?

About \_\_\_\_\_ days

5. In a beehive, about  $1\frac{1}{2}$  ounces of beeswax are used to build a honeycomb that holds 4 pounds of honey. How much beeswax is needed to build a honeycomb that could hold 20 pounds of honey?

About \_\_\_\_\_ ounces

Source: 2201 Fascinating Facts



**STUDY LINK**  
**12•7**

# Operations with Fractions



1. In the Malagasay Indian tribes, it is against the law for a son to be taller than his father. If a son is taller, he must give his father money or an ox. Suppose a father is 5 feet  $10\frac{1}{2}$  inches tall and his son is 5 feet  $6\frac{3}{4}$  inches tall. How many more inches can the son grow before he is as tall as his father?  
 \_\_\_\_\_  
 (unit)
  
2. In the state of Indiana, it is illegal to travel on a bus within 4 hours of eating garlic. If you lived in Indiana and had eaten a bowl of pasta with garlic bread  $2\frac{1}{3}$  hours ago, how many more hours would you need to wait before you could legally travel on a bus?  
 \_\_\_\_\_  
 (unit)
  
3. In Idaho, it is against the law to give a person a box of candy that weighs more than 50 pounds. It is Valentine's Day, and you give your mother a box of candy that weighs  $48\frac{1}{4}$  pounds. How much more could the box weigh without breaking the law?  
 \_\_\_\_\_  
 (unit)
  
4. The body of an average jellyfish is about  $\frac{9}{10}$  water. What fraction of the jellyfish is not water?  
 \_\_\_\_\_
  
5. The world record for a jump by a frog is 19 feet  $3\frac{1}{8}$  inches. How much farther would a frog need to jump to set a new world record of 7 yards?  
 \_\_\_\_\_  
 (unit)
  
6. The maximum length for a typical king cobra is about  $5\frac{4}{5}$  meters. If 6 of these snakes were lined up end to end, how far would they stretch?  
 \_\_\_\_\_  
 (unit)
  
7. An average trumpeter swan weighs about  $16\frac{4}{5}$  kilograms. What is the approximate weight of 3 average trumpeter swans?  
 \_\_\_\_\_  
 (unit)

Sources: *The Top 10 of Everything*; *Beyond Belief!*

**Practice**

8.  $(4 * 4) + \frac{4}{4} =$  \_\_\_\_\_
9.  $4! + 4 + 4 + \sqrt{4} =$  \_\_\_\_\_
10. 75% of 12 = \_\_\_\_\_
11. 50% of 360 = \_\_\_\_\_



**STUDY LINK**  
**12•8**

# Rate and Ratio Problems



1. The average American eats about 250 eggs per year. At this rate, about how many eggs will the average American eat in . . .

a. five years? \_\_\_\_\_  
(unit)

b.  $\frac{1}{12}$  of a year? \_\_\_\_\_  
(unit)

2. The average fifth grader can eat  $\frac{3}{8}$  of a pizza for lunch. At this rate, how many lunches will it take for an average fifth grader to eat the equivalent of 3 whole pizzas? \_\_\_\_\_

(unit)

3. In 1975, a man in Washington state ate 424 clams in 8 minutes. At this rate, how many would he eat . . .

a. in  $\frac{1}{4}$  of this time? \_\_\_\_\_  
(unit)

b. in  $2\frac{1}{2}$  times as much time? \_\_\_\_\_  
(unit)

4. A deck has 52 playing cards. In two decks,

a. what is the ratio of 2s to 10s? \_\_\_\_\_

b. what is the ratio of Hearts to the total number of playing cards? \_\_\_\_\_

c. what is the ratio of Jacks to Kings and Queens? \_\_\_\_\_

**Practice**

5.  $3\frac{4}{7} * \frac{8}{8} =$  \_\_\_\_\_

6.  $3n + 2n = 25$

$n =$  \_\_\_\_\_

7.  $25 = 2n$

8.  $12.5 * n = 100$

$n =$  \_\_\_\_\_

$n =$  \_\_\_\_\_



**LESSON**  
**12•8****Solving Ratio Problems**

<b>Instrument Players in the United States</b>	
Piano/Keyboard	21 million
Guitar	19 million
Organ	6 million
Flute	4 million
Clarinet	4 million
Drums	3 million
Trumpet	3 million
Violin	2 million
Harmonica	1.7 million
Saxophone	1 million

Source: *America by the Numbers*

- What is the ratio of flute players to harmonica players? \_\_\_\_\_
  - What is the ratio of drum players to piano players? \_\_\_\_\_
  - Record the ratio of violin and saxophone players to trumpet players. \_\_\_\_\_
- Which two pairs of instrument players have a 1-to-1 ratio? \_\_\_\_\_  
\_\_\_\_\_
- In a fifth-grade band, the ratio of saxophonists to clarinetists is 2:3. If there are 10 saxophonists, how many clarinetists are there? \_\_\_\_\_
- The school orchestra is performing tonight. There are 24 orchestra members. There are 6 violas. The ratio of violins to violas is 2:1. The ratio of cellos to basses is 2:1. There are no other instruments. How many chairs are needed in each section?
  - violins \_\_\_\_\_
  - violas \_\_\_\_\_
  - cellos \_\_\_\_\_
  - basses \_\_\_\_\_

# End-of-Year Family Letter



Congratulations!

By completing *Fifth Grade Everyday Mathematics*, your child has accomplished a great deal. Thank you for your support!

This Family Letter provides a resource throughout your child's vacation. It includes an extended list of Do-Anytime Activities, directions for games that can be played at home, a list of mathematics-related books to check out over vacation, and a preview of what your child will be learning in *Sixth Grade Everyday Mathematics*. Enjoy your vacation!

## Do-Anytime Activities

Mathematics means more when it is rooted in real-life situations. To help your child review many of the concepts he or she has learned in fifth grade, we suggest the following activities for you to do together over vacation. These activities will help your child build on the skills he or she has learned this year and will help prepare him or her for *Sixth Grade Everyday Mathematics*.

1. Review multiplication facts. For example, include basic facts such as  $7 \times 8 = 56$ , and extended facts, such as  $70 \times 8 = 560$  and  $70 \times 80 = 5,600$ .
2. Create opportunities to work with rulers, yardsticks, metersticks, tape measures, and scales. Have your child measure items using metric and U.S. customary units.
3. Ask your child to solve multiplication and division problems that are based on real-life situations. Vary the problems so that some are suitable for mental computation, some require paper-and-pencil calculation, and some require the use of a calculator.
4. Practice using percents by asking your child to calculate sales tax, percent discounts, sports statistics, and so on.
5. Continue the American Tour by reading about important people, events, inventions, explorations, and other topics in American history. Focus on data displays such as bar, line, and circle graphs, and on color-coded maps.



## Building Skills through Games

The following section lists rules for games that can be played at home. The number cards used in some games can be made from 3" by 5" index cards.

### Factor Captor

- To start the first round, Player 1 (James) chooses a 2-digit number on the number grid. James covers it with a counter and records the number on scratch paper. This is James's score for the round.
- Player 2 (Emma) covers all the factors of James's number. Emma finds the sum of the factors, and records it on scratch paper. This is Emma's score for the round.  
**A factor may only be covered once during a round.**
- If Emma missed any factors, James can cover them with counters and add them to his score.
- In the next round, players switch roles. Player 2 (Emma) chooses a number that is not covered by a counter. Player 1 (James) covers all factors of that number.
- Any number that is covered by a counter is no longer available and may not be used again.
- The first player in a round may not cover a number less than 10, unless no other numbers are available.
- Play continues with players trading roles in each round, until all numbers on the grid have been covered. Players then use their calculators to find their total scores. The player with the higher total score wins the game.

Factor Captor  
Grid 1

1	2	2	2	2	2
2	3	3	3	3	3
3	4	4	4	4	5
5	5	5	6	6	7
7	8	8	9	9	10
10	11	12	13	14	15
16	18	20	21	22	24
25	26	27	28	30	32

### 2-4-5-10 Frac-Tac-Toe

**Advance Preparation:** Separate the cards into two piles—a numerator pile and a denominator pile. Place two each of the 2, 4, 5, and 10 cards in the denominator pile. All other cards are placed on the numerator pile.

Shuffle the cards in each pile. Place the piles facedown. When the numerator pile is completely used, reshuffle that pile, and place it facedown. When the denominator pile is completely used, turn it over, and place it facedown without reshuffling it.

- Players take turns. When it is your turn:
  - Turn over the top card from each pile to form a fraction (numerator card over denominator card).
  - Try to match the fraction shown with one of the grid squares on the gameboard. (Use either of the gameboards shown.) If a match is found, cover that grid square with your counter and your turn is over. If no match is found, your turn is over.

2-4-5-10 Frac-Tac-Toe  
Gameboards

> 1.0	0 or 1	> 2.0	0 or 1	> 1.0
0.1	0.2	0.25	0.3	0.4
> 1.5	0.5	> 1.5	0.5	> 1.5
0.6	0.7	0.75	0.8	0.9
> 1.0	0 or 1	> 2.0	0 or 1	> 1.0

>100%	0% or 100%	>200%	0% or 100%	>100%
10%	20%	25%	30%	40%
>100%	50%	>200%	50%	>100%
60%	70%	75%	80%	90%
>100%	0% or 100%	>200%	0% or 100%	>100%

- To change the fraction shown by the cards to a decimal or percent, players may use a calculator.
- Scoring** The first player covering three squares in a row in any direction (horizontal, vertical, diagonal) is the winner.

**Variations:**

- ◆ For a 2-4-8 game, place two each of the 2, 4, and 8 cards in the denominator pile. Use the gameboards shown in the margin.
- ◆ For a 3-6-9 game, place two each of the 3, 6, and 9 cards in the denominator pile. Use the gameboards shown in the margin.

**Multiplication Bull's-eye**

- Shuffle a deck of number cards (4 each of the numbers 0–9) and place them facedown on the playing surface.
- Players take turns. When it is your turn:
  - ◆ Roll a six-sided die. Look up the target range of the product in the table.
  - ◆ Take four cards from the top of the deck.
  - ◆ Use the cards to try and form two numbers whose product falls within the target range. **Do not use a calculator.**
  - ◆ Multiply the two numbers on your calculator to determine whether the product falls within the target range. If it does, you have hit the bull's-eye and score 1 point. If it doesn't, you score 0 points.
  - ◆ Sometimes it is impossible to form two numbers whose product falls within the target range. If this happens, you score 0 points for that turn.
- The game ends when each player has had five turns.
- The player scoring more points wins the game.

**Example:**

Tom rolls a 3, so the target range of the product is from 1,001 to 3,000.

He turns over a 5, a 7, a 2, and a 9.

Tom uses estimation to try to form two numbers whose product falls within the target range, for example, 97 and 25.

He finds the product on the calculator:

$$97 * 25 = 2,425.$$

Because the product is between 1,001 and 3,000, Tom has hit the bull's-eye and scores 1 point.

Some other possible winning products from the 5, 7, 2, and 9 cards are:

$$25 * 79, 27 * 59, 9 * 257, \text{ and } 2 * 579.$$

Number on Die	Target Range of Product
1	500 or less
2	501–1,000
3	1,001–3,000
4	3,001–5,000
5	5,001–7,000
6	more than 7,000

2-4-8 Frac-Tac-Toe  
Gameboards

> 2.0	0 or 1	> 1.5	0 or 1	> 2.0
1.5	0.125	0.25	0.375	1.5
> 1.0	0.5	0.25 or 0.75	0.5	> 1.0
2.0	0.625	0.75	0.875	2.0
> 2.0	0 or 1	1.125	0 or 1	> 2.0

>200%	0% or 100%	>150%	0% or 100%	>200%
150%	12½%	25%	37½%	150%
>100%	50%	25% or 75%	50%	>100%
200%	62½%	75%	87½%	200%
>200%	0% or 100%	112½%	0% or 100%	>200%

3-6-9 Frac-Tac-Toe  
Gameboards

> 1.0	0 or 1	0.1̄	0 or 1	> 1.0
0.16̄	0.2̄	0.3̄	0.3̄	0.4̄
> 2.0	0.5̄	> 1.0	0.6̄	> 2.0
0.6̄	0.7̄	0.83̄	0.8̄	1.3̄
> 1.0	0 or 1	1.6̄	0 or 1	> 1.0

>100%	0% or 100%	11.1%	0% or 100%	>100%
16⅔%	22.2%	33⅓%	33.3%	44.4%
>200%	55.5%	>100%	66.6%	>200%
66⅔%	77.7%	83⅓%	88.8%	133⅓%
>100%	0% or 100%	166⅔%	0% or 100%	>100%

## Vacation Reading with a Mathematical Twist

Books can contribute to children's learning by presenting mathematics in a combination of real-world and imaginary contexts. The titles listed below were recommended by teachers who use *Everyday Mathematics* in their classrooms. They are organized by mathematical topics. Visit your local library and check out these mathematics-related books with your child.

### Numeration

*The Rajah's Rice: A Mathematical Folktale from India* by David Barry

### Operations and Computation

*Counting on Frank* by Rod Clement

### Data and Chance

*Jumanji* by Chris Van Allsburg

### Geometry

*A Cloak for the Dreamer* by Aileen Friedman;  
*Flatland* by Edwin Abbott; *The Boy Who Reversed Himself* by William Sleator

### Measurement and Reference Frames

*Spaghetti and Meatballs for All!: A Mathematical Story* by Marilyn Burns;  
*Mr. Archimedes' Bath* by Pamela Allen

## Looking Ahead: *Sixth Grade Everyday Mathematics*

Next year your child will ...

- ◆ continue to collect, display, describe, and interpret data.
- ◆ maintain and extend skills for comparing, adding, subtracting, multiplying, and dividing fractions and mixed numbers.
- ◆ use scientific notation to write large and small numbers, and explore scientific notation on a calculator.
- ◆ continue the study of variables, expressions, equations, and other topics in algebra; use variables in spreadsheets; and solve equations and inequalities.
- ◆ extend skills in geometry, including constructions, transformations of figures, and finding volumes of 3-dimensional figures.
- ◆ maintain and apply skills for adding, subtracting, multiplying, and dividing whole numbers, decimals, and positive and negative numbers.