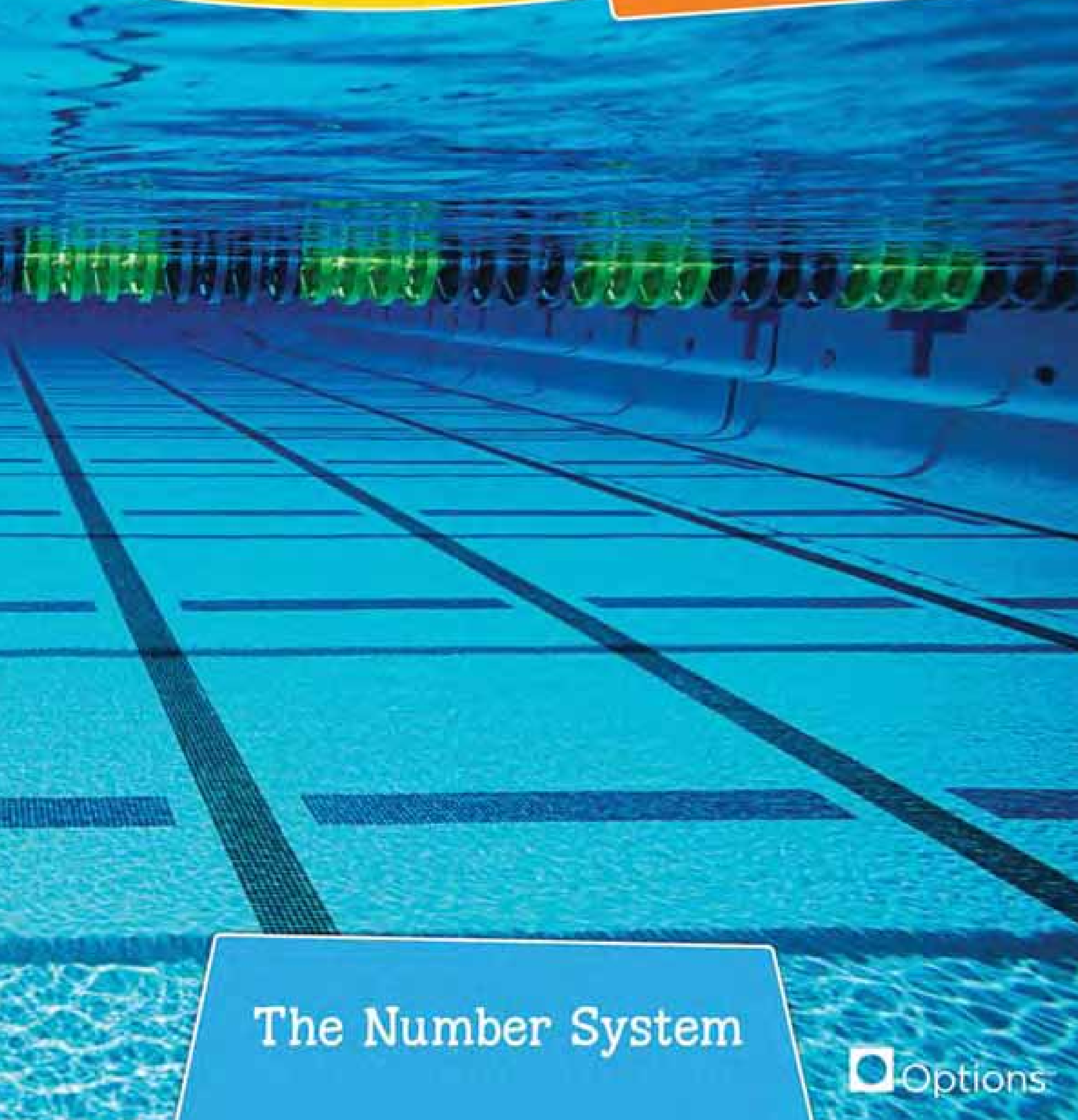
COMMON CORE CLINICS

Grade 7

Mathematics



The Number System

Options

Module 1

The Number System

1 Relate Fractions, Decimals, and Percents

Key Words

decimal
denominator
fraction
numerator
percent

Fractions and **decimals** can be used to show parts of a whole. For example, the fraction $\frac{17}{100}$ represents 17 out of 100 equal parts. The decimal 0.17 is read as 17 hundredths, so it also represents $\frac{17}{100}$.

The word **percent** means "out of 100." So, 17% means 17 out of 100 and can be written as $\frac{17}{100}$. This means that 17% is equivalent to both $\frac{17}{100}$ and 0.17.

- To convert a fraction to a decimal, divide the **numerator** by the **denominator**.
- To convert a decimal to a fraction, use the place values of the digits to write an equivalent fraction.
- To convert a decimal to a percent, multiply by 100, and add a percent sign (%).
- To convert a percent to a decimal, divide by 100, and remove the percent sign.

Example 1

What fraction and decimal are equivalent to 6%?

Percent means "out of 100," so 6% means $\frac{6}{100}$.

Simplify: $\frac{6}{100} = \frac{6 \div 2}{100 \div 2} = \frac{3}{50}$

$\frac{6}{100}$ is read as "6 hundredths." 0.06 has a 6 in the hundredths place.

$6\% = \frac{6}{100} = \frac{3}{50} = 0.06$

Example 2

What percent is equivalent to $\frac{1}{3}$?

Divide the numerator by the denominator to convert $\frac{1}{3}$ to a decimal.

$\frac{1}{3} = 1 \div 3 = 0.3333\ldots$

Multiply by 100, and add a percent sign.

$0.3333\ldots \times 100 = 33.33\ldots\% = 33.\overline{3}\%$ or $33\frac{1}{3}\%$

$\frac{1}{3} = 33.\overline{3}\%$

REVIEW

How many hundredths are there in 7 tenths? How many thousandths?

Guided Practice

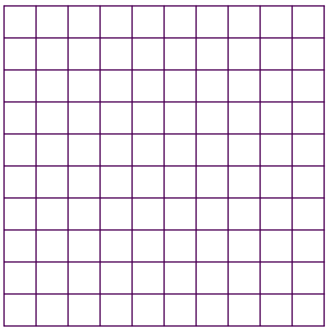
1 Shade the grid below to show 0.8. What percent is equivalent to 0.8?

Step 1 Shade 0.8 of the model.

Eight tenths is equivalent to _______ hundredths,

because 0.8 = _______.

To show 0.8, shade _______ of the 100 squares.



> **REMEMBER**
> You can insert zeros after the last nonzero digit to the right of a decimal point. For example, 0.1 = 0.10.

Step 2 Write a percent to represent the shaded part.

Since _______ out of 100 squares are shaded, _______% is shaded.

> **THINK**
> *Percent* means "out of 100."

The grid is 0.8 shaded. _______% is equivalent to 0.8.

2 A mayoral candidate received 12.5% of the votes in the general election. What fraction of the votes did she receive?

Step 1 Write 12.5% as a decimal.

12.5 ÷ 100 = _______

Step 2 Convert the decimal to a fraction and simplify.

The decimal shows _______ thousandths.

So, the fraction is _______.

Simplify the fraction: _______________________________________

> **THINK**
> The greatest common factor of 125 and 1,000 is 125.

The fraction of the votes the candidate received was _______.

Independent Practice

1. When using a fraction to name part of a whole, what do the numerator and denominator each show?

____

____

2. How can you convert a decimal to a fraction? Give an example.

____

____

3. How do you convert a percent to a fraction?

____

____

Ask Yourself

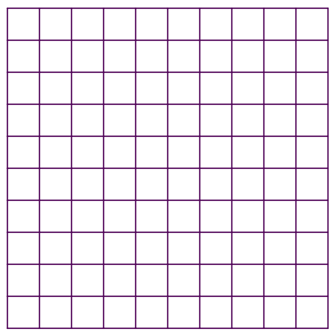
How can the shading of the grid help you write the decimal?

Shade each model to show the percent indicated. Then identify the equivalent fraction and decimal.

4. Shade to show 51%.

fraction: ____________

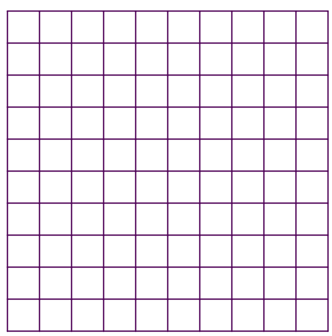
decimal: ____________



5. Shade to show 30%.

fraction: ____________

decimal: ____________



Find the simplest form of the fraction that is equivalent to each number.

6. 0.5 _______ **7.** 0.05 _______ **8.** 0.005 _______

9. 6% _______ **10.** 85% _______ **11.** 13.1% _______

Find the decimal that is equivalent to each number.

12. $\frac{11}{100}$ __________ **13.** $\frac{7}{8}$ __________ **14.** $\frac{2}{3}$ __________

15. 40% __________ **16.** 500% __________ **17.** 0.7% __________

Find the percent that is equivalent to each number.

18. $\frac{23}{100}$ __________ **19.** $\frac{7}{10}$ __________ **20.** $\frac{9}{1,000}$ __________

21. 0.08 __________ **22.** 0.111… __________ **23.** 1.25 __________

Solve each problem.

24. At Jill's school, 25% of the students play on a school sports team. What fraction of the students play on a school sports team?

____

25. The decimal 0.002 represents the portion of lightbulbs in a shipment that were defective. What percent of the lightbulbs were defective?

____

26. Five-eighths of the cards in Max's card collection are baseball cards. What percent of the cards in the collection are baseball cards?

____

COMMON CORE CLINICS

Grade 7

Mathematics

Ratios/Proportional Relationships and Expressions/Equations

Options

Module 2

Ratios and Proportional Relationships; Expressions and Equations

1 Ratios and Rates

Key Words

rate
ratio
unit rate

A **ratio** is a comparison of two numbers, called terms. For example, if there are 2 red apples and 3 green apples in a basket, we can write this as a ratio using words (2 to 3), as a fraction $\left(\frac{2}{3}\right)$, or with a colon (2:3). Ratios can be used to compare parts to parts, parts to a whole, or a whole to a part.

A **rate** is a special kind of ratio that compares two quantities of different units. For example, a speed such as $\frac{40 \text{ miles}}{2 \text{ hours}}$ is a rate. If the second quantity in the ratio is 1 unit, the rate is called a **unit rate**. For example, the speed mentioned earlier could be expressed as the unit rate, $\frac{20 \text{ miles}}{1 \text{ hour}}$ or 20 miles per hour.

Example 1

There are 10 boys and 14 girls in the school chorus. What is the ratio of boys to all students in the chorus?

The ratio of boys to all students is a comparison of a part to a whole.

$$\frac{\text{boys}}{\text{total students}} = \frac{10 \text{ boys}}{10 \text{ boys} + 14 \text{ girls}} = \frac{10}{24}$$

Simplify: $\frac{10}{24} = \frac{5}{12}$

The ratio of boys to all students is $\frac{5}{12}$. This can also be written as 5:12 or 5 to 12.

Example 2

June pays \$1.95 for $\frac{1}{2}$ pound of peanuts. What is the unit price per pound?

Write the ratio.

$$\frac{\$1.95}{\frac{1}{2}\text{ lb}} = \frac{1.95}{0.5}$$

A unit price is an example of a unit rate. So, divide to find the unit price.

$$\frac{1.95}{0.5} = 1.95 \div 0.5 = 3.90 \text{ or } \frac{3.90}{1}$$

This represents a unit price of $\frac{\$3.90}{1 \text{ lb}}$.

The unit price is $\frac{\$3.90}{1 \text{ lb}}$ or \$3.90 per pound.

COUNT

Count the number of boys and girls in your class. Write the ratio of girls to boys in your class.

Guided Practice

1 Francisco's bedroom has a width of 12 feet and a length of 15 feet. What is the length-to-width ratio of his bedroom?

Write the length-to-width ratio.

$$\frac{\text{length}}{\text{width}} = \frac{15\text{ ft}}{12\text{ ft}} = \frac{15}{12}$$

Simplify: ____________

The length-to-width ratio is ____ to ____.

This can also be written as ____ or ____:____.

THINK

A ratio written as $\frac{15}{12}$ is not the same as an improper fraction. The ratio $\frac{15}{12}$ is not equal to the mixed number $1\frac{3}{12}$.

2 Katia walks $\frac{1}{2}$ mile in $\frac{1}{6}$ hour. What is her unit rate of speed?

Step 1 Write the ratio as a complex fraction.

$$\frac{\frac{1}{2}\text{ mi}}{\frac{1}{6}\text{ h}} \text{ or } \frac{\frac{1}{2}}{\frac{1}{6}}$$

Step 2 Divide to find the unit rate.

$$\frac{\frac{1}{2}}{\frac{1}{6}} = \frac{1}{2} \div \frac{1}{6}$$

The reciprocal of $\frac{1}{6}$ is ____, so:

$$\frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \cdot \underline{\quad\quad} = \underline{\quad\quad\quad\quad}$$

The unit rate is ____ miles per hour.

REMEMBER

A complex fraction is a fraction in which the numerator, the denominator, or both contain a fraction.

REMEMBER

To divide a fraction by another fraction, take the reciprocal of the divisor. Then multiply.

Independent Practice

1. What is a ratio and what are the three ways to write a ratio?

____

____

2. What is a rate?

____

____

3. What is a unit rate? Give an example.

____

____

Ask Yourself

Can I simplify the numerator and the denominator?

Is this ratio a part-to-part ratio, a part-to-whole ratio, or a whole-to-part ratio?

Simplify each ratio, if possible. Then write it in two different ways.

4. 3 to 4 ____________________

5. 4 to 3 ____________________

6. $\frac{5}{20}$ ____________________

7. $\frac{49}{42}$ ____________________

8. 3:14 ____________________

9. 22:4 ____________________

Find each ratio. Simplify, if possible.

10. There are 4 mollies and 6 guppies in a fish tank. What is the ratio of guppies to mollies in the tank?

____

11. Josephine makes an olive salad using green olives and black olives. She adds 5 green olives for every 3 black olives. What is the ratio of all olives to green olives in the olive salad?

____

Find each unit rate.

12. A sign at a store reads, "3 notebooks for \$6." What is the price per notebook?

____

13. Aiden paid \$1.50 for 5 pounds of watermelon. What is the unit price for the watermelon?

____

14. Yvette earns \$3 for every $\frac{1}{4}$ hour she works. What is her hourly rate of pay?

____

15. Sarah uses $5\frac{1}{2}$ cups of flour for every 2 loaves of bread she bakes. What is the unit rate per loaf?

____

16. A sloth walks $\frac{2}{5}$ mile in each $\frac{1}{3}$ hour. Write a complex fraction to represent the sloth's unit rate of speed. Then determine the unit rate of speed in miles per hour.

____

Solve each problem.

17. There are 9 red gumdrops, 10 yellow gumdrops, and 15 orange gumdrops in a bag. What is the ratio of orange gumdrops to red gumdrops in the bag?

____

18. At a blood drive, 5 donors had type AB blood. The other 95 donors had other blood types. What was the ratio of donors with type AB blood to all donors?

____

19. Julia has a total of 12 T-shirts in her dresser. If 3 of the T-shirts are blue, what is the ratio of blue T-shirts to nonblue T-shirts in her dresser?

____

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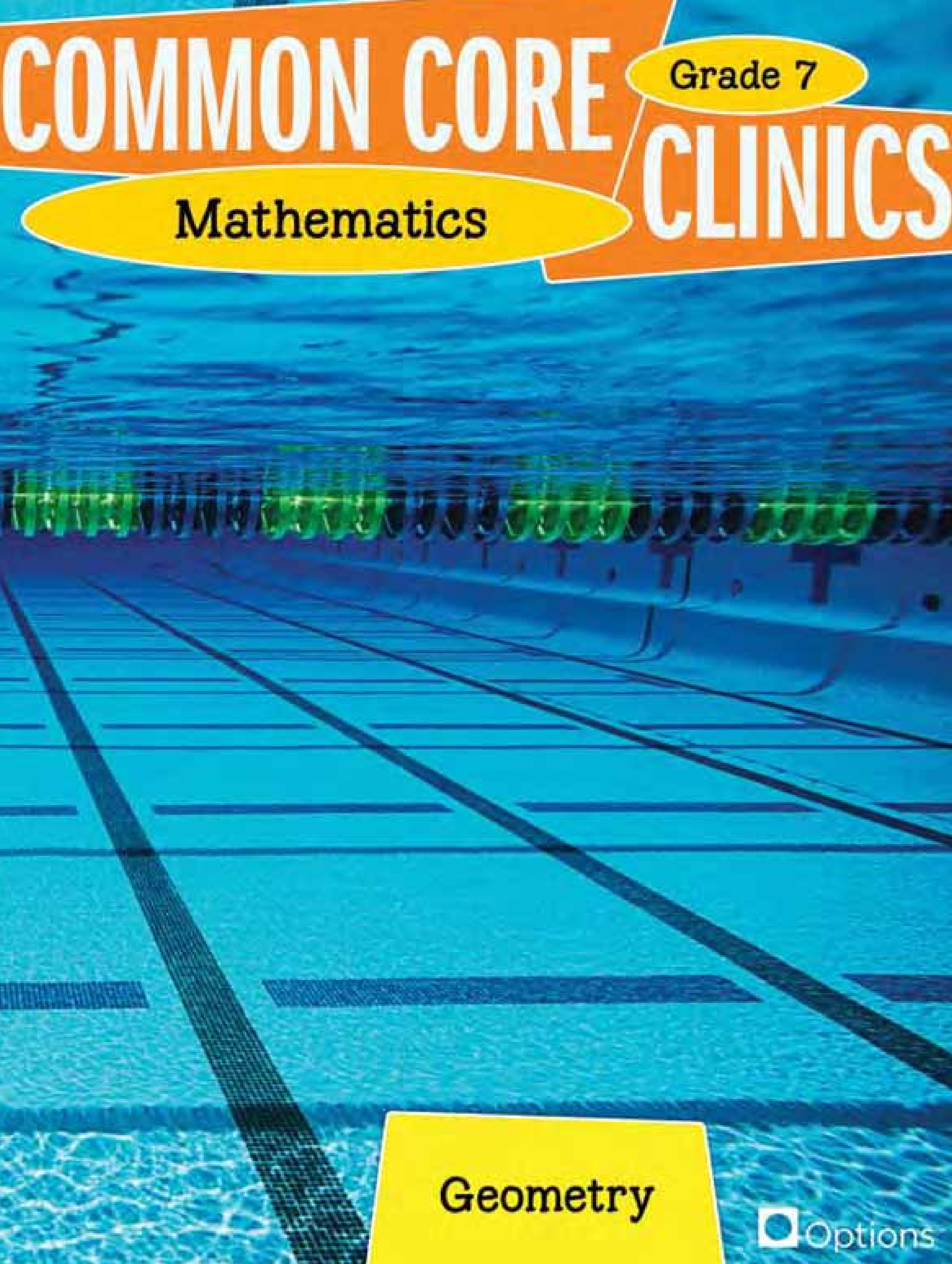
Grade 7

Mathematics



Geometry

Options

Module 3

Geometry

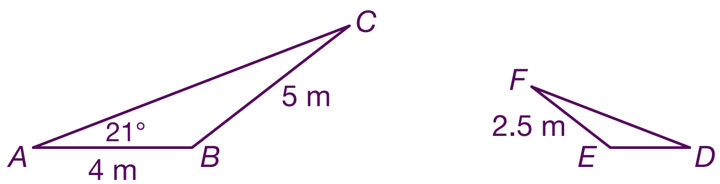
1 Similar Figures

Key Words
congruent
corresponding angles
corresponding sides
similar figures

Similar figures have the same shape but not necessarily the same size. Similar figures have the following properties:

- Their **corresponding angles** are **congruent**.
- Their **corresponding sides** have proportional lengths.

Triangle *ABC* is similar to $\triangle DEF$. Use this art for both examples.



Example 1

What is the measure of $\angle D$?

Angle *D* corresponds to $\angle A$.

Since angle *A* measures 21°, so does $\angle D$.

Angle *D* measures 21°.

Example 2

What is the length of $\overline{DE}$?

The lengths of corresponding sides *BC* and *EF* are given.

The length of side *AB* is given, and you need to find the length of its corresponding side, $\overline{DE}$.

Set up and solve a proportion.

$$\frac{AB}{DE} = \frac{BC}{EF}$$

$$\frac{4}{x} = \frac{5}{2.5}$$

$$4 \cdot 2.5 = x \cdot 5$$

$$10 = 5x$$

$$2 = x$$

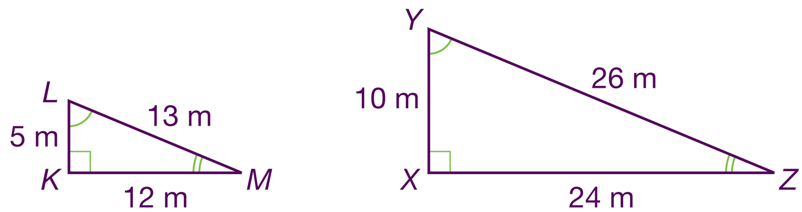
The length of $\overline{DE}$ is 2 meters.

DRAW

Draw a pair of squares with different side lengths. Are the squares similar?

Guided Practice

Is $\triangle KLM$ similar to $\triangle XYZ$?



Step 1 Are corresponding angles congruent?

Angle *K* corresponds to $\angle X$. The symbols show that each is a right angle, so each measures _______ degrees.

Angle *L* corresponds to angle _______.

Angle *M* corresponds to angle _______.

The angle marks show that both of those pairs of angles have __________ measures.

So, all pairs of corresponding angles _______ congruent.

REMEMBER

If two angles have the same angle marks, their measures are the same.

Step 2 Do corresponding sides have proportional lengths?

$\frac{KL}{XY} = \frac{5}{10} = \frac{5 \div 5}{10 \div 5} =$ ______

$\frac{LM}{YZ} = \frac{13}{26} =$ _________________________

$\frac{KM}{XZ} =$ _________________________

All pairs of corresponding sides have lengths in the ratio _______.

THINK

If all pairs of corresponding sides have lengths in the same ratio, then corresponding sides have proportional lengths.

Triangle *KLM* and triangle *XYZ* __________ similar.

Independent Practice

1. What must be true of the corresponding angles in two similar figures?

2. If two figures have the same shape and the same size, are they similar? Explain.

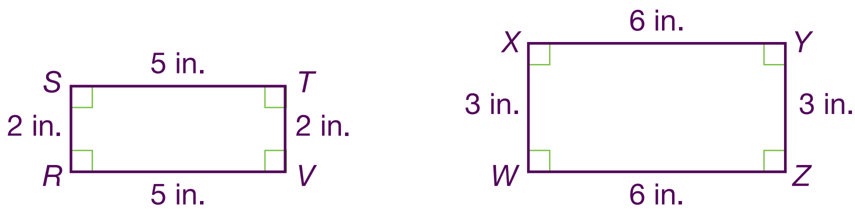
Ask Yourself

What do you notice about corresponding angle measures?

Are corresponding side lengths in the same ratio?

Identify each pair of figures as similar or not similar. Explain why or why not.

3.



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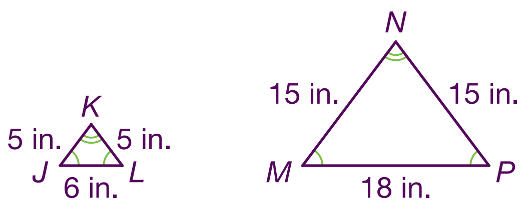

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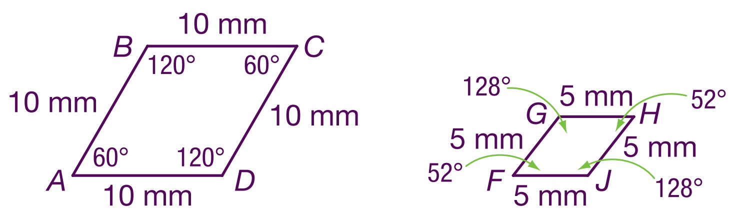
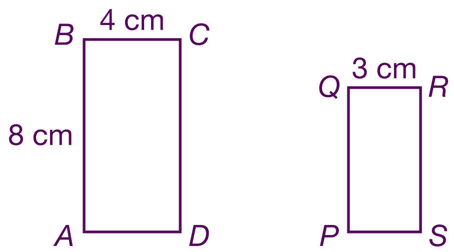


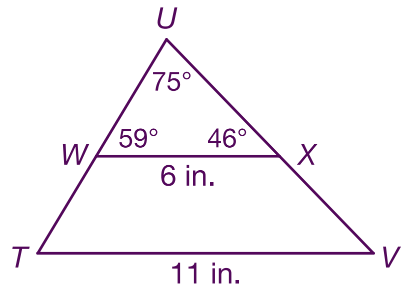
For each of the following, find the indicated measure.

6. Rectangle *ABCD* is similar to rectangle *PQRS*.



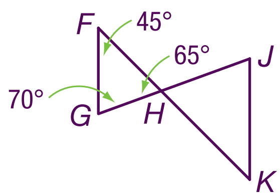
PQ = __________

7. Triangle *WUX* is similar to $\triangle TUV$.



m∠*T* = __________

8. Triangle *FGH* is similar to $\triangle KJH$.



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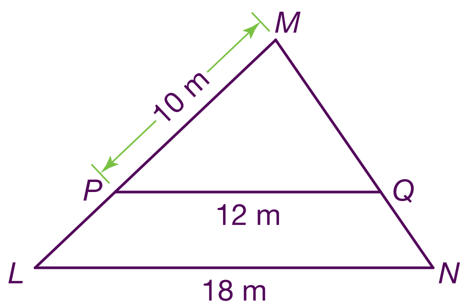
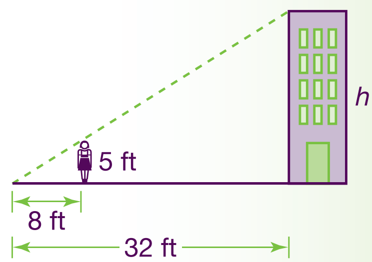


LM = __________

Solve each problem.

10. Cara is 5 feet tall and casts a shadow 8 feet long. At the same time, a building casts a shadow 32 feet long. What is the height of the building?

____



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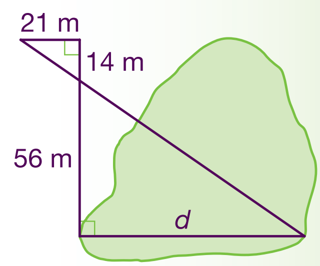
____

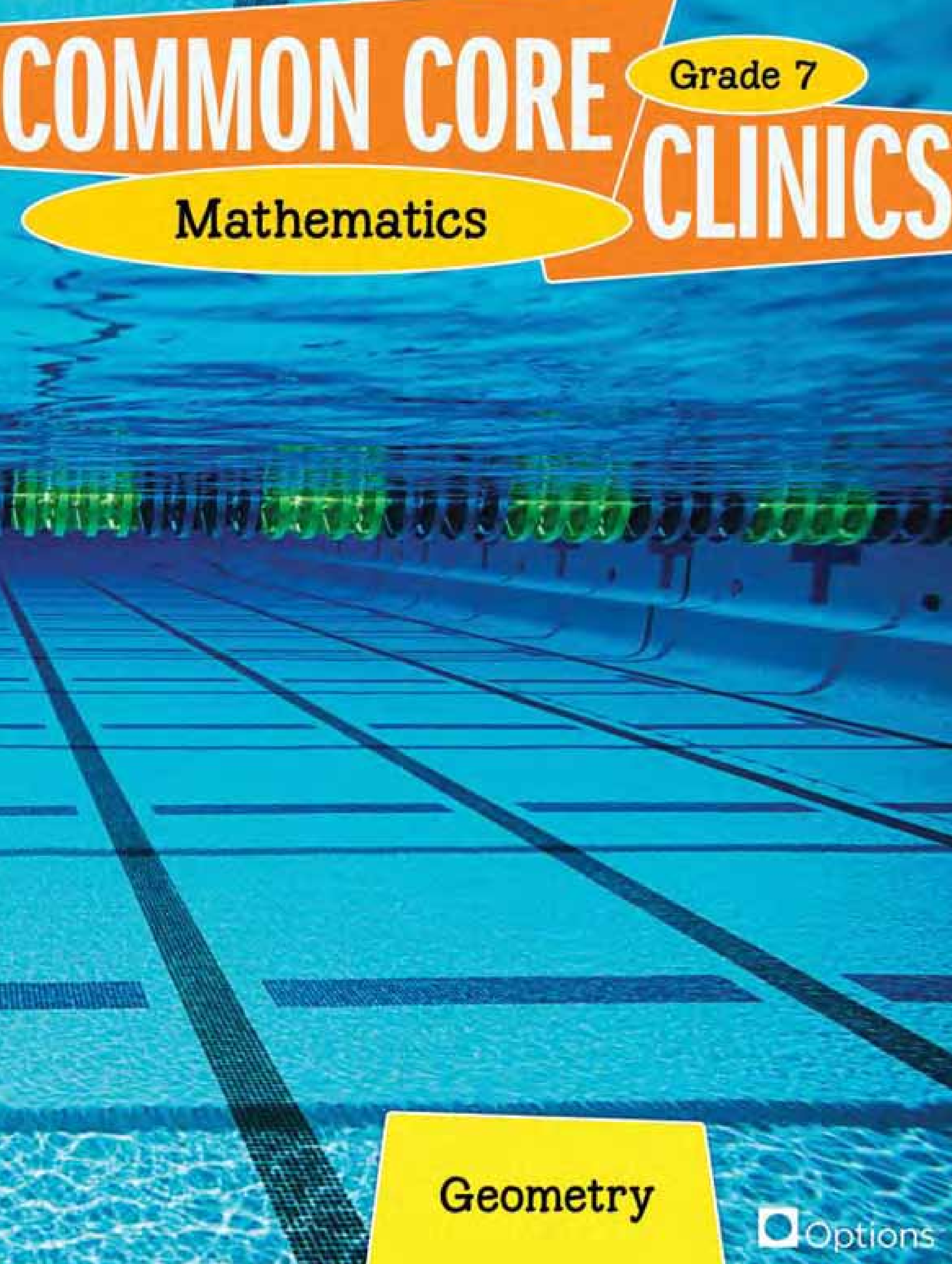
____



COMMON CORE CLINICS

Grade 7

Mathematics



Geometry

Options

Module 3

Geometry

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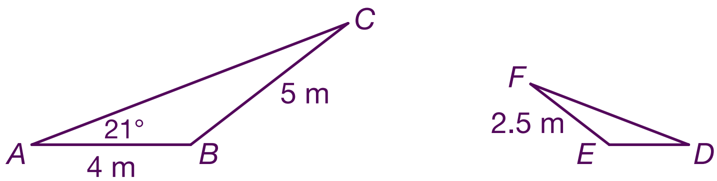

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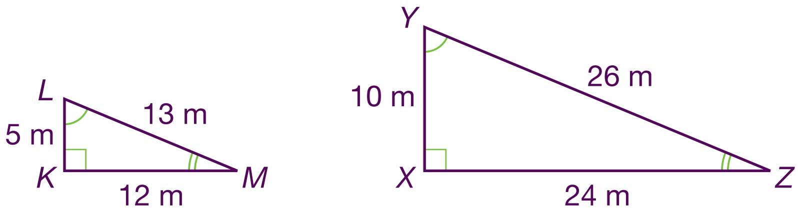

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THINK

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Triangle KLM and triangle XYZ __________ similar.

Independent Practice

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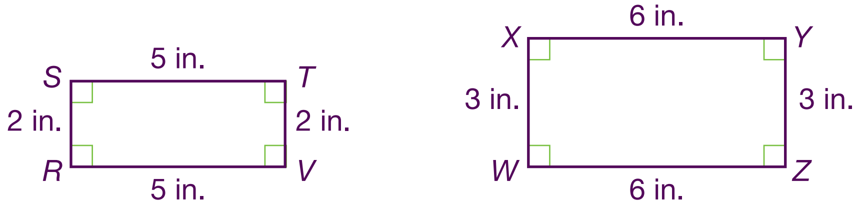

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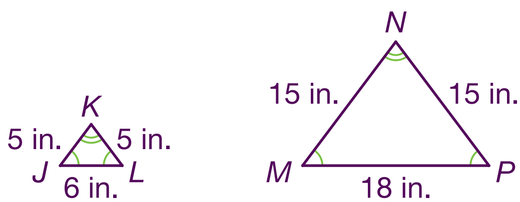

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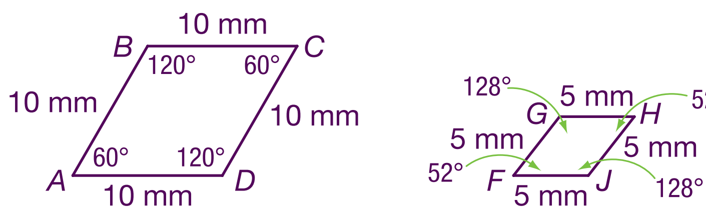

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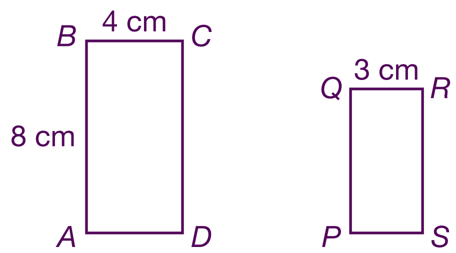

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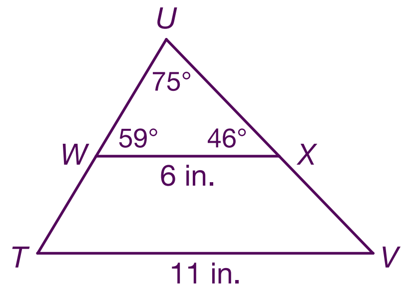

m$\angle T =$ __________

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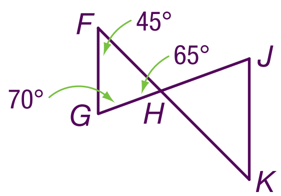

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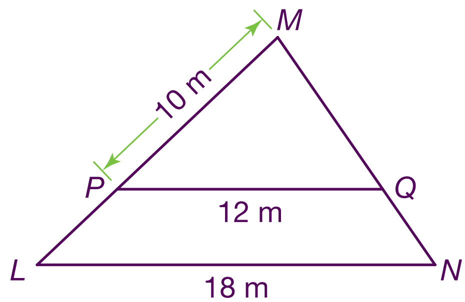

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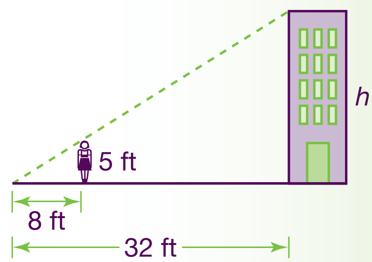

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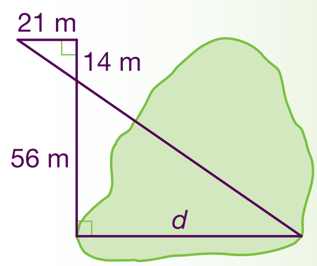
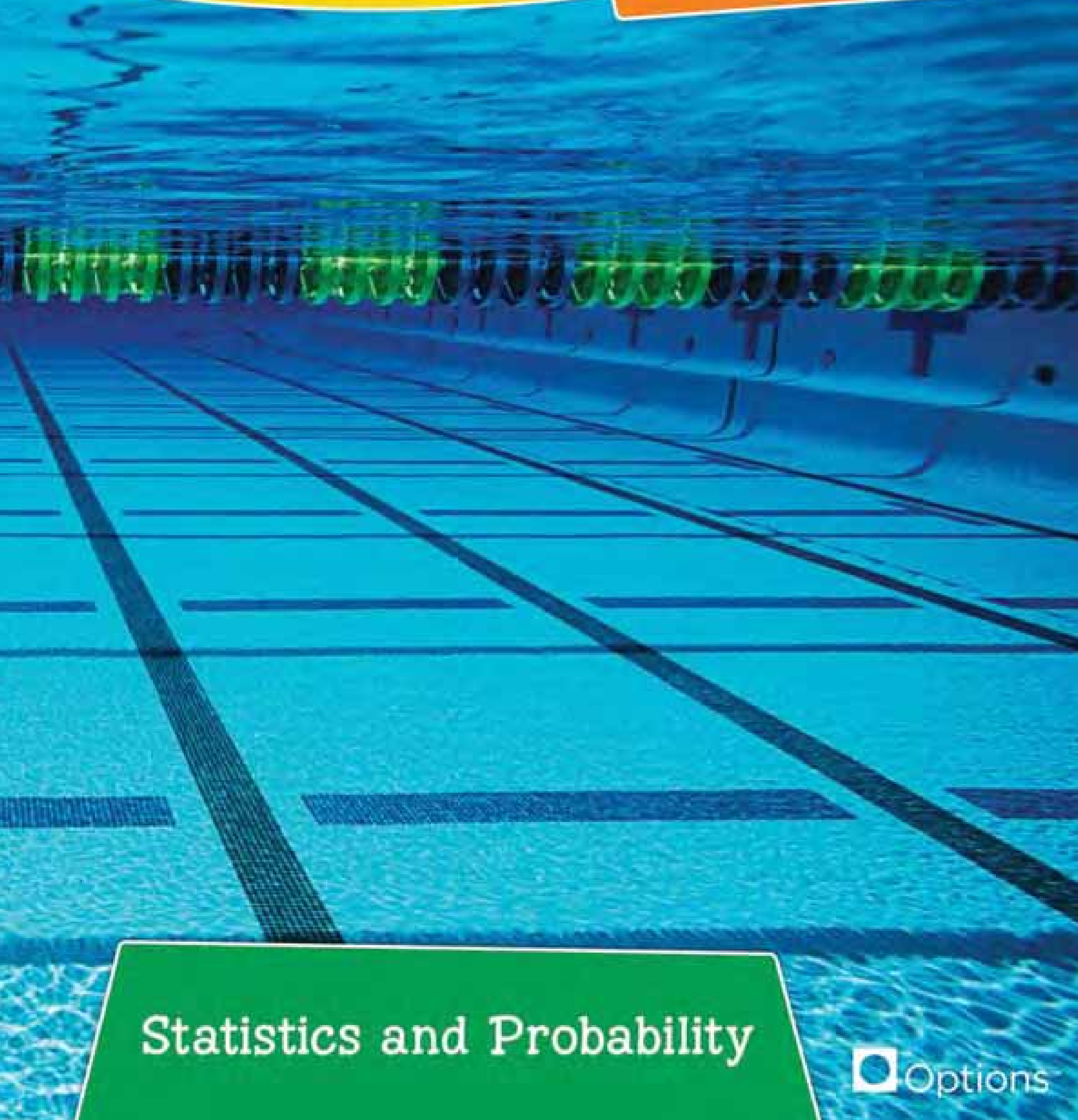


COMMON CORE CLINICS

Grade 7

Mathematics



Statistics and Probability

Options

Module 4 Statistics and Probability

1 Probability

Key Words

experimental probability
probability
theoretical probability

Probability is a number from 0 to 1 that shows the likelihood that an event will occur. A probability close to 0 means an event is unlikely, and a probability close to 1 means it is very likely. A probability close to $\frac{1}{2}$ means an event is neither likely nor unlikely.

The **theoretical probability** of an event *A* occurring is found as follows:

$$P(A) = \frac{\text{favorable outcomes}}{\text{total possible outcomes}}$$

A theoretical probability allows us to predict how many times an event would likely occur in a certain number of trials. Just multiply the theoretical probability by the number of trials.

Since we do not live in a perfect world, your prediction may be close to, but not exactly equal to, your results. The actual outcomes can be used to determine the **experimental probability** that event *A* will occur, as follows:

$$P_e(A) = \frac{\text{times event occurs}}{\text{total trials}}$$

The more times you perform an experiment, the closer the experimental probability should get to the theoretical probability.

Example

A CD has only 1 pop song and 12 classic rock songs on it. What is the probability that a song selected at random will be a pop song? Determine if the event is likely, unlikely, or neither.

There is 1 pop song.

There are a total of 1 + 12, or 13, songs on the CD.

So, $P(\text{pop}) = \frac{\text{favorable outcomes}}{\text{total possible outcomes}} = \frac{1}{13}$.

$\frac{1}{13}$ is close to 0.

So, the event is unlikely.

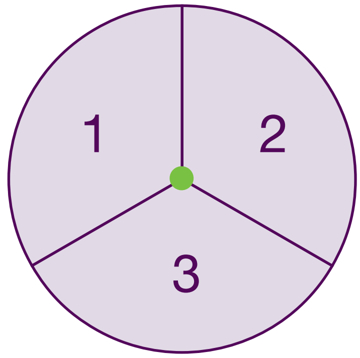
The theoretical probability of choosing a pop song is $\frac{1}{13}$, and the event is unlikely.

APPLY

Suppose you roll a number cube with faces numbered 1 to 6. What is the probability of the cube landing on a number less than 7?

Guided Practice

1 This spinner is divided into three congruent sections. What is the experimental probability of spinning a 2?



Step 1 Place a paper clip over the center of the spinner, hold it in place with the point of a pencil, and flick the paperclip to spin it. Do this 15 times. Record your results in the tally chart.

Number	Tallies	Times Spun
1		
2		
3		

Step 2 Find the experimental probability of spinning a 2.

How many times did you spin a 2? _______

$$P_e(2) = \frac{\text{times event occurs}}{\text{total trials}} = \frac{\square}{15}$$

My experimental probability of spinning a 2 was _______.

THINK

To record the experimental probability, look at the chart to see how many times the event happened. Then write that number over the total number of trials, 15.

2 Compare your experimental probability to the theoretical probability of spinning a 2.

Step 1 Find the theoretical probability of spinning a 2.

There is 1 favorable outcome (spinning a 2).

There are _______ possible outcomes: spinning a ____, ____, or ____.

$$P(2) = \frac{\text{favorable outcomes}}{\text{total possible outcomes}} = \frac{\square}{\square}$$

Step 2 Compare the two probabilities.

experimental probability: _______

theoretical probability: _______

The experimental probability that I found is _____________ the theoretical probability.

REMEMBER

Since you only performed 15 trials, it is reasonable if your experimental probability is different from the theoretical probability.

Independent Practice

1. What is theoretical probability?

____

____

2. How does experimental probability differ from theoretical probability?

____

____

Ask Yourself

How many outcomes are favorable?
How many total possible outcomes are there?

Gillian places the cards below in a bag, shakes the bag, and draws one card at random. Use this diagram for questions 3 through 5.

U N I T E D S T A T E S

3. What is the theoretical probability that Gillian will draw the letter *N*?

____

4. What is the theoretical probability that Gillian will draw the letter *T*?

____

5. Which best describes the probability that Gillian will draw a vowel (*A*, *E*, *I*, *O*, or *U*)—likely, unlikely, or neither? Why?

____

Solve.

6. If you flip a fair coin 50 times, how many times would you expect it to land on heads? Show or explain how you found your answer.

____

____

Cleo has a bag of marbles. Each marble is either blue, red, or yellow. She reaches into the bag, draws a marble, records its color in the table below, and replaces it in the bag. She does this 80 times. Use this information for questions 7 and 8.

Color	Times Picked
Blue	49
Red	8
Yellow	23

7. What is the experimental probability of choosing each type of marble?

P_e(blue): ________ P_e(red): ________ P_e(yellow): ________

8. Do the outcomes appear to be equally likely to one another? Explain.

____

Solve each problem.

9. There are 12 girls and 14 boys in Lilly's class. She is the only girl named Lilly. If each student's name is placed in a hat and a name is drawn at random, what is the probability that a girl's name will be chosen? That Lilly's name will be chosen?

P(girl): ________ *P*(Lilly): ________

10. Jayden tosses a number cube, with faces numbered 1 to 6. If Jayden does this 120 times, how many times would you expect the cube to land on a number less than 3?

____

11. A spinner is divided into four congruent sections, some shaded and some unshaded. Max spun the spinner 100 times and recorded his results in the table.

Section	Times Spun
Shaded	73
Unshaded	27

Based on these results, decide how many of the spinner sections you would expect to be shaded and how many you would expect to be unshaded. Explain your choices.

____

____