Critical Area

Geometry, Measurement, and Data

CRITICAL AREA Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry

Landscape architects can help design and plan outdoor spaces such as botanical gardens.

Project

Landscape Architects

When people who live and work in big cities take breaks, they leave their tall buildings to relax in patches of green. A city garden may be small, but it gives people a chance to enjoy the beauty of nature.

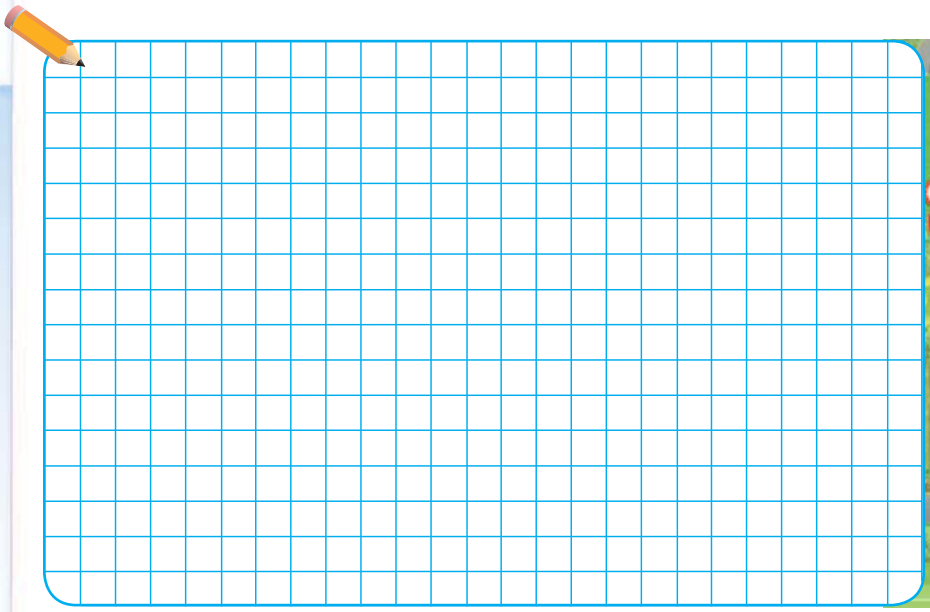
Get Started

Design a garden that covers a whole city block. Decide on features to have in your garden and where they will be located. Mark off parts of your garden for each feature. Then find the number of square units the feature covers and record it on the design. Use the Important Facts to help you.

Important Facts

Features of a City Garden

- Benches
- Flower garden
- Paths
- Shrub garden
- Snack bar
- Spring bulb garden
- Tree garden
- Waterfall and fountain



▲ This map is an example of how a city garden could be laid out.

Completed by _____

Chapter 10

Two-Dimensional Figures

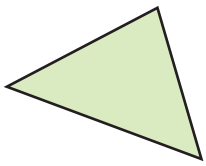
Show What You Know

Check your understanding of important skills.

Name _____

Sides and Vertices

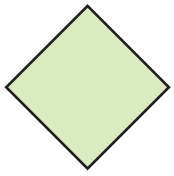
Write the number of vertices.

1. 

_____ vertices

2. 

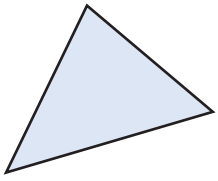
_____ vertices

3. 

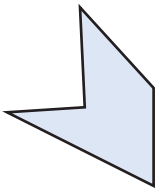
_____ vertices

Number of Sides

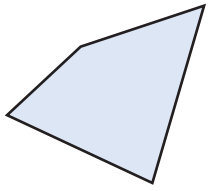
Write the number of sides.

4. 

_____ sides

5. 

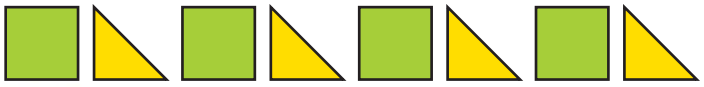
_____ sides

6. 

_____ sides

Geometric Patterns

Draw the next two shapes in the pattern.

7. 

Math Detective

The Isle of Wight Natural History Centre, off the coast of England, has shells of every size, shape, and color. Many shells have symmetry. Be a Math Detective. Investigate this shell. Describe its shape in geometric terms. Then determine whether this shell has line symmetry.

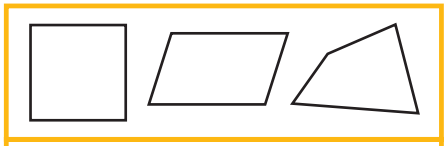
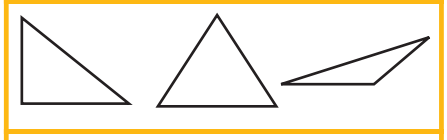
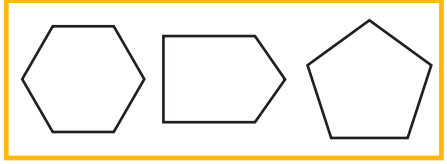
Personal Math Trainer
Online Assessment and Intervention

Vocabulary Builder

Visualize It

Complete the flow map by using the words with a ✓.

Geometry

What is it?	What are some examples?
_____ →	
_____ →	
_____ →	

Review Words

- ✓ polygon
- ✓ triangle
- ✓ quadrilateral

Preview Words

- acute angle
- acute triangle
- equilateral triangle
- isosceles triangle
- line
- line segment
- line symmetry
- obtuse angle
- obtuse triangle
- parallel lines
- parallelogram
- perpendicular lines
- ray
- right angle
- right triangle
- scalene triangle
- straight angle

Understand Vocabulary

Complete the sentences by using preview words.

1. A shape has _____ if it can be folded about a line so that its two parts match exactly.
2. A figure that has no endpoints is called a _____.
3. A figure that has two endpoints is called a _____.
4. _____ are lines that never cross.
5. When two lines cross to form a square corner, the lines are _____.

Name _____

Lines, Rays, and Angles

Essential Question How can you identify and draw points, lines, line segments, rays, and angles?

Geometry—4.G.1

MATHEMATICAL PRACTICES
MP.4, MP.5, MP.6

Unlock the Problem

Everyday things can model geometric figures. For example, the period at the end of this sentence models a point. A solid painted stripe in the middle of a straight road models a line.

Term and Definition	Draw It	Read It	Write It	Example
A **point** is an exact location in space.	A •	point A	point A	
A **line** is a straight path of points that continues without end in both directions.		line BC line CB	$\overleftrightarrow{BC}$ $\overleftrightarrow{CB}$	
A **line segment** is part of a line between two endpoints.		line segment DE line segment ED	$\overline{DE}$ $\overline{ED}$	
A **ray** is a part of a line that has one endpoint and continues without end in one direction.		ray FG	$\overrightarrow{FG}$	

Activity 1 Draw and label $\overline{JK}$.

Math Talk **Mathematical Practices**

Explain how lines, line segments, and rays are related.

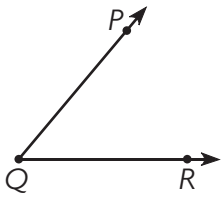
_____

- Is there another way to name $\overline{JK}$? Explain.

_____

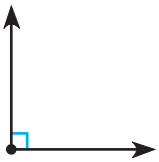
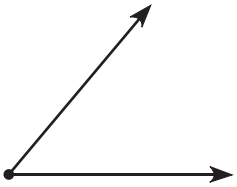
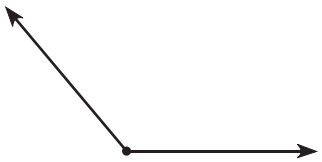
_____

Angles

Term and Definition	Draw It	Read It	Write It	Example
An **angle** is formed by two rays or line segments that have the same endpoint. The shared endpoint is called the vertex.		angle *PQR* angle *RQP* angle *Q*	$\angle PQR$ $\angle RQP$ $\angle Q$	

You can name an angle by the vertex. When you name an angle using 3 points, the vertex is always the point in the middle.

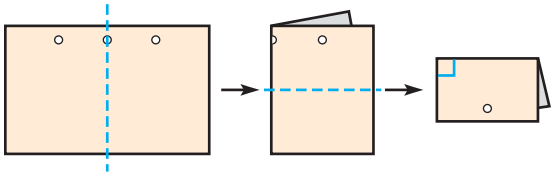
Angles are classified by the size of the opening between the rays.

A **right angle** forms a square corner.	A **straight angle** forms a line.	An **acute angle** is less than a right angle.	An **obtuse angle** is greater than a right angle and less than a straight angle.
			

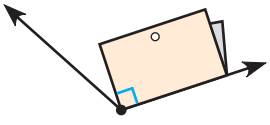
Activity 2 Classify an angle.

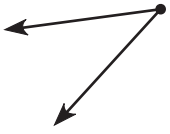
Materials ■ paper

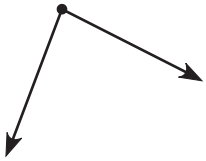
To classify an angle, you can compare it to a right angle.

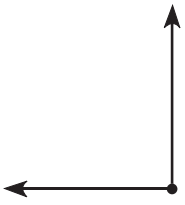


Make a right angle by using a sheet of paper. Fold the paper twice evenly to model a right angle. Use the right angle to classify the angles below. Write *acute*, *obtuse*, *right*, or *straight*.

a. 

b. 

c. 

d. 

_____ _____ _____ _____

Name _____

Share and Show

MATH BOARD

1. Draw and label $\overline{AB}$ in the space at the right.

$\overline{AB}$ is a _____.

Draw and label an example of the figure.

2. $\overleftrightarrow{XY}$

3. obtuse $\angle K$

4. right $\angle CDE$

Use Figure *M* for 5 and 6.

5. Name a line segment.

_____

6. Name a right angle.

_____

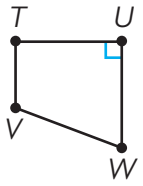


Figure *M*

On Your Own

Draw and label an example of the figure.

7. $\overrightarrow{PQ}$

8. acute $\angle RST$

9. straight $\angle WXZ$

Use Figure *F* for 10–15.

10. Name a ray.

_____

11. Name an obtuse angle.

_____

12. Name a line.

_____

13. Name a line segment.

_____

14. Name a right angle.

_____

15. Name an acute angle.

_____

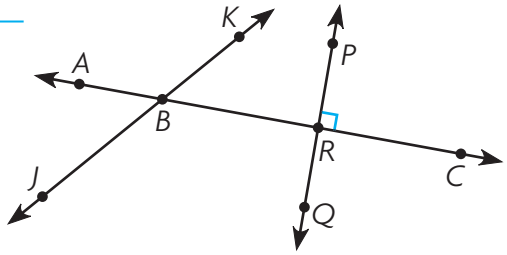
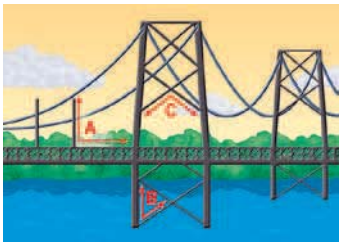


Figure *F*

Problem Solving • Applications

Use the picture of the bridge for 16 and 17.

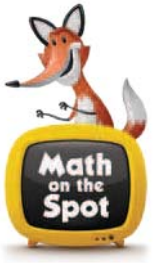


16. Classify $\angle A$.

_____

17. MATHEMATICAL PRACTICE 4 **Use Diagrams** Which angle appears to be obtuse? _____

18. THINK SMARTER How many different angles are in Figure *X*? List them.



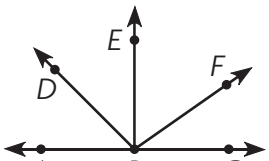
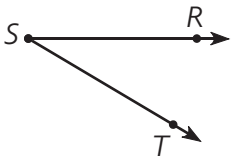


Figure *X*

_____

_____

19. GO DEEPER Vanessa drew the angle at the right and named it $\angle TRS$. Explain why Vanessa's name for the angle is incorrect. Write a correct name for the angle.



_____

_____

20. THINK SMARTER Write the word that describes the part of Figure *A*.

ray | line | line segment | acute angle | right angle

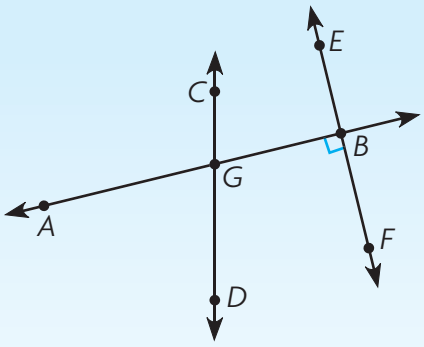


Figure *A*

$\overline{BG}$ _____

$\overleftrightarrow{CD}$ _____

$\angle FBG$ _____

$\overrightarrow{BE}$ _____

$\angle AGD$ _____

FOR MORE PRACTICE: Standards Practice Book

Name _____

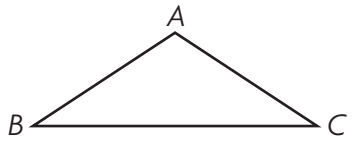
Classify Triangles by Angles

Essential Question How can you classify triangles by the size of their angles?

Geometry—4.G.2
Also 4.G.1
MATHEMATICAL PRACTICES
MP.3, MP.4, MP.6, MP.7

Unlock the Problem

A triangle is a polygon with three sides and three angles. You can name a triangle by the vertices of its angles.

Triangle	Possible Names	
	△*ABC*	△*ACB*
	△*BCA*	△*BAC*
	△*CAB*	△*CBA*

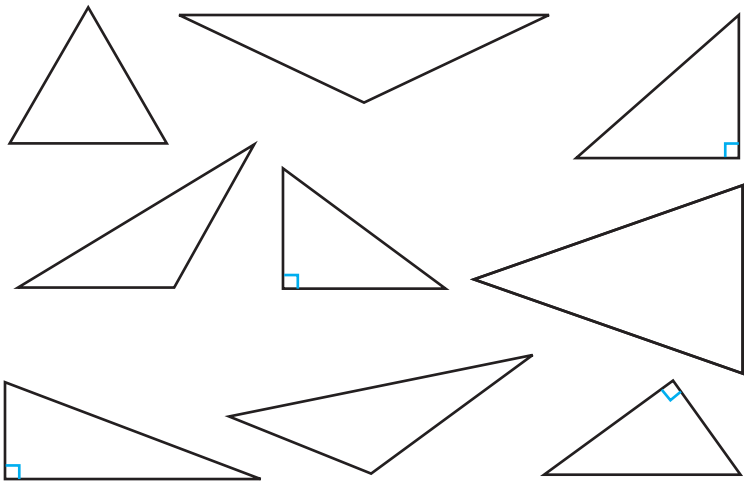
Read Math
When you see "△*ABC*," say "triangle *ABC*."

An angle of a triangle can be right, acute, or obtuse.

Activity 1 Identify right, acute, and obtuse angles in triangles.

Materials ■ color pencils

Use the Triangle Color Guide to color the triangles below.



Triangle Color Guide	
RED	one right angle
BLUE	one obtuse angle
ORANGE	three acute angles

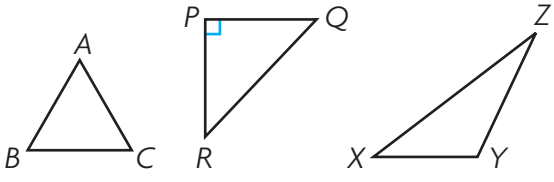
Math Talk **Mathematical Practices**
Can a triangle have more than one obtuse angle? **Explain.**

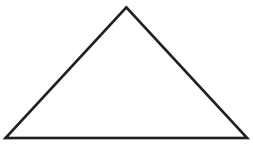
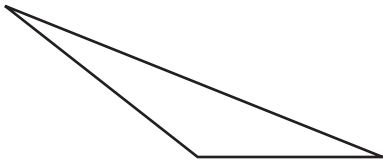
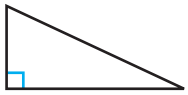
Try This!

a. Name the triangle with one right angle. _____

b. Name the triangle with one obtuse angle. _____

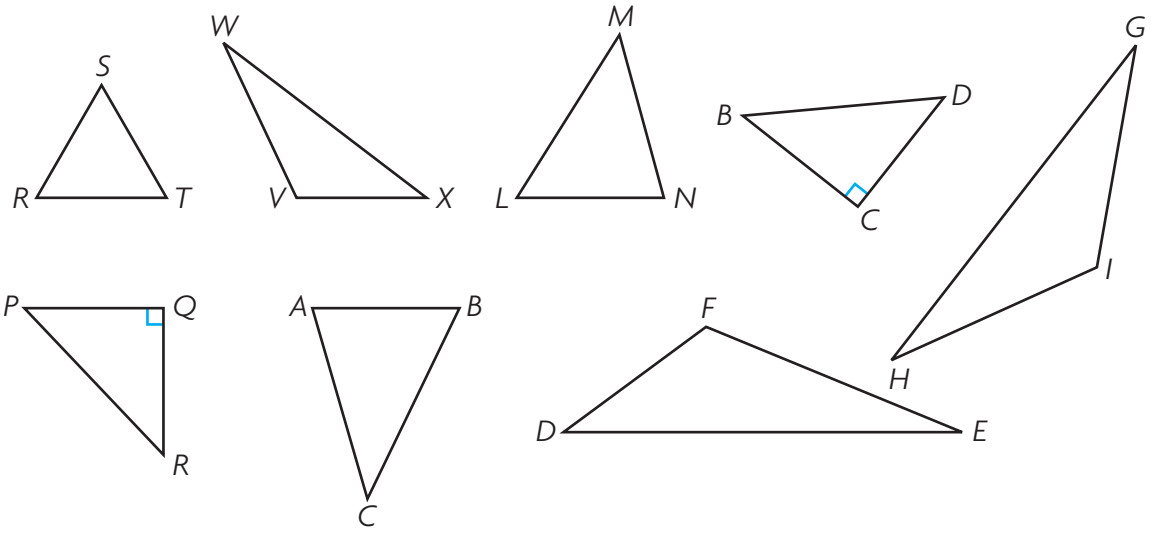
c. Name the triangle with three acute angles. _____

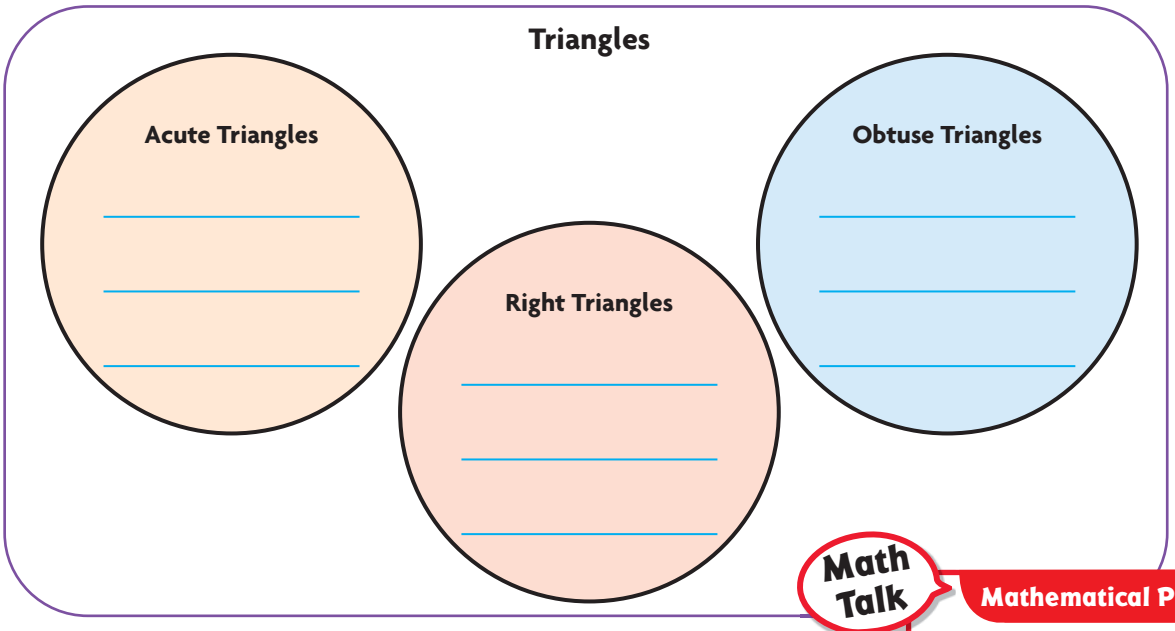


An **acute triangle** is a triangle with three acute angles.	An **obtuse triangle** is a triangle with one obtuse angle.	A **right triangle** is a triangle with one right angle.
		
Acute Triangle	**Obtuse Triangle**	**Right Triangle**

Activity 2 Use a Venn diagram to classify triangles.

Write the names of the triangles in the Venn diagram.





Math Talk **Mathematical Practices**

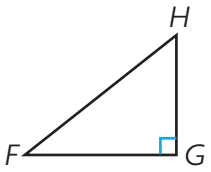
Explain why the three circles in this Venn diagram do not overlap.

Name _____

Share and Show

MATH BOARD

1. Name the triangle. Tell whether each angle is *acute*, *right*, or *obtuse*.



A name for the triangle is _____.

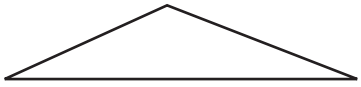
$\angle F$ is _____.

$\angle G$ is _____.

$\angle H$ is _____.

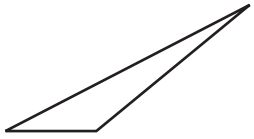
Classify each triangle. Write *acute*, *right*, or *obtuse*.

2.



_____

3.



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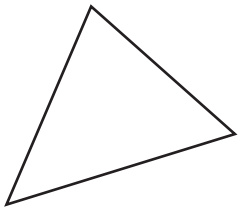
4.



_____

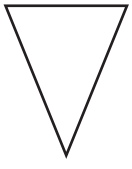
On Your Own

Classify each triangle. Write *acute*, *right*, or *obtuse*.

5.

_____

6.



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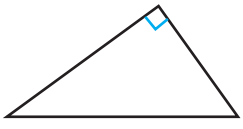
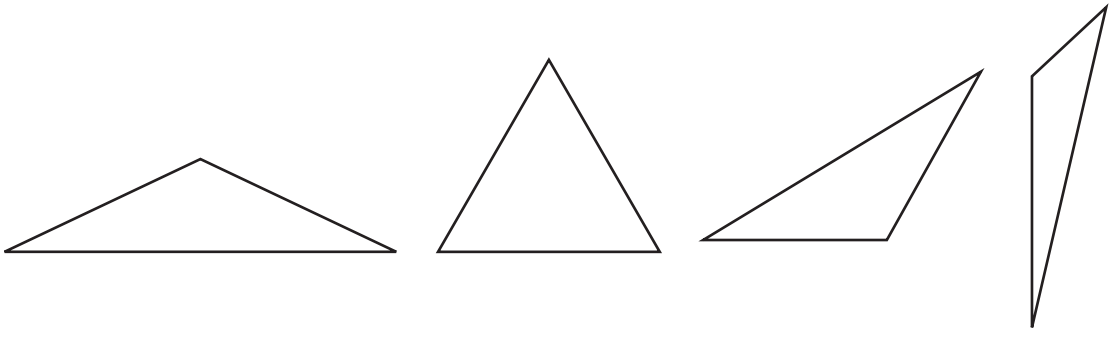
7.



_____

8. THINK SMARTER Cross out the figure that does not belong. Explain.



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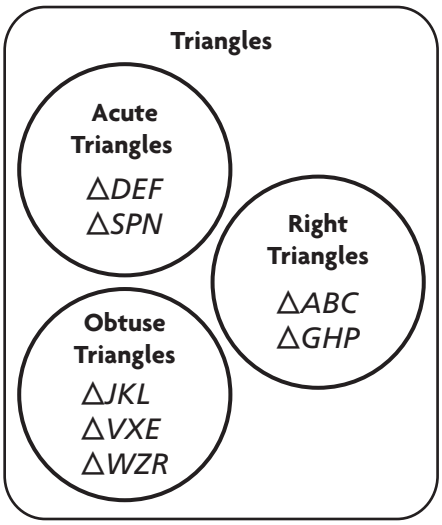
Problem Solving • Applications

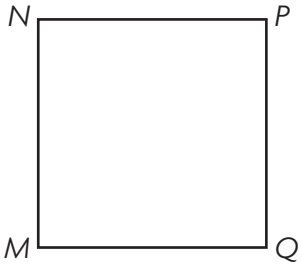
Use the Venn diagram for 9–10.



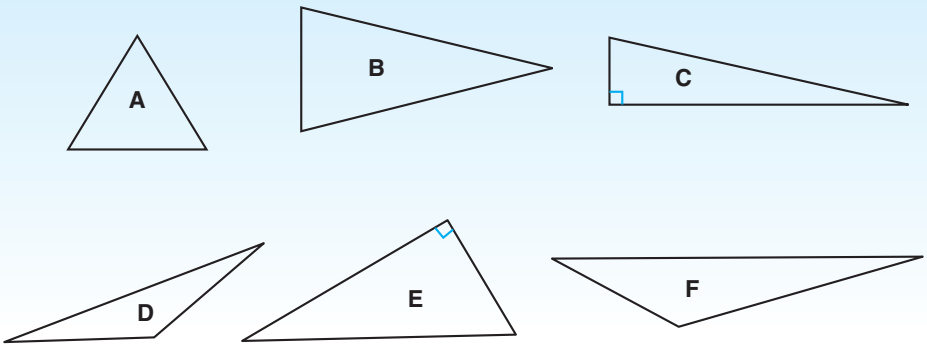
9. THINK SMARTER Which triangles do NOT have an obtuse angle? Explain.

10. MATHEMATICAL PRACTICE 6 How many triangles have *at least* two acute angles? **Explain.**

11. GO DEEPER Use square *MNPQ* shown at the right. Draw a line segment from point *M* to point *P*. Name and classify the triangles formed by the line segment.



12. THINK SMARTER Write the letter of the triangle under its correct classification.



Acute Triangle	Obtuse Triangle	Right Triangle

FOR MORE PRACTICE: Standards Practice Book

Name _____

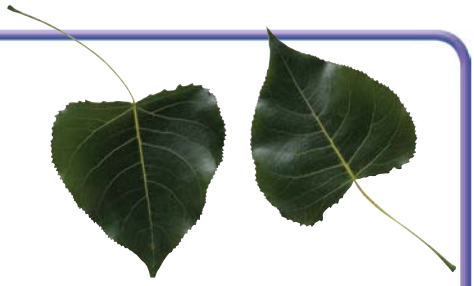
Classify Triangles by Sides

Essential Question How can you classify triangles by the length of their sides?

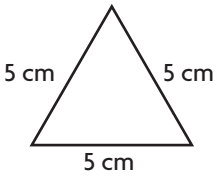
Geometry—4.G.2

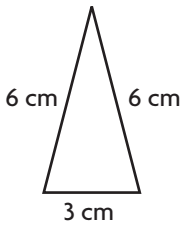
MATHEMATICAL PRACTICES
MP.3, MP.4, MP.6, MP.7

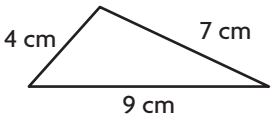
Unlock the Problem



A triangle can also be classified by the lengths of its sides.







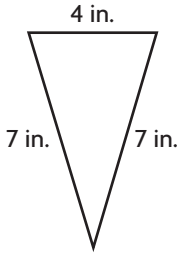
A triangle can have 3 sides that are the same length, 2 sides that are the same length, or no sides that are the same length.

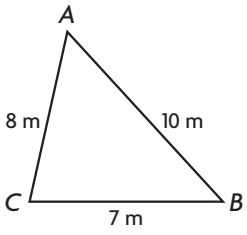
Activity 1 Identify triangles that have 3 sides the same length, 2 sides the same length, or no sides the same length.

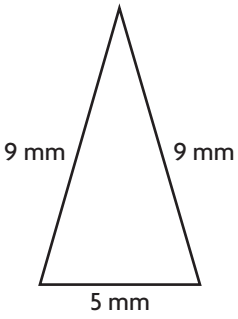
Materials ■ color pencils

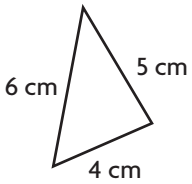
Triangle Color Guide	
Red	3 sides the same length
Blue	2 sides the same length
Orange	0 sides the same length

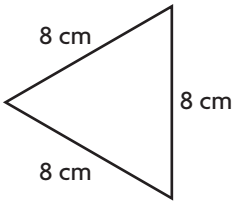
Use the Triangle Color Guide to color the triangles below.

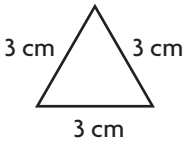








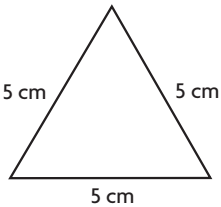




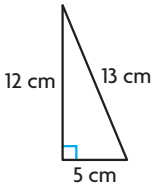
Try This!

a. Name the triangle that has no sides the same length. _____

b. Name the triangle that has 3 sides the same length. _____

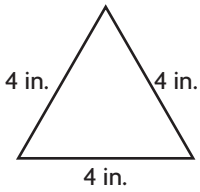


Triangle *A*



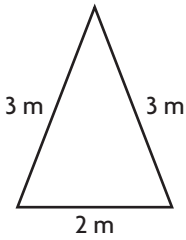
Triangle *B*

An **equilateral triangle** is a triangle that has 3 equal sides.



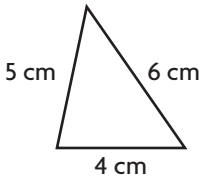
Equilateral Triangle

An **isosceles triangle** is a triangle that has 2 equal sides.



Isosceles Triangle

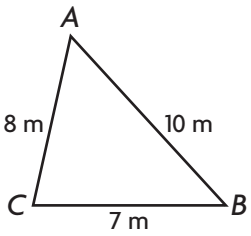
A **scalene triangle** is a triangle that has no equal sides.

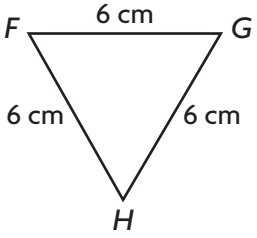


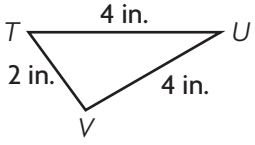
Scalene Triangle

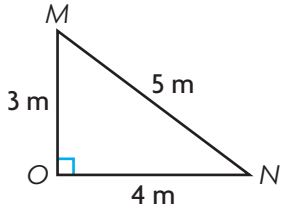
Activity 2 Use a Venn diagram to classify triangles.

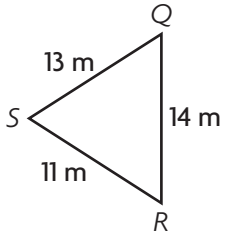
Write the names of the triangles in the Venn diagram

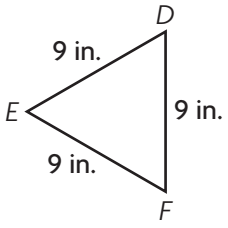




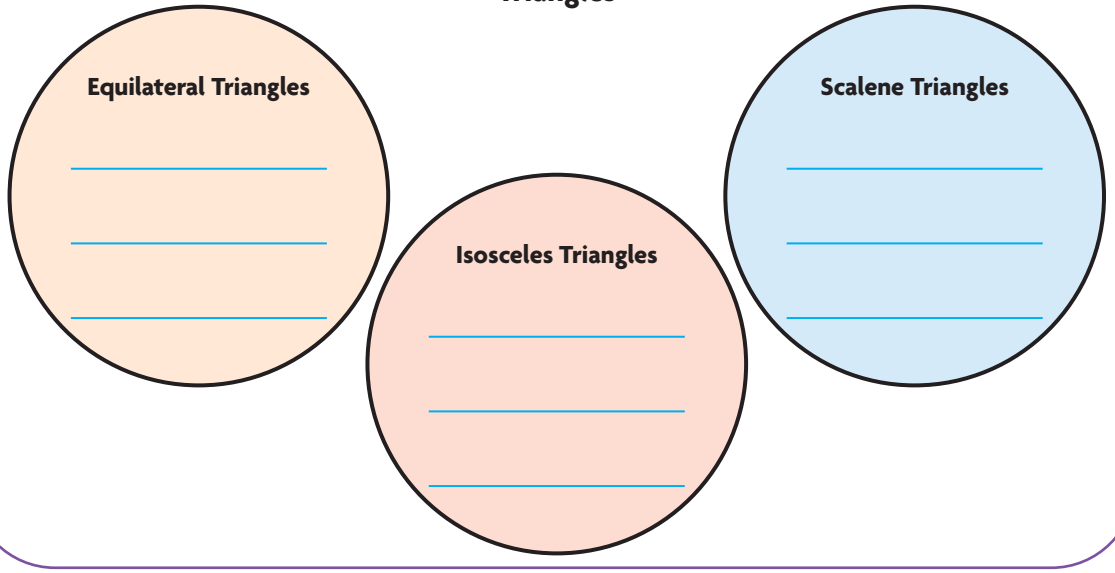








Triangles



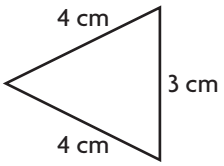
Name _____

Share and Show

MATH BOARD

1. Name the triangle at the right.
Write *equilateral, isosceles,* or *scalene.*

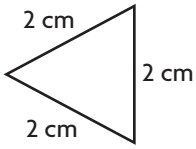
Think: How many equal sides does the triangle have?



_____

Name the triangle. Write *equilateral, isosceles,* or *scalene.*

2.



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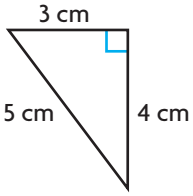
3.



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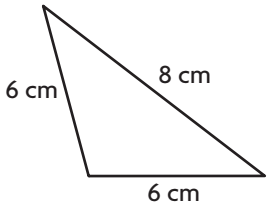
4.



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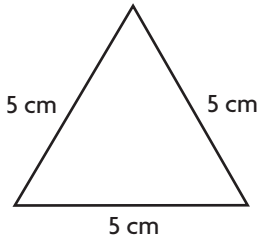
On Your Own

Name the triangle. Write *equilateral, isosceles,* or *scalene.*

5.



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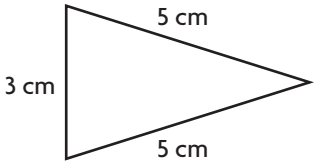
6.



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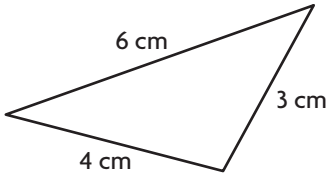
7.



_____

Name the triangle by the lengths of its sides. Write *equilateral, isosceles,* or *scalene.*

8. 12 inches, 12 inches, 12 inches

_____

9. 4 inches, 6 inches, 6 inches

_____

10. 9 inches, 5 inches, 7 inches

_____

11. 14 inches, 7 inches, 14 inches

_____

Problem Solving • Applications

12. THINK SMARTER The American crocodile's head appears to be shaped like a triangle. Classify the shape of the head by the lengths of its sides. Write *isosceles, scalene,* or *equilateral.*

13. THINK SMARTER How are an equilateral triangle and a scalene triangle alike? How are they different? Explain your answer.

14. GO DEEPER I am a triangle. Two of my sides are 5 inches long. My third side is less than 5 inches. None of my angles are right angles. What two names do I have?

WRITE Math
Show Your Work

15. MATHEMATICAL PRACTICE 6 **Explain** how a triangle can be isosceles and obtuse.

16. THINK SMARTER Select the lengths that identify a scalene triangle. Mark all that apply.

- (A) 2 inches, 2 inches, 3 inches
- (B) 3 meters, 4 meters, 5 meters
- (C) 6 feet, 6 feet, 6 feet
- (D) 10 meters, 7 meters, 5 meters
- (E) 8 feet, 3 feet, 8 feet

FOR MORE PRACTICE:
Standards Practice Book

Name _____

Parallel Lines and Perpendicular Lines

Essential Question How can you identify and draw parallel lines and perpendicular lines?

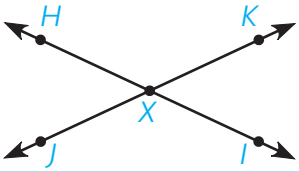
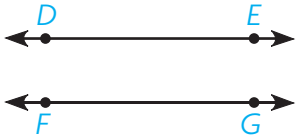
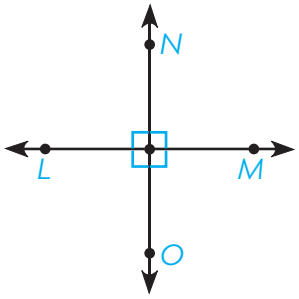
Geometry—4.G.1

MATHEMATICAL PRACTICES
MP.4, MP.5, MP.6

Unlock the Problem

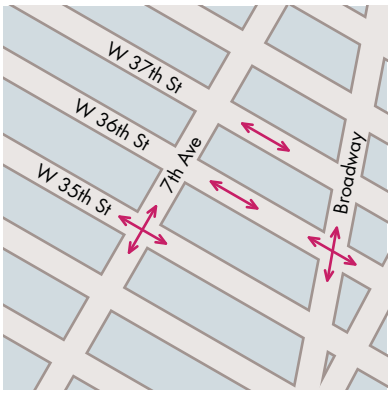
You can find models of lines in the world around you. For example, two streets that cross each other model intersecting lines. Metal rails on a train track that never cross model parallel lines.

▲ Maglev trains use magnets to lift them above the tracks while moving.

Term and Definition	Draw It	Read It	Write It
Intersecting lines are lines in a plane that cross at exactly one point. Intersecting lines form four angles.		Line *HI* intersects line *JK* at point *X*.	$\overleftrightarrow{HI}$ and $\overleftrightarrow{JK}$ intersect at point *X*
Parallel lines are lines in a plane that are always the same distance apart. Parallel lines never intersect.		Line *DE* is parallel to line *FG*.	$\overleftrightarrow{DE} \parallel \overleftrightarrow{FG}$ The symbol ∥ means "is parallel to."
Perpendicular lines are lines in a plane that intersect to form four right angles.		Line *LM* is perpendicular to line *NO*.	$\overleftrightarrow{LM} \perp \overleftrightarrow{NO}$ The symbol ⊥ means "is perpendicular to."

Try This! **Tell how the streets appear to be related. Write *perpendicular*, *parallel*, or *intersecting*.**

- W 36th St and Broadway _____
- W 35th St and 7th Ave _____
- W 37th St and W 36th St _____



Math Talk **Mathematical Practices**

Can two rays be parallel? **Explain**.

Activity Draw and label $\overrightarrow{YX} \perp \overrightarrow{YZ}$ intersecting at point Y.

Materials ■ straightedge

STEP 1: Draw and label $\overrightarrow{YX}$.

STEP 2: Then draw and label $\overrightarrow{YZ}$.

STEP 3: Make sure $\overrightarrow{YX}$ and $\overrightarrow{YZ}$ intersect at point Y.

STEP 4: Make sure the rays are perpendicular.

- How can you check if two rays are perpendicular?

1. Name the figure you drew.

2. Can you classify the figure? Explain.

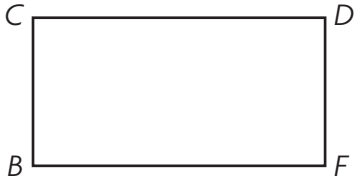
Share and Show

MATH BOARD

1. Draw and label $\overline{QR} \parallel \overline{ST}$.

Think: Parallel lines never intersect. Parallel line segments are parts of parallel lines.

Use the figure for 2 and 3.



2. Name two sides that appear to be parallel.

3. Name two sides that appear to be perpendicular.

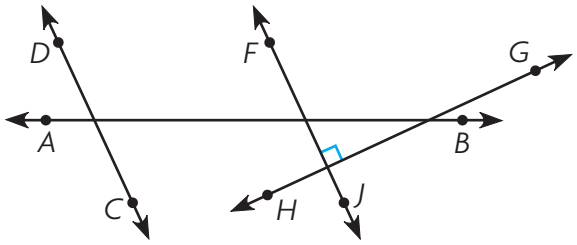
Math Talk **Mathematical Practices**

Explain how the symbols $\perp$ and $\parallel$ help you remember which relationships they describe.

Name _____

On Your Own

Use the figure for 4–5.



4. Name a pair of lines that appear to be perpendicular. _____

5. Name a pair of lines that appear to be parallel.

_____

Draw and label the figure described.

6. $\overline{RS} \parallel \overline{TU}$

7. $\overrightarrow{KL}$ and $\overrightarrow{KM}$

8. $\overline{CD} \perp \overline{DE}$

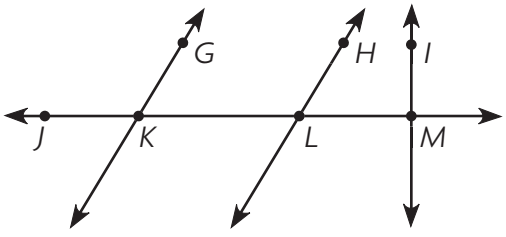
9. $\overleftrightarrow{JK} \perp \overleftrightarrow{LM}$

10. $\overleftrightarrow{ST}$ intersecting $\overleftrightarrow{UV}$ at point X

11. $\overleftrightarrow{AB} \parallel \overleftrightarrow{FG}$

Problem Solving • Applications

Use the figure for 12–13.



12. THINK SMARTER Dan says that $\overleftrightarrow{HL}$ is parallel to $\overleftrightarrow{IM}$. Is Dan correct? Explain.

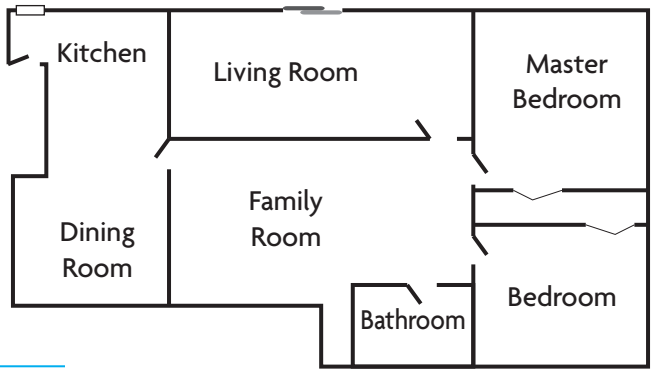
_____

_____

13. GO DEEPER Name two intersecting line segments that are not perpendicular.

_____

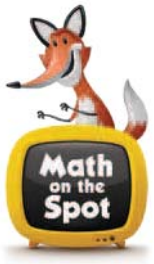
Use the house plan at the right for 14–16.



14. What geometric term describes a corner of the living room?

15. Name three parts of the plan that show line segments.

16. THINK SMARTER Name a pair of line segments that appear to be parallel.



Use the map at the right for 17–19.

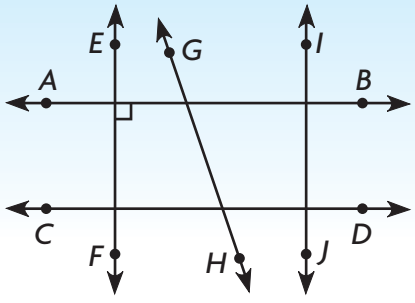
17. Name a street that appears to be parallel to S 17th Street.

18. MATHEMATICAL PRACTICE 4 **Use Diagrams** Name a street that appears to be parallel to Vernon Street.

19. Name a street that appears to be perpendicular to S 19th Street.

20. THINK SMARTER Choose the labels to make a true statement.

$\overleftrightarrow{GH}$ $\overleftrightarrow{IJ}$ $\overleftrightarrow{AB}$	is perpendicular to	$\overleftrightarrow{EF}$ $\overline{AE}$ $\overleftrightarrow{GH}$



FOR MORE PRACTICE: Standards Practice Book

Name _____

Classify Quadrilaterals

Essential Question How can you sort and classify quadrilaterals?

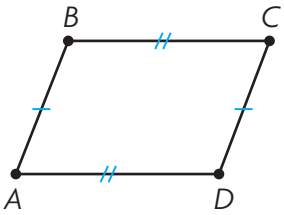
Geometry—4.G.2

MATHEMATICAL PRACTICES
MP.2, MP.4, MP.6

Unlock the Problem

A quadrilateral is a polygon with four sides and four angles. You can name a quadrilateral by the vertices of its angles.

Quadrilateral *ABCD* is a possible name for the figure shown at the right. Quadrilateral *ACBD* is not a possible name, since points *A* and *C* are not endpoints of the same side.

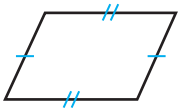


The tick marks on the line segments show that they have the same length. Sides *AD* and *BC* have the same length. Sides *AB* and *CD* have the same length.

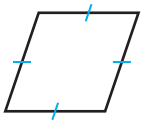
Assume that line segments that appear to be parallel are parallel.

Common Quadrilaterals

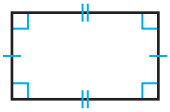
Trapezoid
- 1 pair of parallel sides



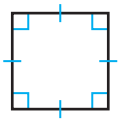
Parallelogram
- 2 pairs of parallel sides
- 2 pairs of sides of equal length



Rhombus
- 2 pairs of parallel sides
- 4 sides of equal length



Rectangle
- 2 pairs of parallel sides
- 2 pairs of sides of equal length
- 4 right angles

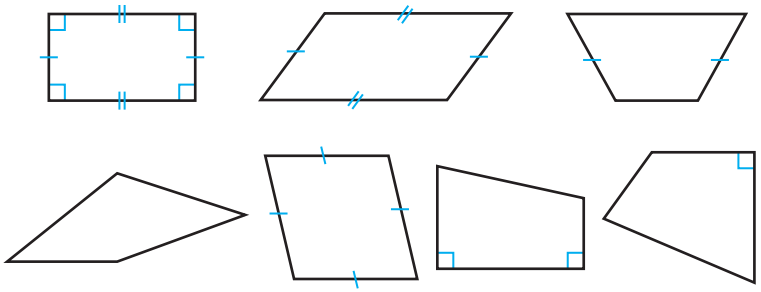


Square
- 2 pairs of parallel sides
- 4 sides of equal length
- 4 right angles

Activity 1 Identify right angles in quadrilaterals.

Materials ■ color pencils

Use the Quadrilateral Color Guide to color the quadrilaterals.



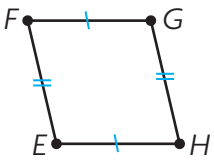
Quadrilateral Color Guide	
RED:	exactly 4 right angles
BLUE:	exactly 2 right angles
ORANGE:	exactly 1 right angle

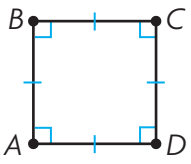
Math Talk **Mathematical Practices**

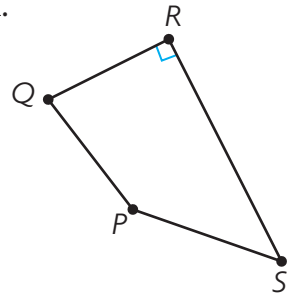
Can a quadrilateral have exactly 3 right angles? **Explain.**

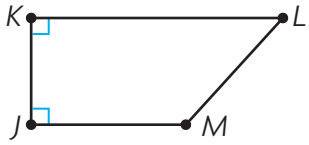
Activity 2 Use a Venn diagram to sort quadrilaterals.

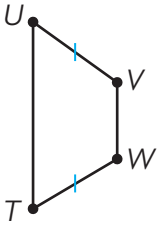
Write the names of the quadrilaterals in the Venn diagram.

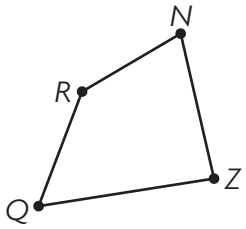












Quadrilaterals

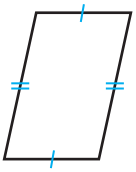
Exactly 1 Pair of Parallel Sides

No Parallel Sides

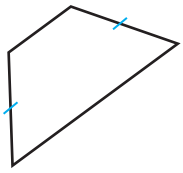
2 Pairs of Parallel Sides

Try This! **Classify each figure as many ways as possible. Write *quadrilateral, trapezoid, parallelogram, rhombus, rectangle,* or *square.***

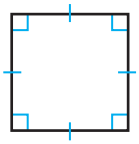
a.



b.



c.

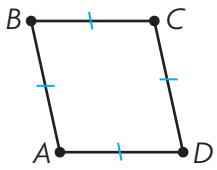


Name _____

Share and Show

MATH BOARD

1. Tell whether the quadrilateral is also a trapezoid, parallelogram, rhombus, rectangle, or square.



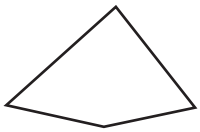
Think: _____ pairs of parallel sides

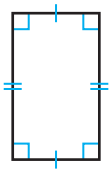
_____ sides of equal length

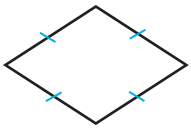
_____ right angles

Quadrilateral *ABCD* is also a _____.

Classify each figure as many ways as possible. Write *quadrilateral, trapezoid, parallelogram, rhombus, rectangle,* or *square.*

2. 

3. 

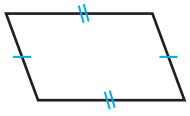
4. 

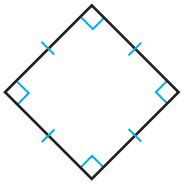
Math Talk — **Mathematical Practices**

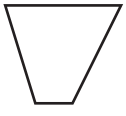
How would you classify a figure with 4 sides, none of which are parallel? **Explain.**

On Your Own

Classify each figure as many ways as possible.
Write *quadrilateral, trapezoid, parallelogram, rhombus, rectangle,* or *square.*

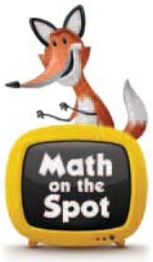
5. 

6. 

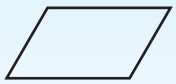
7. 

Problem Solving • Applications

8. THINK SMARTER Explain how a rhombus and square are alike, and how they are different.



9. THINK SMARTER Classify the figure. Select all that apply.

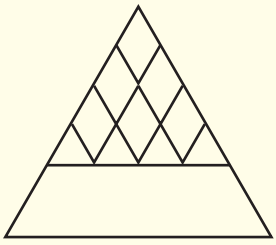


- ○ quadrilateral
- ○ rectangle
- ○ trapezoid
- ○ rhombus
- ○ parallelogram
- ○ square

Connect to Art

The Louvre Museum is located in Paris, France. Architect I.M. Pei designed the glass and metal structure at the main entrance of the museum. This structure is called the Louvre Pyramid.

Below is a diagram of part of the entrance to the Louvre Pyramid.



10. MATHEMATICAL PRACTICE 1 **Describe** the quadrilaterals you see in the diagram.

11. GO DEEPER How many triangles do you see in the diagram? Explain.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Mid-Chapter Checkpoint

Vocabulary

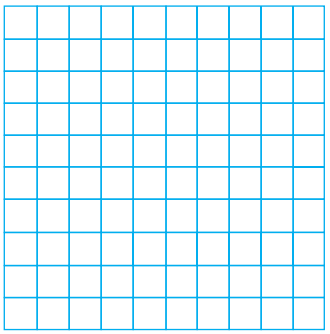
Choose the best term from the box to complete the sentence.

Vocabulary
acute angle
line segment
obtuse angle
ray
right angle
straight angle

1. A _____ is part of a line between two endpoints. (p.399)
2. A _____ forms a square corner. (p. 400)
3. An _____ is greater than a right angle and less than a straight angle. (p. 400)
4. The two-dimensional figure that has one endpoint is a _____. (p. 399)
5. An angle that forms a line is called a _____. (p. 400)

Concepts and Skills

6. On the grid to the right, draw a polygon that has 2 pairs of parallel sides, 2 pairs of sides equal in length, and 2 acute and 2 obtuse angles. Tell all the possible names for the figure. (4.G.2)



_____

Draw the figure. (4.G.1)

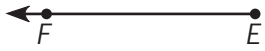
7. parallel lines
8. obtuse $\angle ABC$
9. intersecting lines that are not perpendicular
10. acute $\angle RST$

11. Which triangle has no sides lengths of equal length? (4.G.2)

12. Which figure has 2 pairs of parallel sides, 2 pairs of sides of equal length, and 4 right angles? (4.G.2)

13. Which quadrilateral can have 2 pairs of parallel sides, all sides with equal length, and no right angles? (4.G.2)

14. What is the correct name of the figure shown? (4.G.1)



15. Describe the angles of an obtuse triangle. (4.G.2)

Name _____

Line Symmetry

Essential Question How can you check if a shape has line symmetry?

Geometry—4.G.3

MATHEMATICAL PRACTICES
MP.2, MP.3, MP.5

Unlock the Problem

One type of symmetry found in geometric shapes is line symmetry. This sign is in the hills above Hollywood, California. Do any of the letters in the Hollywood sign show line symmetry?

A shape has **line symmetry** if it can be folded about a line so that its two parts match exactly.
A fold line, or a **line of symmetry**, divides a shape into two parts that are the same size and shape.

Activity Explore line symmetry.

Materials ■ pattern blocks ■ scissors

A **Does the letter W have line symmetry?**

STEP 1 Use pattern blocks to make the letter W.

STEP 2 Trace the letter.

STEP 3 Cut out the tracing.

STEP 4 Fold the tracing over a vertical line.

Think: The two parts of the folded W match exactly. The fold line is a line of symmetry.

So, the letter W _____ line symmetry.

Math Idea

A vertical line goes up and down. ↕

A horizontal line goes left and right. ↔

A diagonal line goes through vertices of a polygon that are not next to each other. It can go up and down and left and right. ⤢ ⤡

Math Talk **Mathematical Practices**

Why is it important to use a fold line to check if a shape has line symmetry?

B Does the letter L have line symmetry?

STEP 1

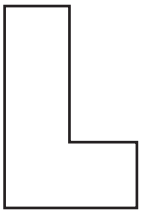
Use pattern blocks or grid paper to make the letter L.

STEP 2

Trace the letter.

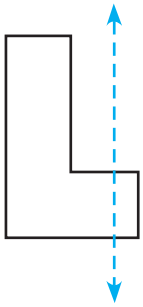
STEP 3

Cut out the tracing.



STEP 4

Fold the tracing over a vertical line.

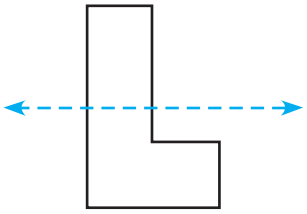


Do the two parts match exactly?

_____

STEP 5

Then open it and fold it horizontally.

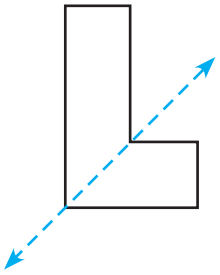


Do the two parts match exactly?

_____

STEP 6

Then open it and fold it diagonally.



Do the two parts match exactly?

_____

So, the letter L _____ line symmetry.

1. Repeat Steps 1–6 for the remaining letters in HOLLYWOOD. Which letters have line symmetry?

_____

2. Do any of the letters have more than one line of symmetry? Explain.

_____

_____

Remember

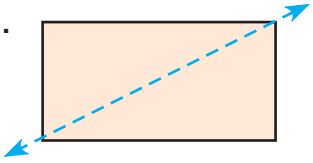
You can fold horizontally, vertically, or diagonally to determine if the parts match exactly.

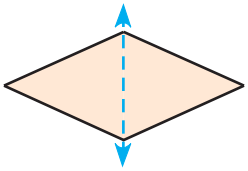
Name _____

Share and Show

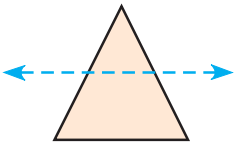
MATH BOARD

Tell whether the parts on each side of the line match. Is the line a line of symmetry? Write *yes* or *no*.

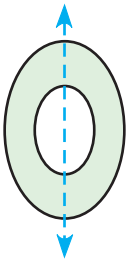
1. 

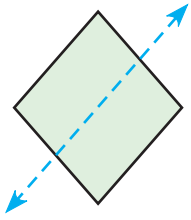
2. 

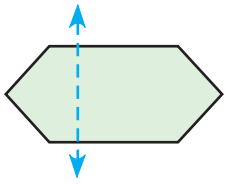
3. 

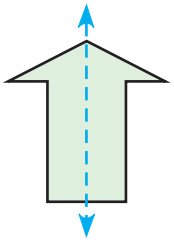
4. 

Tell if the blue line appears to be a line of symmetry. Write *yes* or *no*.

5. 

6. 

7. 

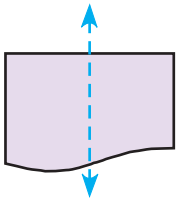
8. 

Math Talk — **Mathematical Practices**

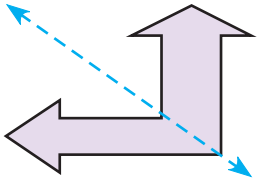
Explain how you can use paper folding to check if a shape has line symmetry.

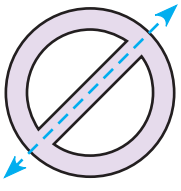
On Your Own

Tell if the blue line appears to be a line of symmetry. Write *yes* or *no*.

9. 

10. 

11. 

12. 

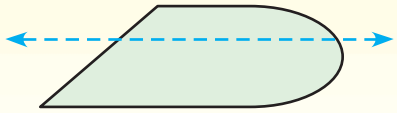
13. GO DEEPER Which best describes the symmetry in the letter I?

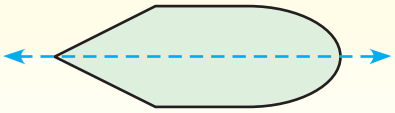
I

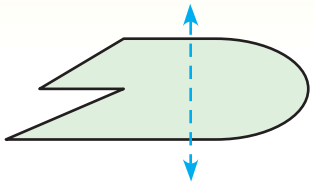
_____

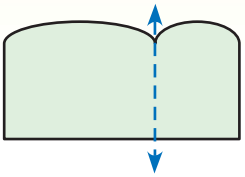
Unlock the Problem

14. Which shape has a correctly drawn line of symmetry?









a. What do you need to find? _____

_____

b. How can you tell if the line of symmetry is correct?

_____

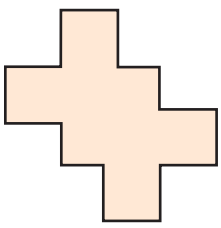
c. Tell how you solved the problem.

_____

_____

d. Circle the correct shape above.

15. MATHEMATICAL PRACTICE 2 **Reason Abstractly** Draw a line of symmetry in the figure shown.



Personal Math Trainer

16. THINK SMARTER + Evie's birthday is on the 18th of May. Since May is the 5th month, Evie wrote the date as shown.

5/18

Evie says all the numbers she wrote have line symmetry. Is she correct? Explain.

_____

_____

_____

FOR MORE PRACTICE:
Standards Practice Book

Name _____

Find and Draw Lines of Symmetry

Essential Question How do you find lines of symmetry?

Geometry—4.G.3

MATHEMATICAL PRACTICES
MP.1, MP.7, MP.8

Unlock the Problem

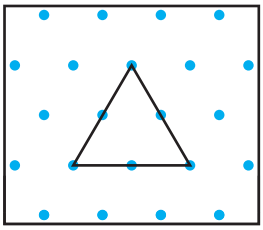
How many lines of symmetry does each polygon have?

Activity 1 Find lines of symmetry.

Materials ■ isometric and square dot paper ■ straightedge

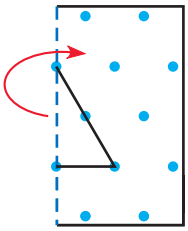
STEP 1

Draw a triangle like the one shown, so all sides have equal length.



STEP 2

Fold the triangle in different ways to test for line symmetry. Draw along the fold lines that are lines of symmetry.

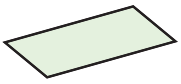


- Is there a line of symmetry if you fold the paper horizontally?

_____

STEP 3

Repeat the steps for each polygon shown. Complete the table.

Polygon	 Triangle	 Square	 Parallelogram	 Rhombus	 Trapezoid	 Hexagon
Number of Sides	3					
Number of Lines of Symmetry	3					

- In a regular polygon, all sides are of equal length and all angles are equal. What do you notice about the number of lines of symmetry in regular polygons?

_____

_____

Math Talk **Mathematical Practices**

How many lines of symmetry does a circle have? **Explain.**

Activity 2 Make designs that have line symmetry.

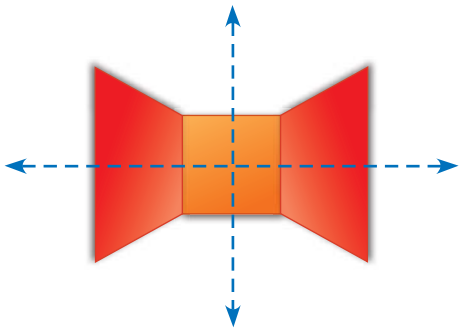
Materials ■ pattern blocks

Make a design by using more than one pattern block. Record your design. Draw the line or lines of symmetry.

ERROR Alert

To avoid errors, you may use a mirror to check for line symmetry.

Make a design with 2 lines of symmetry.



Make a design with 1 line of symmetry.

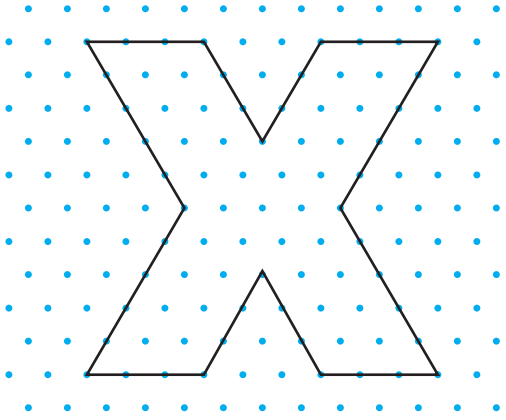
Make a design with more than 2 lines of symmetry.

Make a design with zero lines of symmetry.

Share and Show

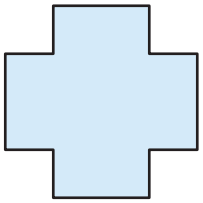
MATH BOARD

1. The shape at the right has line symmetry. Draw the 2 lines of symmetry.



Name _____

Tell whether the shape appears to have zero lines, 1 line, or more than 1 line of symmetry. Write *zero*, *1*, or *more than 1*.

2. 

3. 

4. 

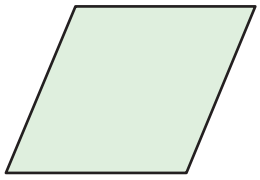
5. 

On Your Own

Math Talk **Mathematical Practices**

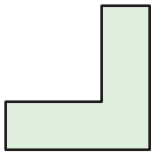
Explain how you can find lines of symmetry for a shape.

Tell whether the shape appears to have zero lines, 1 line, or more than 1 line of symmetry. Write *zero*, *1*, or *more than 1*.

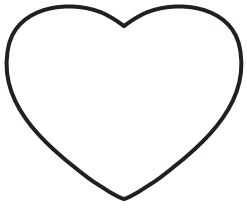
6. 

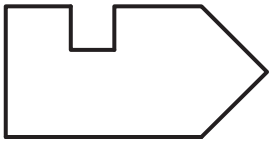
7. 

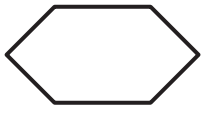
8. 

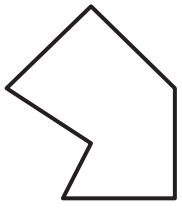
9. 

Practice: Copy and Solve **Does the design have line symmetry? Write *yes* or *no*. If your answer is *yes*, draw all lines of symmetry.**

10. 

11. 

12. 

13. 

14. GO DEEPER Draw a figure that has 5 sides and exactly 1 line of symmetry.

Problem Solving • Applications

Use the chart for 15–17.

A	H	S
B	I	T
C	J	U
D	L	V
E	N	W

15. Which letters appear to have only 1 line of symmetry?

_____

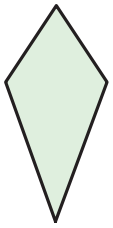
16. Which letters appear to have zero lines of symmetry?

_____

17. THINK SMARTER The letter C has horizontal symmetry. The letter A has vertical symmetry. Which letters appear to have both horizontal and vertical symmetry?

_____

18. MATHEMATICAL PRACTICE 3 **Verify the Reasoning of Others** Jeff says that the shape has only 2 lines of symmetry.



Does his statement make sense? Explain.

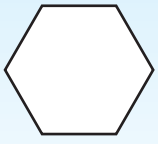
_____

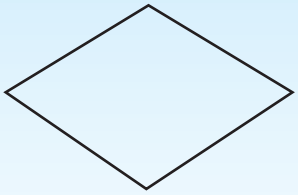
_____

_____

Personal Math Trainer

19. THINK SMARTER + Match each figure with the correct number of lines of symmetry it has.





0 lines of symmetry	1 line of symmetry	2 lines of symmetry	More than 2 lines of symmetry
•	•	•	•
•	•	•	•

FOR MORE PRACTICE: Standards Practice Book

Name _____

Problem Solving • Shape Patterns

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

Operations and Algebraic Thinking—4.OA.5

MATHEMATICAL PRACTICES
MP.4, MP.7, MP.8

Unlock the Problem

Real World

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

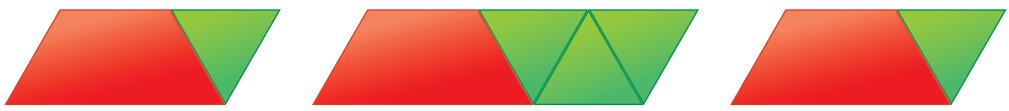
What do I need to find?	What information do I need to use?	How will I use the information?
I need to find the next three _____ in the pattern.	I need to use the _____ of each figure in Sofia's pattern.	I will use pattern blocks to model the _____ and act out the problem.

Solve the Problem

Describe how you acted out the problem to solve it.

I used a trapezoid and triangle to model the first figure in the pattern. I used a _____ and _____ to model the second figure in the pattern. I continued to model the pattern by repeating the models of the first two figures.

These are the next three figures in the pattern.



Math Talk Mathematical Practices

Explain how you can describe the shape pattern using numbers.

Try Another Problem

Draw what might be the next figure in the pattern.

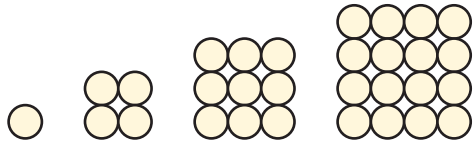


Figure: 1 2 3 4 _____ 5

How can you describe the pattern?

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

1. Use the figures to write a number pattern. Then describe the pattern in the numbers.

_____

_____

_____

2. What might the tenth number in your pattern be? Explain.

_____

_____

Math Talk **Mathematical Practices**

What other strategy could you use to solve the problem?

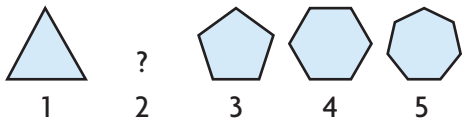
Name _____

Share and Show

MATH BOARD

1. Marisol is making a pattern with blocks. What might the missing shape be?

First, look at the blocks.

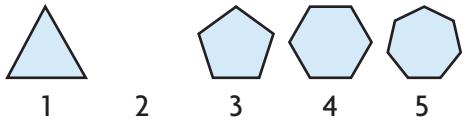


Next, describe the pattern.

_____

_____

Finally, draw the missing shape.



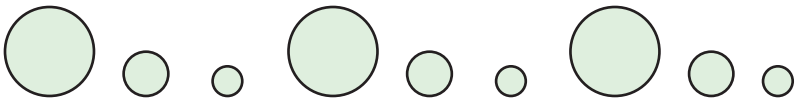
2. Use the shapes to write a number pattern. Then describe the pattern in the numbers.

_____

3. THINK SMARTER What if the pattern continued? Write an expression to describe the number of sides the sixth shape has in Marisol's pattern.

_____

4. Sahil made a pattern using circles. The first nine circles are shown. Describe the pattern. If Sahil continues the pattern, what might the next three circles be?



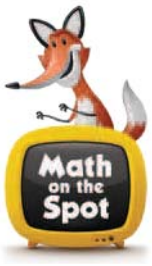
_____

Unlock the Problem

- Use the Problem Solving MathBoard.
- Underline the important facts.
- Choose a strategy you know.

On Your Own

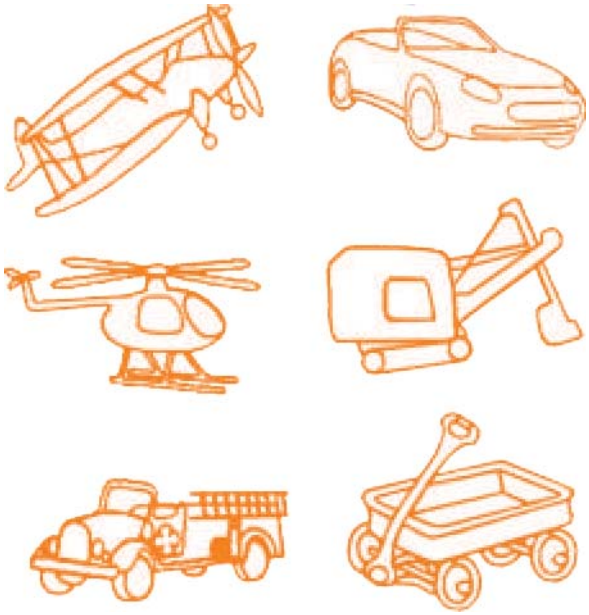
Use the toy quilt designs for 5–6.



5. THINK SMARTER Lu is making a quilt that is 20 squares wide and has 24 rows. The border of the quilt is made by using each toy design equally as often. Each square can hold one design. How many of each design does she use for the border?

_____

6. MATHEMATICAL PRACTICE 5 **Communicate** Starting in the first square of her quilt, Lu lined up her toy designs in this order: plane, car, fire truck, helicopter, crane, and wagon. Using this pattern unit, which design will Lu place in the fifteenth square? Explain how you found your answer.



_____

_____

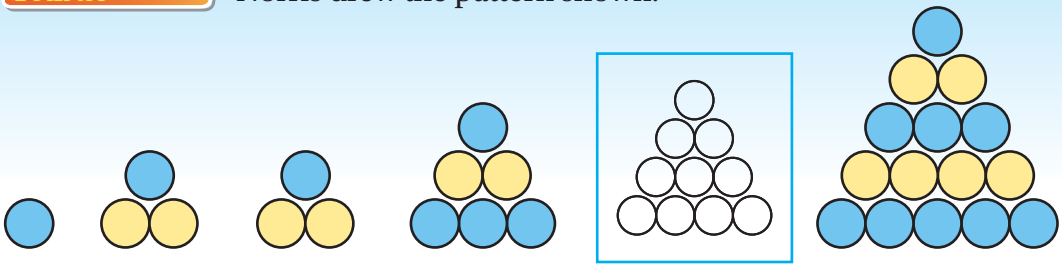
_____

_____

7. GO DEEPER Missy uses 1 hexagonal, 2 rectangular, and 4 triangular pieces of fabric to make 1 bug design for a quilt. If she uses 70 pieces in all to make bug designs, how many of each shape does she use?

_____

8. THINK SMARTER Norris drew the pattern shown.



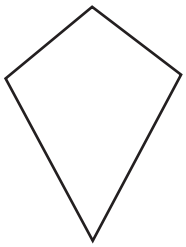
Use the circles shown to draw the missing pattern.

FOR MORE PRACTICE:
Standards Practice Book

Name _____

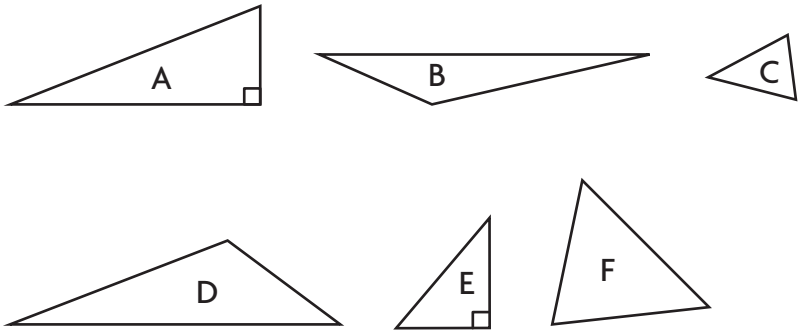
Chapter 10 Review/Test

1. Gavin is designing a kite. He sketched a picture of the kite. How many right angles does the kite appear to have?



_____ right angles

2. Write the letter of the triangle under its correct classification.



Acute Triangle	Obtuse Triangle	Right Triangle

3. Select the lengths that identify a scalene triangle. Mark all that apply.

(A) 5 inches, 5 inches, 6 inches

(B) 2 meters, 3 meters, 4 meters

(C) 9 feet, 9 feet, 9 feet

(D) 11 meters, 6 meters, 15 meters

(E) 6 feet, 3 feet, 6 feet

GO DIGITAL Assessment Options
Chapter Test

4. Write the word that describes the part of Figure A written below.

ray	line	line segment
acute angle	right angle	

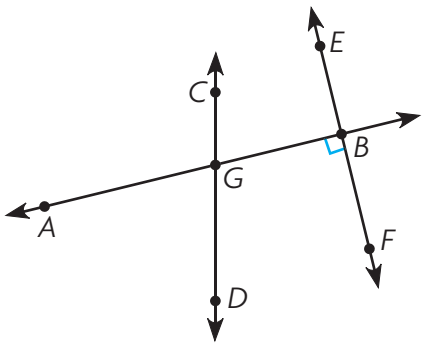


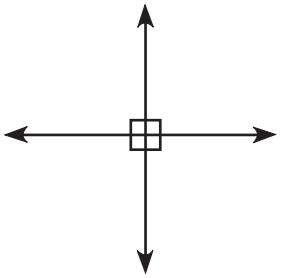
Figure *A*

$\overline{EB}$ _____ $\angle EBG$ _____

$\overleftrightarrow{AB}$ _____ $\angle CGB$ _____

$\overrightarrow{GA}$ _____

5. What term best describes the figure shown below?



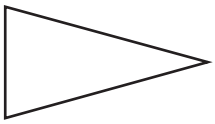
6. Naomi leaves for her trip to Los Angeles on the 12th day of August. Since August is the 8th month, Naomi wrote the date as shown.

8/12

Naomi says all the numbers she wrote have line symmetry. Is she correct? Explain your thinking.

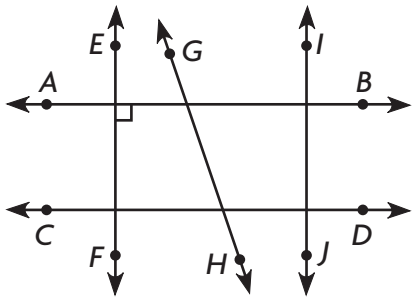
Name _____

7. Max made a pennant that looks like a triangle. How can you classify the triangle based upon its angles?



The triangle is a(n) _____ triangle.

8. Choose the labels to make a true statement.



$\overleftrightarrow{GH}$	is parallel to	$\overleftrightarrow{EF}$
$\overleftrightarrow{CD}$		$\overleftrightarrow{CD}$
$\overleftrightarrow{AB}$		$\overleftrightarrow{GH}$

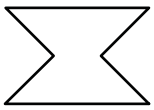
9. Classify the figure. Select all that apply.

- ○ quadrilateral
- ○ rectangle
- ○ trapezoid
- ○ rhombus
- ○ parallelogram
- ○ square

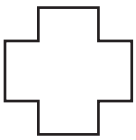
10. Lily designed a deck in her backyard that looks like a quadrilateral that has only 1 pair of parallel sides. How can you classify the figure?

The quadrilateral is a _____.

11. Match each figure with the correct number of lines of symmetry it has.



F

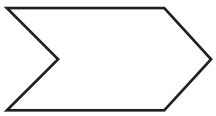


0 lines of symmetry	1 line of symmetry	2 lines of symmetry	More than 2 lines of symmetry

12. Barb drew the pattern shown.

Use the square shown to draw the missing pattern. ☐

13. Claudia drew the figure below. Draw a line of symmetry on Claudia's figure.



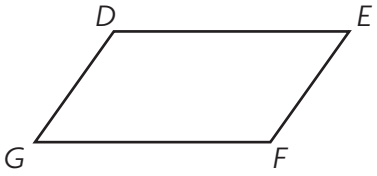
14. Write the word or words that best describe this figure.

15. How many acute angles does a right triangle have?

A right triangle has _____ acute angles.

Name _____

16. Mike drew a figure with opposite sides parallel. Write the pairs of parallel sides. What figure is it?



17. Circle the letter that does not have line symmetry.

DOTS

18. Joseph made a pattern using ovals and rectangles. The first four figures of his pattern are shown. Draw the next figure in the pattern.

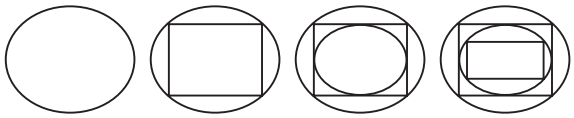


Figure 1 **Figure 2** **Figure 3** **Figure 4** **Figure 5**

19. Jeremy drew Figure 1 and Louisa drew Figure 2.

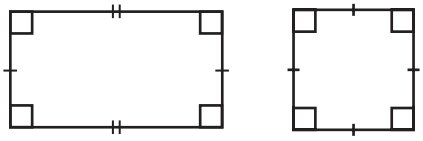


Figure 1 **Figure 2**

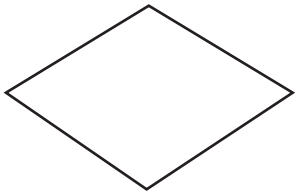
Part A

Jeremy says both figures are rectangles. Do you agree with Jeremy? Support your answer.

Part B

Louisa says both figures are rhombuses. Do you agree with Louisa? Support your answer.

20. Veronica found the number of lines of symmetry for the figure below. How many lines of symmetry does it have?



_____ lines of symmetry

21. Judy drew an isosceles triangle. One side of the triangle was 5 inches long. The other side of the triangle was 8 inches long. What could be the length of the third side of the triangle Judy drew? Explain your reasoning.

22. Jordan drew the pattern below.

Part A

Describe the pattern.

Part B

Write a rule using numbers to find the number of squares in any figure in the pattern.

Part C

Draw Figure 5.

Chapter 11

Angles

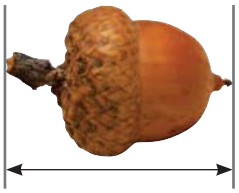
Show What You Know

Check your understanding of important skills.

Name _____

Use a Metric Ruler

Use a centimeter ruler to measure. Find the length in centimeters.

1. 

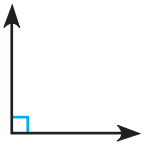
_____ centimeters

2. 

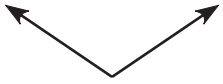
_____ centimeters

Classify Angles

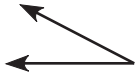
Classify the angle. Write *acute, right,* or *obtuse.*

3. 

_____

4. 

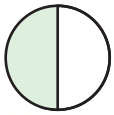
_____

5. 

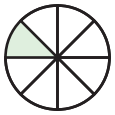
_____

Parts of a Whole

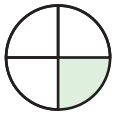
Write a fraction for each shaded part.

6. 

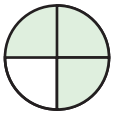
_____

7. 

_____

8. 

_____

9. 

_____

Math Detective

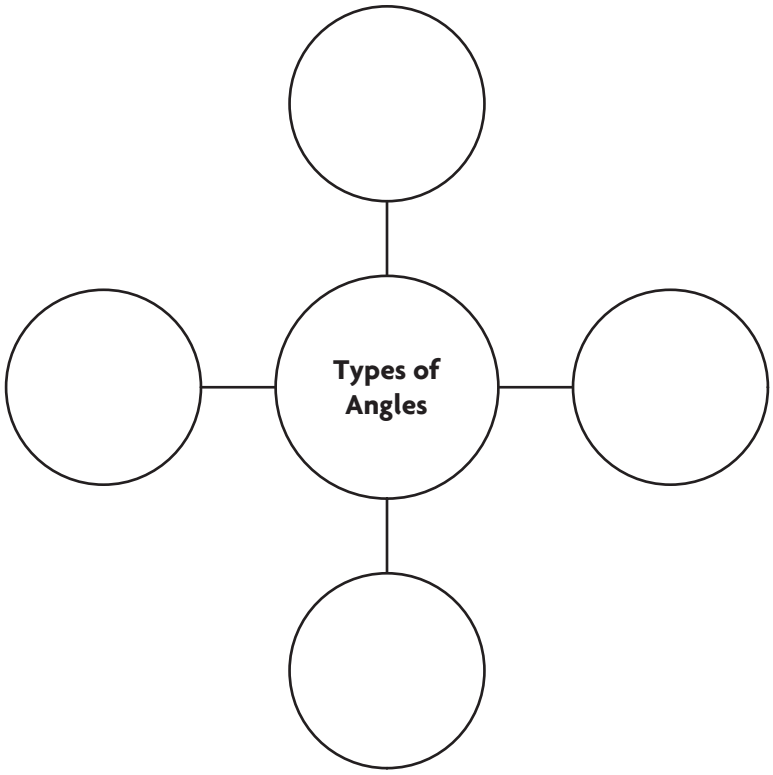
The Sunshine Skyway Bridge crosses over Tampa Bay, Florida. Bridges and other building structures can model geometric figures. Be a Math Detective and investigate the bridge. Describe the geometric figures you see. Then classify the labeled angles and triangle.

Personal Math Trainer
Online Assessment and Intervention

Vocabulary Builder

Visualize It

Complete the Bubble Map using review words.



Review Words

acute
circle
obtuse
ray
right
straight
vertex

Preview Words

clockwise
counterclockwise
degree (°)
protractor

Understand Vocabulary

Draw a line to match each word with its definition.

1. protractor
2. degree(°)
3. clockwise
4. counterclockwise

- In the same direction in which the hands of a clock move
- In the opposite direction in which the hands of a clock move
- A tool for measuring the size of an angle
- The unit used for measuring angles

Name _____

Angles and Fractional Parts of a Circle

Essential Question How can you relate angles and fractional parts of a circle?

Measurement and Data—4.MD.5a

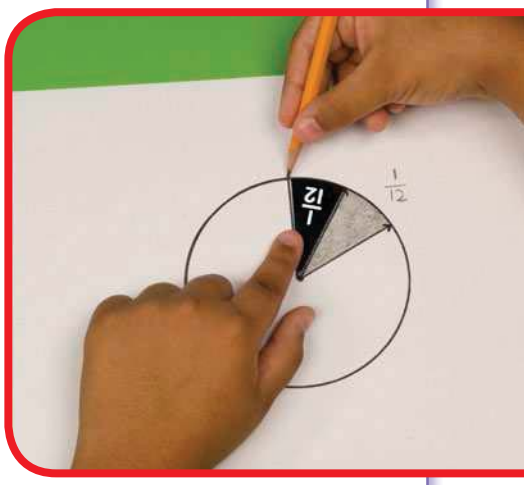
MATHEMATICAL PRACTICES
MP.2, MP.3, MP.5

Investigate

Hands On

Materials ■ fraction circles

A. Place a $\frac{1}{12}$ piece on the circle. Place the tip of the fraction piece on the center of the circle. Trace the fraction piece to create an angle.



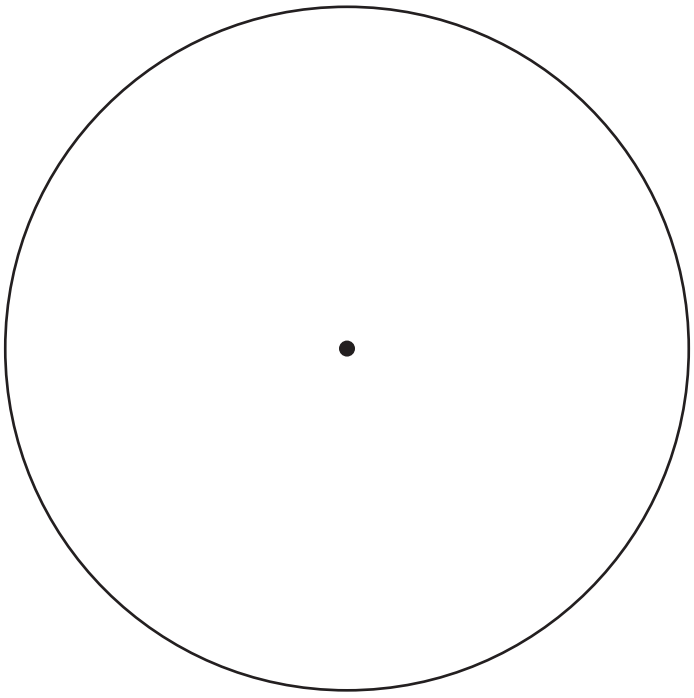
What parts of the fraction piece represent the rays of the angle? _____

Where is the vertex of the angle?

_____

B. Shade the angle formed by the $\frac{1}{12}$ piece. Label it $\frac{1}{12}$.

C. Place the $\frac{1}{12}$ piece back on the shaded angle. Turn it counterclockwise. **Counterclockwise** is the direction opposite from the way the hands move on a clock.



Trace the fraction piece in its new position. How many twelfths have you traced in all? _____ Label $\frac{2}{12}$.

D. Turn the fraction piece counterclockwise again and trace it. Label the total number of twelfths.

Continue until you reach the shaded angle.

How many times did you need to turn the $\frac{1}{12}$ piece to make a circle? _____

How many angles come together in the center of the circle? _____

Draw Conclusions

1. Compare the size of the angle formed by a $\frac{1}{4}$ piece and the size of the angle formed by a $\frac{1}{12}$ piece. Use a $\frac{1}{4}$ piece and your model on page 441 to help.

2. Describe the relationship between the size of the fraction piece and the number of turns it takes to make a circle.

Make Connections

You can relate fractions and angles to the hands of a clock.

Let the hands of the clock represent the rays of an angle. Each 5-minute mark represents a $\frac{1}{12}$ turn **clockwise**.

15 minutes elapse.

The minute hand makes a

_____ turn clockwise.

30 minutes elapse.

The minute hand makes a

_____ turn clockwise.

45 minutes elapse.

The minute hand makes a

_____ turn clockwise.

60 minutes elapse.

The minute hand makes a

_____ turn clockwise.

Math Talk **Mathematical Practices**

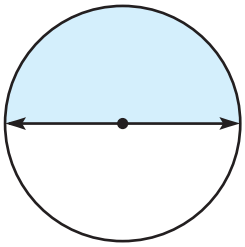
Explain how an angle formed in a circle using a $\frac{1}{4}$ fraction piece is like a $\frac{1}{4}$ turn and 15 minutes elapsing on a clock.

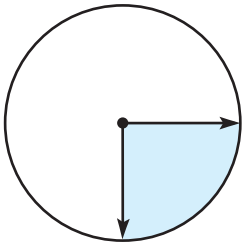
Name _____

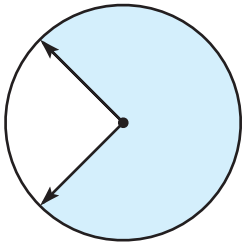
Share and Show

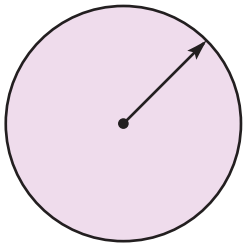
MATH BOARD

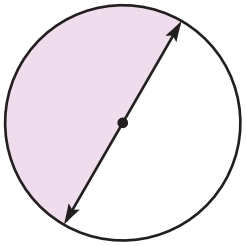
Tell what fraction of the circle the shaded angle represents.

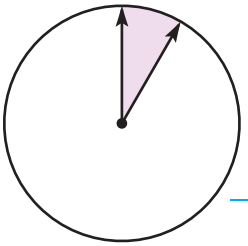
1.  _____

2.  _____

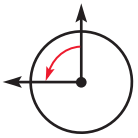
3.  _____

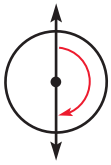
4.  _____

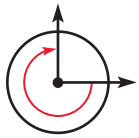
5.  _____

6.  _____

Tell whether the angle on the circle shows a $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or 1 full turn clockwise or counterclockwise.

7.  _____

8.  _____

9.  _____

Problem Solving • Applications

Real World

10. MATHEMATICAL PRACTICE 1 Susan watched the game from 1 P.M. to 1:30 P.M. **Describe** the turn the minute hand made.

_____

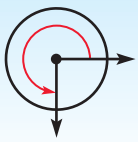
11. GO DEEPER Compare the angles in Exercises 1 and 5. Does the position of the angle affect the size of the angle? Explain.

_____

_____

Personal Math Trainer

12. THINK SMARTER+ Malcolm drew this angle on the circle.

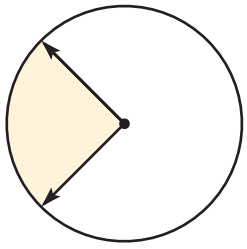


Which of the following describes the angle? Mark all that apply.

- ○ $\frac{3}{4}$ turn
- ○ $\frac{1}{4}$ turn
- ○ clockwise
- ○ counterclockwise

Sense or Nonsense?

13. THINK SMARTER Whose statement makes sense? Whose statement is nonsense? Explain your reasoning.



The shaded angle represents $\frac{1}{4}$ of the circle.

The shaded angle represents $\frac{3}{8}$ of the circle.

Carla's Statement	Adam's Statement

- For the statement that is nonsense, write a statement that makes sense.

- What is another way to describe the size of the angle? Explain.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Degrees

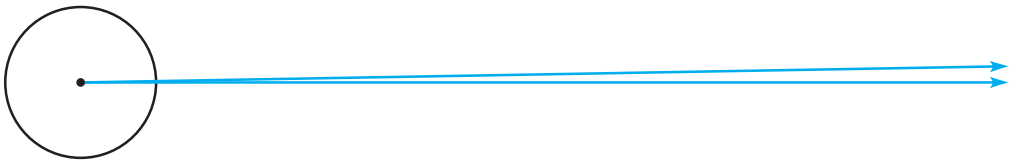
Essential Question How are degrees related to fractional parts of a circle?

Measurement and Data—4.MD.5a, 4.MD.5b

MATHEMATICAL PRACTICES
MP.1, MP.2, MP.5

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.

Math Idea
The symbol for degrees is °.



Unlock the Problem

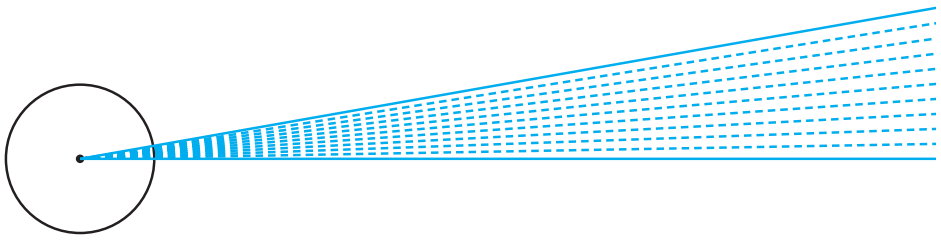
The angle between two spokes on the bicycle wheel turns through $\frac{10}{360}$ of a circle. What is the measure of the angle formed between the spokes?

- What part of an angle does a spoke represent?

_____

_____

Example 1 Use fractional parts to find the angle measure.



Each $\frac{1}{360}$ turn measures _____ degree.

Ten $\frac{1}{360}$ turns measure _____ degrees.

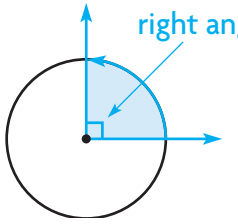
So, the measure of the angle between the spokes is _____.

Math Talk **Mathematical Practices**

How many degrees is the measure of an angle that turns through 1 whole circle? **Explain.**

▲ The Penny Farthing bicycle was built in the 1800s.

Example 2 Find the measure of a right angle.



Think: Through what fraction of a circle does a right angle turn? _____

STEP 1 Write $\frac{1}{4}$ as an equivalent fraction with 360 in the denominator.

$\frac{1}{4} = \frac{\square}{360}$ **Think:** $4 \times 9 = 36$, so $4 \times$ _____ $= 360$.

Remember
To write an equivalent fraction, multiply the numerator and denominator by the same factor.

STEP 2 Write $\frac{90}{360}$ in degrees.

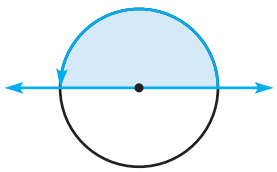
An angle that turns through $\frac{1}{360}$ of a circle measures _____.

An angle that turns through $\frac{90}{360}$ of a circle measures _____.

So, a right angle measures _____.

Try This! Find the measure of a straight angle.

Through what fraction of a circle does a straight angle turn? _____



Write $\frac{1}{2}$ as an equivalent fraction with 360 in the denominator.

$\frac{1}{2} = \frac{\square}{360}$ **Think:** $2 \times 18 = 36$, so $2 \times$ _____ $= 360$.

So, a straight angle measures _____.

1. How can you describe the measure of an acute angle in degrees?

_____

_____

2. How can you describe the measure of an obtuse angle in degrees?

_____

Name _____

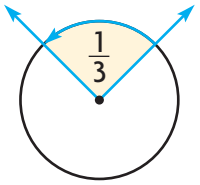
Share and Show

MATH BOARD

1. Find the measure of the angle.

Through what fraction of a circle does the angle turn? _____

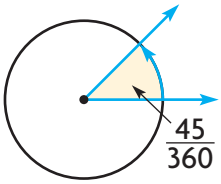
$\frac{1}{3} = \frac{\square}{360}$ Think: 3 × 12 = 36, so 3 × _____ = 360.



So, the measure of the angle is _____.

Tell the measure of the angle in degrees.

2.



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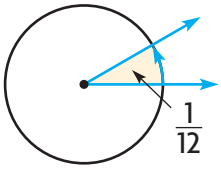
3.



_____

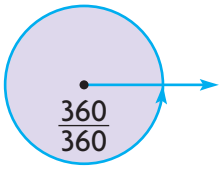
Math Talk Mathematical Practices

If an angle measures 60°, through what fraction of a circle does it turn? **Explain.**

On Your Own

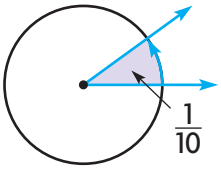
Tell the measure of the angle in degrees.

4.



_____

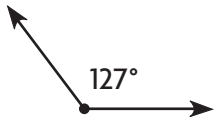
5.



_____

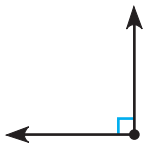
Classify the angle. Write *acute, obtuse, right,* or *straight.*

6.



_____

7.



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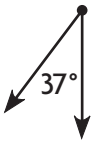
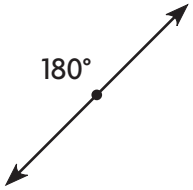
8.



_____

9.



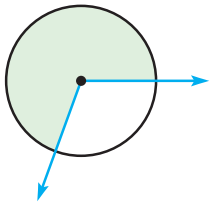
_____

10. MATHEMATICAL PRACTICE 6 Is this an obtuse angle? **Explain.**

_____

_____

_____



11. GO DEEPER Alex cut a pizza into 8 equal slices. He removed 2 of the slices of pizza. What is the measure of the angle made by the missing slices of pizza?

_____

Unlock the Problem Real World

12. THINK SMARTER Ava started reading at 3:30 P.M. She stopped for a snack at 4:15 P.M. During this time, through what fraction of a circle did the minute hand turn? How many degrees did the minute hand turn?

a. What are you asked to find? _____

_____

b. What information can you use to find the fraction of a circle through which the minute hand turned?

_____

_____

c. How can you use the fraction of a circle through which the minute hand turned to find how many degrees it turned?

_____

_____

d. Show the steps to solve the problem.

STEP 1 $\frac{3 \times \square}{4 \times \square} = \frac{?}{360}$

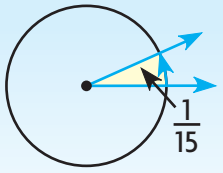
STEP 2 $\frac{3 \times 90}{4 \times 90} = \frac{\square}{360}$

e. Complete the sentences.

From 3:30 P.M. to 4:15 P.M., the minute hand made a _____ turn clockwise.

The minute hand turned _____ degrees.

13. THINK SMARTER An angle represents $\frac{1}{15}$ of a circle. Select the number to show how to find the measure of the angle in degrees.



$\frac{1}{15} = \frac{1 \times \square}{15 \times \square} = \frac{\square}{360}$

20

24

30

The angle measures _____.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Measure and Draw Angles

Essential Question How can you use a protractor to measure and draw angles?

Measurement and Data—4.MD.6
MATHEMATICAL PRACTICES
MP.4, MP.5, MP.6,

Unlock the Problem

Real World

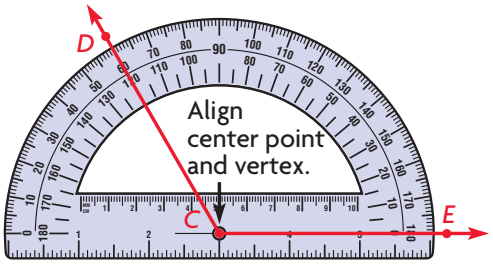
Emma wants to make a clay sculpture of her daughter as she appears in the photo from her dance recital. How can she measure $\angle DCE$, or the angle formed by her daughter's arms?

A **protractor** is a tool for measuring the size of an angle.

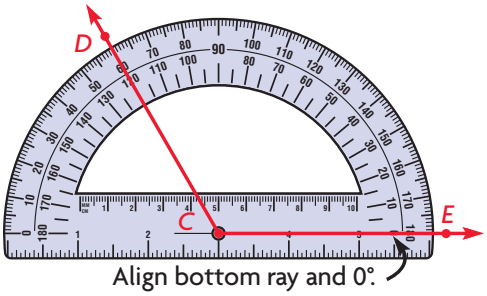
Activity Measure $\angle DCE$ using a protractor.

Materials ■ protractor

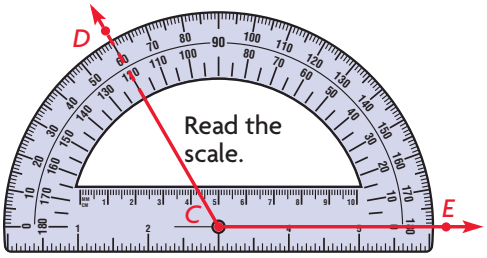
STEP 1 Place the center point of the protractor on vertex *C* of the angle.



STEP 2 Align the 0° mark on the scale of the protractor with ray *CE*.



STEP 3 Find where ray *CD* intersects the same scale. Read the angle measure on that scale. Extend the ray if you need to.



The m$\angle DCE$ = _____.

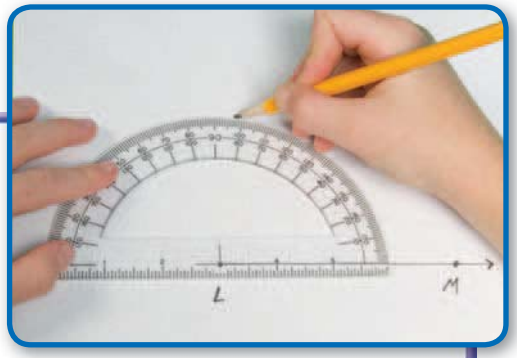
Read the m$\angle DCE$ as the "measure of angle *DCE*".

So, the angle formed by Emma's daughter's arms is _____.

Math Talk **Mathematical Practices**

Can you line up either ray of the angle with the protractor when measuring? **Explain.**

Draw Angles You can also use a protractor to draw an angle of a given measure.



Activity Draw $\angle KLM$ with a measure of 82°.

Materials ■ protractor

STEP 1 Use the straight edge of the protractor to draw and label ray *LM*.

STEP 2 Place the center point of the protractor on point *L*. Align ray *LM* with the 0° mark on the protractor.

STEP 3 Using the same scale, mark a point at 82°. Label the point *K*.

STEP 4 Use the straight edge of the protractor to draw ray *LK*.

Share and Show

MATH BOARD

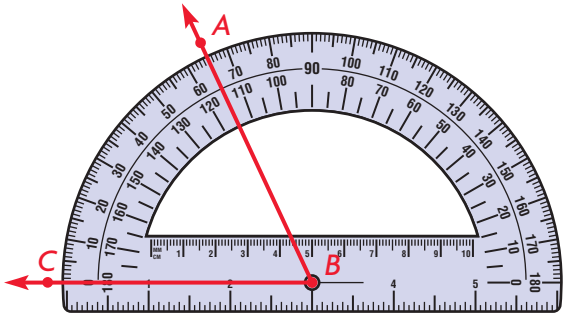
1. Measure $\angle ABC$.

Place the center of the protractor on point _____.

Align ray *BC* with _____.

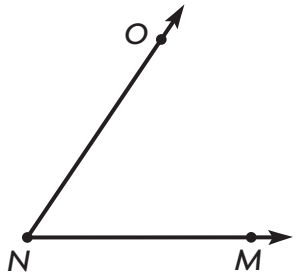
Read where _____ intersects the same scale.

So, the m$\angle ABC$ is _____.



Use a protractor to find the angle measure.

2.



m$\angle ONM$ = _____

3.

m$\angle TSR$ = _____

Use a protractor to draw the angle.

4. 170°

5. 78°

ERROR Alert

Be sure to use the correct scale on the protractor. Ask yourself: Is the measure reasonable?

Math Talk **Mathematical Practices**

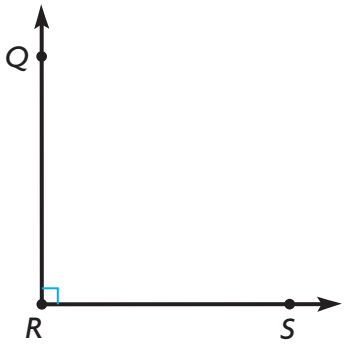
Describe how drawing and measuring angles are similar.

Name _____

On Your Own

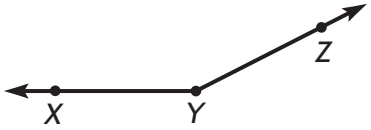
Use a protractor to find the angle measure.

6.



m∠*QRS* = _____

7.



m∠*XYZ* = _____

Use a protractor to draw the angle.

8. 115°

9. 67°

Draw an example of each. Label the angle with its measure.

10. an acute angle

11. an obtuse angle

12. a straight angle

13. a right angle

14. THINK SMARTER Draw an angle with a measure of 0°. Describe your drawing.

_____

_____

Problem Solving • Applications Real World

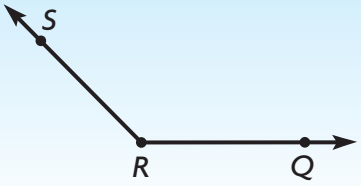
15. GO DEEPER Elizabeth has one quarter of her pizza left. She cut it into three equal slices. What is the angle measure of each of the three slices of pizza? _____

16. MATHEMATICAL PRACTICE 6 Tracy measured an angle as 50° that was actually 130°. **Explain** her error.

_____

_____

17. THINK SMARTER Choose the word or number to complete a true statement about $\angle QRS$.



$\angle QRS$ is a(n) [acute / obtuse / right] angle that has a measure of [45°. / 115°. / 135°.]

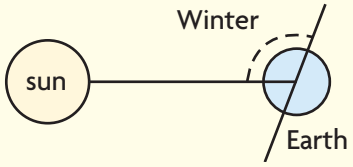
Connect to Science

Earth's Axis

Earth revolves around the sun yearly. The Northern Hemisphere is the half of Earth that is north of the equator. The seasons of the year are due to the tilt of Earth's axis.

Use the diagrams and a protractor for 18–20.

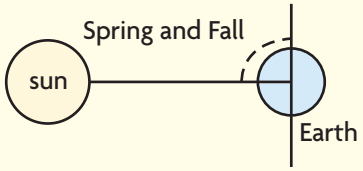
Northern Hemisphere



18. In the Northern Hemisphere, Earth's axis is tilted away from the sun on the first day of winter, which is often on December 21. What is the measure of the marked angle on the first day of winter, the shortest day of the year?

_____

19. Earth's axis is not tilted away from or toward the sun on the first days of spring and fall, which are often on March 20 and September 22. What is the measure of the marked angle on the first day of spring or fall?



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FOR MORE PRACTICE: Standards Practice Book

Name _____

Mid-Chapter Checkpoint

Vocabulary

Choose the best term from the box.

Vocabulary
clockwise
counterclockwise
degree (°)
protractor

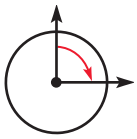
1. The unit used to measure an angle is called a _____. (p. 445)

2. _____ is the opposite of the direction in which the hands of a clock move. (p. 441)

3. A _____ is a tool for measuring the size of an angle. (p. 449)

Concepts and Skills

Tell whether the angle on the circle shows a $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, or 1 full turn clockwise or counterclockwise. (4.MD.5a)

4. 

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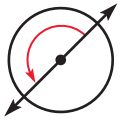
5. 

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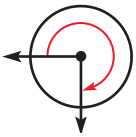
6. 

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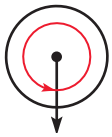
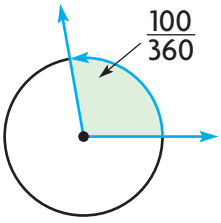
7. 

_____

_____

Tell the measure of the angle in degrees. (4.MD.5a, 4.MD.5b)

8. 

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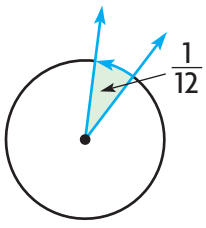
9. 

_____

Use a protractor to draw the angle. (4.MD.6)

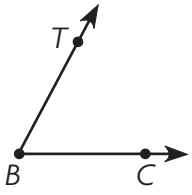
10. 75°

11. 127°

12. Phillip watched a beach volleyball game from 1:45 P.M. to 2:00 P.M. How many degrees did the minute hand turn?
(4.MD.5a, 4.MD.5b)


13. What angle does this piece of pie form? (4.MD.5a, 4.MD.5b)

14. What is m∠*CBT*? Use a protractor to help you. (4.MD.6)



Name _____

Join and Separate Angles

Essential Question How can you determine the measure of an angle separated into parts?

Measurement and Data—4.MD.7

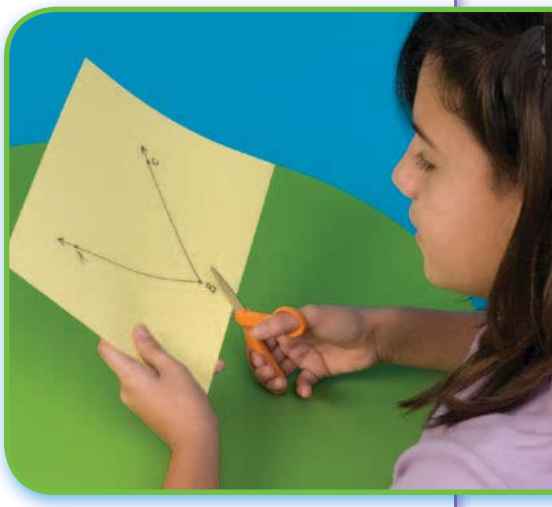
MATHEMATICAL PRACTICES

MP.2, MP.4, MP.5

Investigate

Hands On

Materials ■ construction paper ■ scissors ■ protractor



A. Use construction paper. Draw an angle that measures exactly 70°. Label it $\angle ABC$.

B. Cut out $\angle ABC$.

C. Separate $\angle ABC$ by cutting it into two parts. Begin cutting at the vertex and cut between the rays.

What figures did you form? _____

D. Use a protractor to measure the two angles you formed.

Record the measures. _____

E. Find the sum of the angles you formed.

_____ + _____ = _____

part + part = whole

F. Join the two angles. Compare $m\angle ABC$ to the sum of the measures of its parts. Explain how they compare.

_____

_____

_____

_____

Math Idea

You can think of $\angle ABC$ as the whole and the two angles you formed as the parts of the whole.

Draw Conclusions

1. What if you cut ∠ABC into two different angles? What can you conclude about the sum of the measures of these two angles? Explain.

2. THINK SMARTER Seth cut ∠*ABC* into 3 parts. Draw a model that shows two different ways he could have separated his angle.

3. Write a sentence that compares the measure of an angle to the sum of its parts.

Make Connections

Materials ■ protractor

You can write the measure of the angles shown in a circle as a sum.

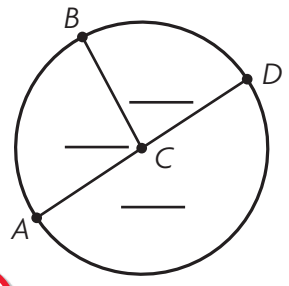
STEP 1 Use a protractor to find the measure of each angle.

STEP 2 Label each angle with its measure.

STEP 3 Write the sum of the angle measures as an equation.

_____ + _____ + _____ = _____

part + part + part = whole



Math Talk **Mathematical Practices**

Describe the angles shown in the circle above using the words *whole* and *part*.

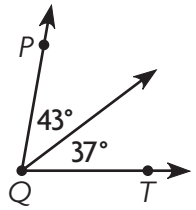
Name _____

Share and Show

MATH BOARD

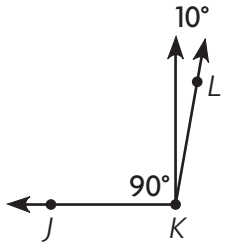
Add to find the measure of the angle. Write an equation to record your work.

1.



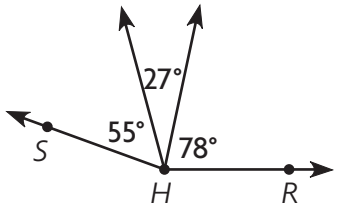
m∠*PQT* = _____

2.



m∠*JKL* = _____

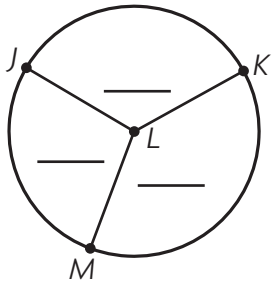
3.



m∠*RHS* = _____

Use a protractor to find the measure of each angle. Label each angle with its measure. Write the sum of the angle measures as an equation.

4.



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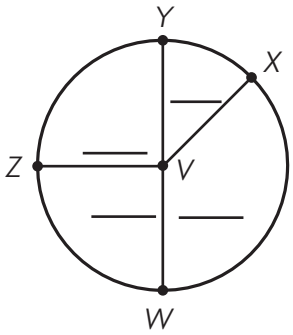
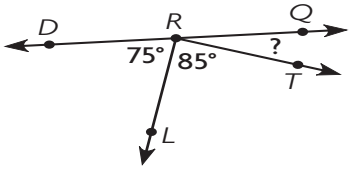


Problem Solving • Applications

Real World

6. MATHEMATICAL PRACTICE 4 **Use Diagrams** What is the m∠*QRT*?



7. GO DEEPER Look back at Exercise 1. Suppose you joined an angle measuring 10° to ∠*PQT*. Draw the new angle, showing all three parts. What type of angle is formed?

Unlock the Problem Real World

8. THINK SMARTER Stephanie, Kay, and Shane each ate an equal-sized piece of a pizza. The measure of the angle of each piece was 45°. When the pieces were together, what is the measure of the angle they formed?

a. What are you asked to find? _____

_____

b. What information do you need to use? _____

_____

_____

c. Tell how you can use addition to solve the problem. _____

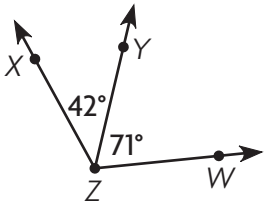
_____

_____

_____

d. Complete the sentence. The three pieces of pizza formed a _____ angle.

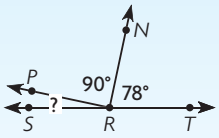
9. What equation can you write to find $m\angle XZW$?



_____

Personal Math Trainer

10. THINK SMARTER + Shamus drew this figure with a protractor. What is the measure of $\angle PRS$? Use equations to explain how you find and check your answer.



_____

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_____

_____

_____

FOR MORE PRACTICE: Standards Practice Book

Name _____

Problem Solving • Unknown Angle Measures

Essential Question How can you use the strategy *draw a diagram* to solve angle measurement problems?

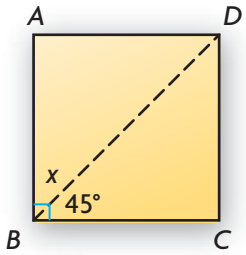
Measurement and Data—4.MD.7

MATHEMATICAL PRACTICES
MP.1, MP.4

Unlock the Problem

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.

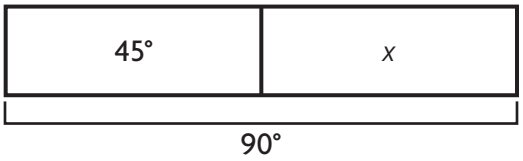


Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?
I need to find _____ _____	I can use the measures of the angles I know. _____ _____	I can draw a bar model and use the information to _____ _____

Solve the Problem

I can draw a bar model to represent the problem.
Then I can write an equation to solve the problem.



$m\angle ABD + m\angle CBD = m\angle ABC$

$x +$ _____ $=$ _____

$x =$ _____

The $m\angle ABD =$ _____.

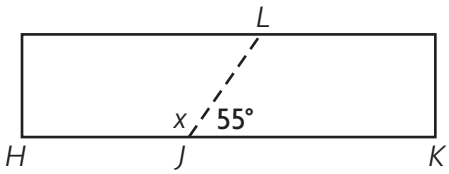
Since both tiles measure _____, Mr. Tran can use both pieces in the design.

Math Talk **Mathematical Practices**

What other equation can you write to solve the problem? **Explain.**

Try Another Problem

Marisol is building a frame for a sandbox, but the boards she has are too short. She must join two boards together to build a side as shown. At what angle did she cut the first board?



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

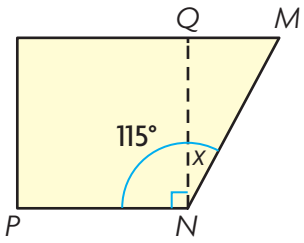
- Explain how you can check the answer to the problem.

Name _____

Share and Show

MATH BOARD

1. Laura cuts a square out of scrap paper as shown. What is the angle measure of the piece left over?



First, draw a bar model to represent the problem.

Next, write the equation you need to solve.

_____

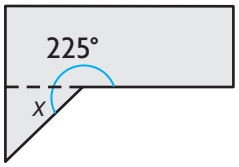
_____

Last, find the angle measure of the piece left over.

$m\angle MNQ =$ _____

So, the angle measure of the piece left over is _____.

2. Jackie trimmed a piece of scrap metal to make a straight edge as shown. What is the measure of the piece she trimmed off?



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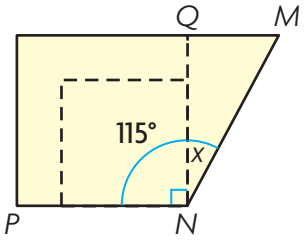
On Your Own



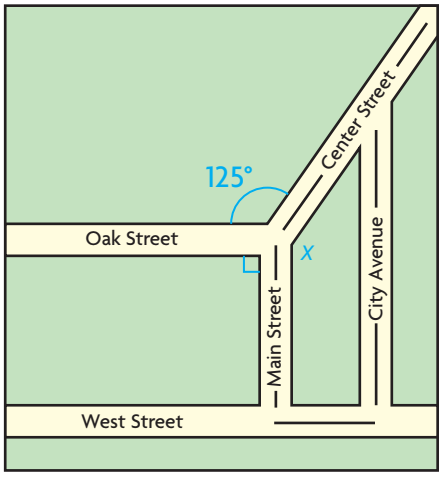
3. THINK SMARTER What if Laura cut a smaller square as shown? Would $m\angle MNQ$ be different? Explain.

_____

_____

_____

4. GO DEEPER The map shows Marco's paper route. When Marco turns right onto Center Street from Main Street, what degree turn does he make? **Hint:** Draw a dashed line to extend Oak Street to form a 180° angle.



_____

Problem Solving • Applications

5. MATHEMATICAL PRACTICE 4 **Write an Equation** Two angles form a straight angle. One angle measures 89°. What is the measure of the other angle? Explain.

6. **Pose a Problem** Look back at Problem 5. Write a similar problem about two angles that form a right angle.

WRITE Math • Show Your Work

7. Sam paid $20 for two t-shirts. The price of each t-shirt was a multiple of 5. What are the possible prices of the t-shirts?

8. Zayna has 3 boxes with 15 art books in each box. She has 2 bags with 11 math books in each bag. If she gives 30 books away, how many art and math books does she have left?

9. **What's the Question?** It measures greater than 0° and less than 90°.

10. THINK SMARTER Two angles, $\angle A$ and $\angle B$, form a straight angle. $\angle A$ measures 65°. For numbers 10a–10c, select True or False for the statement.

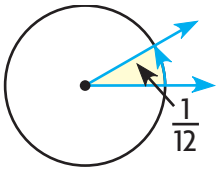
10a.	$\angle B$ is an acute angle.	○ True	○ False
10b.	The equation $180° - 65° = x°$ can be used to find the measure of $\angle B$.	○ True	○ False
10c.	The measure of $\angle B$ is 125°.	○ True	○ False

FOR MORE PRACTICE: Standards Practice Book

Name _____

Chapter 11 Review/Test

1. An angle represents $\frac{1}{12}$ of a circle. Use the numbers to show how to find the measure of the angle in degrees.



$$\frac{1}{12} = \frac{1 \times \square}{12 \times \square} = \frac{\square}{360}$$

24 | 30 | 36

The angle measure is _____.

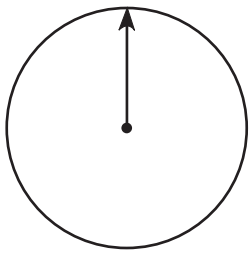
2. Match the measure of each $\angle C$ with the measure of $\angle D$ that forms a straight angle.

$\angle C$	$\angle D$
	145°
122°	75°
35°	148°
62°	58°
105°	55°
	118°

3. Katie drew an obtuse angle. Which could be the measure of the angle she drew? Mark all that apply.

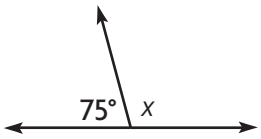
(A) 35°
(B) 157°
(C) 180°
(D) 92°

4. Draw an angle that represents a $\frac{1}{4}$ turn counterclockwise on the circle.



GO DIGITAL Assessment Options
Chapter Test

5. Renee drew the figure shown. For 5a–5c, select Yes or No to tell whether the statement is true.

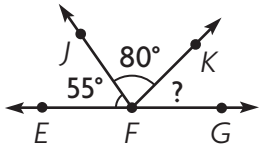


5a. The measure of a straight angle is 180°. ○ Yes ○ No

5b. To find the measure of x, Renee can subtract 75° from 180°. ○ Yes ○ No

5c. The measure of x is 115°. ○ Yes ○ No

6. Trey drew this figure with a protractor.



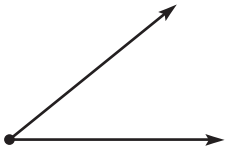
Part A

Write an equation that can be used to find m∠*KFG*.

Part B

What is the measure of ∠*KFG*? Describe how you solved the equation and how you can check your answer.

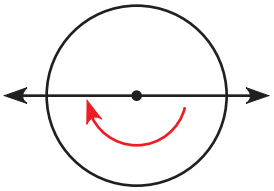
7. Use a protractor to find the measure of the angle.



The angle measures _____.

Name _____

8. Alex drew this angle on the circle. Which describes the angle? Mark all that apply.



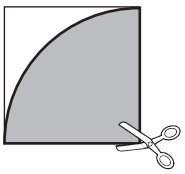
Ⓐ $\frac{1}{4}$ turn

Ⓑ $\frac{1}{2}$ turn

Ⓒ clockwise

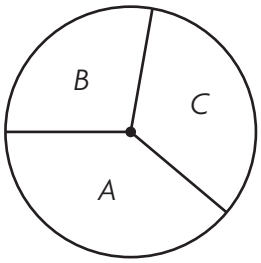
Ⓓ counterclockwise

9. Miles has a piece of paper that is $\frac{1}{4}$ of a large circle. He cuts the paper into three equal parts from the center point of the circle. What is the angle measure of each part?



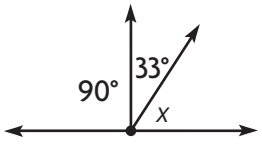
The angle measures _____.

10. Use a protractor to find the measure of each angle. Write each angle and its measure in a box ordered by the measure of the angles from least to greatest.



Angle:	Angle:	Angle:
Measure:	Measure:	Measure:

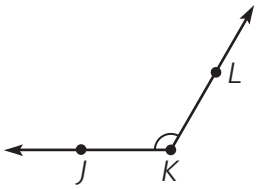
11. Use the numbers and symbols to write an equation that can be used to find the measure of the unknown angle.



33	45	90	180
x	$=$	$+$	$\times$

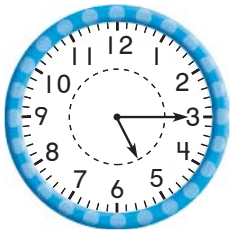
What is the measure of the unknown angle? _____

12. Choose the word or number to complete a true statement about $\angle JKL$.

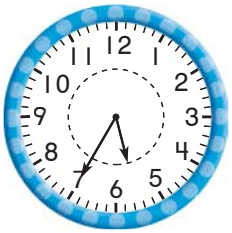


$\angle JKL$ is a(n) [acute / obtuse / right] angle that has a measure of [60°. / 120°. / 135°.]

13. Vince began practicing piano at 5:15 P.M. He stopped at 5:35 P.M. How many degrees did the minute hand turn during Vince's practice time? Explain how you found your answer.



Start



Stop

14. An angle measures 125°. Through what fraction of a circle does the angle turn?

$\frac{\square}{\square}$ of a circle

15. Write the letter for each angle measure in the correct box.

(A) 125° (B) 90° (C) 180° (D) 30° (E) 45° (F) 95°

acute	obtuse	right	straight

Name _____

16. For numbers 16a–16b, select the fraction that makes a true statement about the figure.

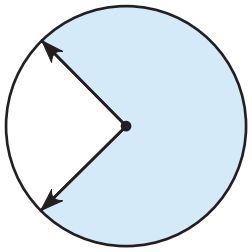


Figure 1

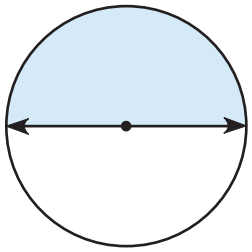
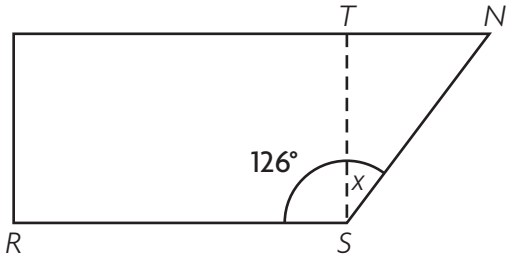


Figure 2

16a. The angle in Figure 1 represents a [$\frac{1}{4}$ / $\frac{1}{2}$ / $\frac{3}{4}$] turn.

16b. The angle in Figure 2 represents a [$\frac{1}{4}$ / $\frac{1}{2}$ / $\frac{3}{4}$] turn.

17. Melanie cuts a square out of a piece of scrap paper as shown. She wants to calculate the angle measure of the piece that is left over.



Part A

Draw a bar model to represent the problem.

Part B

Write and solve an equation to find x.

The angle measures _____.

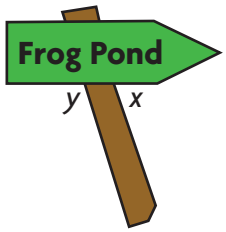
18. Two angles, $\angle A$ and $\angle B$, form a right angle. $\angle A$ measures 32°. For numbers 18a–18c, select True or False for the statement.

18a.	$\angle B$ is an acute angle.	○ True	○ False
18b.	The equation $180° - 32° = x°$ can be used to find the measure of $\angle B$.	○ True	○ False
18c.	The measure of $\angle B$ is 58°.	○ True	○ False

19. A circle is divided into parts. Which sum could represent the angle measures that make up the circle? Mark all that apply.

- (A) $120° + 120° + 120° + 120°$
- (B) $25° + 40° + 80° + 105° + 110°$
- (C) $33° + 82° + 111° + 50° + 84°$
- (D) $40° + 53° + 72° + 81° + 90° + 34°$

20. Use a protractor to find the measures of the unknown angles.



$m\angle x =$ _____ $m\angle y =$ _____

What do you notice about the measures of the unknown angles? Is this what you would have expected? Explain your reasoning.

Chapter 12

Relative Sizes of Measurement Units

Show What You Know

Check your understanding of important skills.

Name _____

Time to the Half Hour

Read the clock. Write the time.

1. 

_____

2. 

_____

3. 

_____

Multiply by 1-Digit Numbers

Find the product.

4. $\begin{array}{r} 84 \\ \times\ 7 \\ \hline \end{array}$

5. $\begin{array}{r} 536 \\ \times\ 8 \\ \hline \end{array}$

6. $\begin{array}{r} 748 \\ \times\ 5 \\ \hline \end{array}$

7. $\begin{array}{r} 2{,}524 \\ \times\ 2 \\ \hline \end{array}$

8. $\begin{array}{r} 360 \\ \times\ 9 \\ \hline \end{array}$

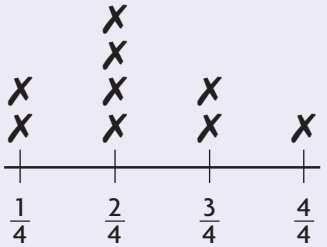
9. $\begin{array}{r} 296 \\ \times\ 3 \\ \hline \end{array}$

10. $\begin{array}{r} \$1{,}428 \\ \times\ 4 \\ \hline \end{array}$

11. $\begin{array}{r} 64 \\ \times\ 5 \\ \hline \end{array}$

Math Detective

A team was given a bucket of water and a sponge. The team had 1 minute to fill an empty half-gallon bucket with water using only the sponge. The line plot shows the amount of water squeezed into the bucket. Be a Math Detective. Did the team squeeze enough water to fill the half-gallon bucket?



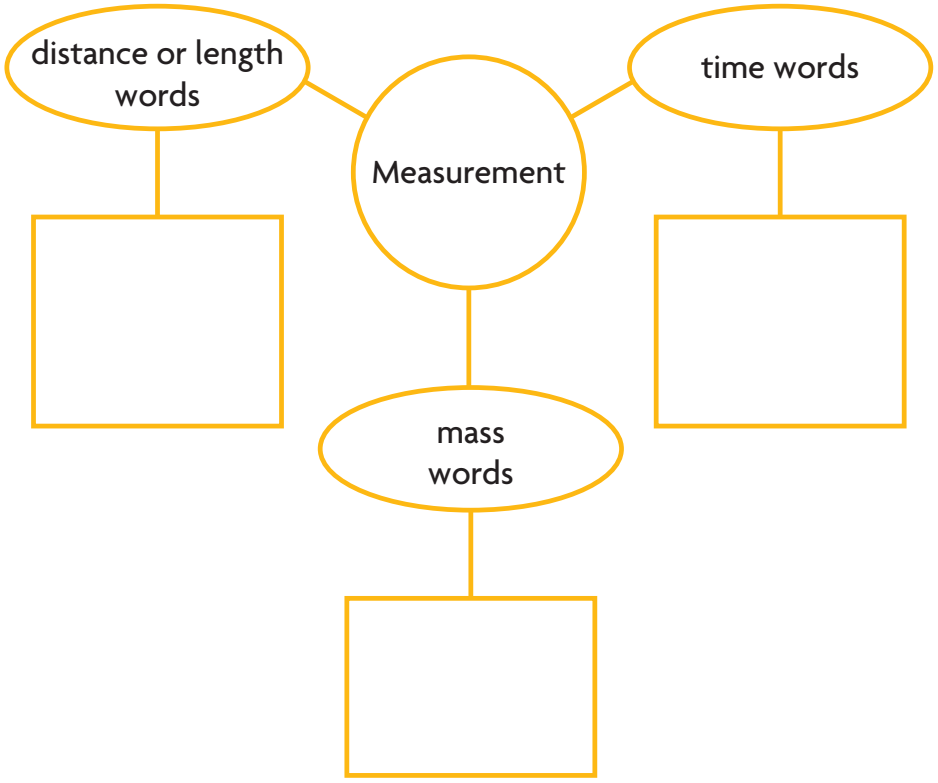
Amount of Water Squeezed into the Bucket (in cups)

Personal Math Trainer
Online Assessment and Intervention

Vocabulary Builder

Visualize It

Complete the Brain Storming diagram by using words with a ✓.



Understand Vocabulary

Draw a line to match each word with its definition.

1. decimeter
2. second
3. fluid ounce
4. ton
5. line plot

- A customary unit for measuring liquid volume
- A graph that shows the frequency of data along a number line
- A customary unit used to measure weight
- A small unit of time
- A metric unit for measuring length or distance

Review Words

- ✓ A.M.
- ✓ centimeter
- ✓ elapsed time
- ✓ foot
- ✓ gram
- ✓ hour
- ✓ inch
- ✓ kilogram
- ✓ meter
- ✓ minute
- ✓ P.M.
- ✓ yard

Preview Words

- cup
- decimeter
- fluid ounce
- gallon
- half gallon
- line plot
- milliliter
- millimeter
- ounce
- pint
- pound
- quart
- second
- ton

Name _____

Measurement Benchmarks

Essential Question How can you use benchmarks to understand the relative sizes of measurement units?

Measurement and Data—4.MD.1

MATHEMATICAL PRACTICES

MP.1, MP.5

Unlock the Problem

Real World

Jake says the length of his bike is about four yards. Use the benchmark units below to determine if Jake's statement is reasonable.

Customary Units of Length			
1 in.  about 1 inch	 1 ft about 1 foot	 1 yd about 1 yard	 1 mile in about 20 minutes

A baseball bat is about one yard long. Since Jake's bike is shorter than four times the length of a baseball bat, his bike is shorter than four yards long.

So, Jake's statement _____ reasonable.

Jake's bike is about _____ baseball bats long.

A **mile** is a customary unit for measuring length or distance. The benchmark shows the distance you can walk in about 20 minutes.

Example 1 Use the benchmark customary units.

Customary Units of Liquid Volume				
 1 cup = 8 fluid ounces	 1 pint	 1 quart	 1 half gallon	 1 gallon

- About how much liquid is in a mug of hot chocolate? _____

Customary Units of Weight		
 about 1 ounce	 about 1 pound	 about 1 ton

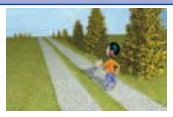
- About how much does a grapefruit weigh? _____

Math Talk **Mathematical Practices**

Order the units of weight from heaviest to lightest. Use benchmarks to **explain** your answer.

Benchmarks for Metric Units Like place value, the metric system is based on multiples of ten. Each unit is 10 times as large as the next smaller unit. Below are some common metric benchmarks.

Example 2 Use the benchmark metric units.

Metric Units of Length				
 about 1 millimeter	 about 1 centimeter	 about 1 decimeter	 about 1 meter	 1 kilometer in about 10 minutes

A **kilometer** is a metric unit for measuring length or distance. The benchmark shows the distance you can walk in about 10 minutes.

- Is the length of your classroom greater than or less than one kilometer?

_____

- About how much medicine is usually in a medicine bottle?

about 120 _____

Metric Units of Mass	
about 1 gram	about 1 kilogram

- About how much is the mass of a paper clip?

_____

Math Talk **Mathematical Practices**

Explain how benchmark measurements can help you decide which unit to use when measuring.

Name _____

Share and Show

MATH BOARD

Use benchmarks to choose the metric unit you would use to measure each.

1. mass of a strawberry

_____

2. length of a cell phone

_____

Metric Units
centimeter
meter
kilometer
gram
kilogram
milliliter
liter

Circle the better estimate.

3. width of a teacher's desk

10 meters or 1 meter

4. the amount of liquid a punch bowl holds

2 liters or 20 liters

5. distance between Seattle and San Francisco

6 miles or 680 miles

Math Talk

Mathematical Practices

Explain why you would use kilometers instead of meters to measure the distance across the United States.

On Your Own

Use benchmarks to choose the customary unit you would use to measure each.

6. length of a football field

_____

7. weight of a pumpkin

_____

Customary Units
inch
foot
yard
ounce
pound
cup
gallon

Circle the better estimate.

8. weight of a watermelon

4 pounds or 4 ounces

9. the amount of liquid a fish tank holds

10 cups or 10 gallons

Complete the sentence. Write *more* or *less*.

10. Matthew's large dog weighs _____ than one ton.

11. The amount of liquid a sink can hold is _____ than one cup of water.

12. A paper clip has a mass of _____ than one kilogram.

Problem Solving • Applications

For 13–15, use benchmarks to explain your answer.

13. THINK SMARTER Cristina is making macaroni and cheese for her family. Would Cristina use 1 pound of macaroni or 1 ounce of macaroni?

14. Which is the better estimate for the length of a kitchen table, 200 centimeters or 200 meters?

15. GO DEEPER Jodi wants to weigh her dog and measure its height. Which two units should she use?

16. MATHEMATICAL PRACTICE 1 **Evaluate Reasonableness** Dalton used benchmarks to estimate that there are more cups than quarts in one gallon. Is Dalton's estimate reasonable? Explain.

17. THINK SMARTER Select the correct word to complete the sentence.

Justine is thirsty after running two miles.

She should drink

1 liter
1 meter
100 millimeters

of water.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Customary Units of Length

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

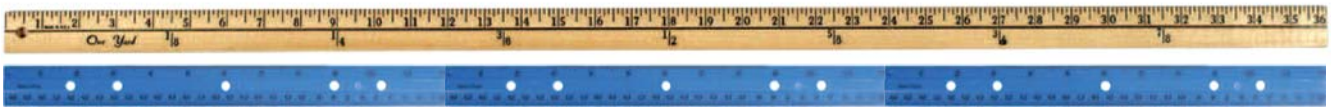
Measurement and Data—4.MD.1
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.1, MP.2, MP.5

Unlock the Problem

Real World

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.

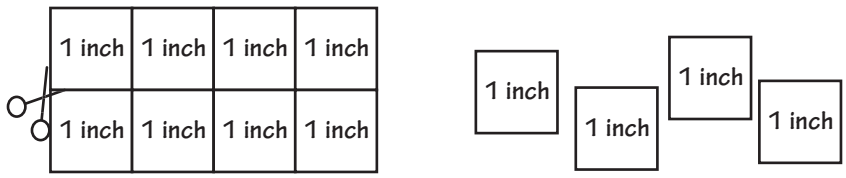


How does the size of a foot compare to the size of an inch?

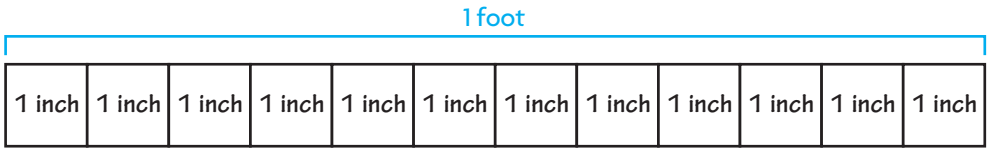
Activity

Materials ■ 1-inch grid paper ■ scissors ■ tape

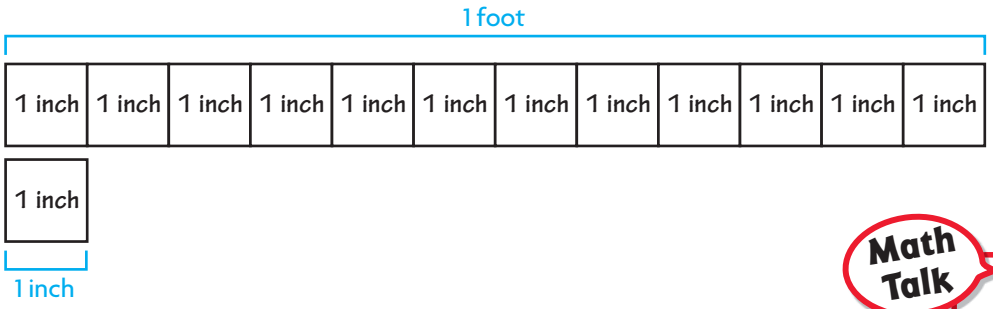
STEP 1 Cut out the paper inch tiles. Label each tile 1 inch.



STEP 2 Place 12 tiles end-to-end to build 1 foot. Tape the tiles together.



STEP 3 Compare the size of 1 foot to the size of 1 inch.



Think: You need 12 inches to make 1 foot.

So, 1 foot is _____ times as long as 1 inch.

Math Talk **Mathematical Practices**

How many inches would you need to make a yard? **Explain.**

Example Compare measures.

Emma has 4 feet of thread. She needs 50 inches of thread to make some bracelets. How can she determine if she has enough thread to make the bracelets?

Since 1 foot is 12 times as long as 1 inch, you can write feet as inches by multiplying the number of feet by 12.

STEP 1 Make a table that relates feet and inches.

Feet	Inches
1	12
2	
3	
4	
5	

Think:

1 foot × 12 = 12 inches

2 feet × 12 = _____

3 feet × _____ = _____

4 feet × _____ = _____

5 feet × _____ = _____

STEP 2 Compare 4 feet and 50 inches.

4 feet ↓ 50 inches ↓

Think: Write each measure in inches and compare using <, >, or =.

_____ ◯ _____

Emma has 4 feet of thread. She needs 50 inches of thread.

4 feet is _____ than 50 inches.

So, Emma _____ enough thread to make the bracelets.

Math Talk **Mathematical Practices**

Explain how making a table helped you solve the problem.

- What if Emma had 5 feet of thread? Would she have enough thread to make the bracelets? Explain.

_____

_____

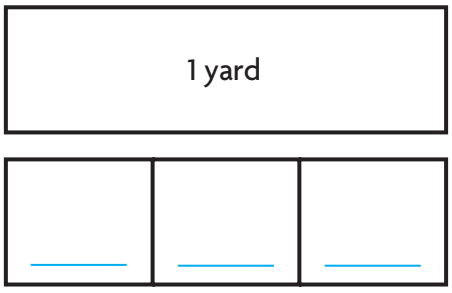
_____

Name _____

Share and Show

MATH BOARD

1. Compare the size of a yard to the size of a foot. Use a model to help.



1 yard is _____ times as long as _____ foot.

Customary Units of Length
1 foot (ft) = 12 inches (in.)
1 yard (yd) = 3 feet
1 yard (yd) = 36 inches

Complete.

2. 2 feet = _____ inches

3. 3 yards = _____ feet

4. 7 yards = _____ feet

Math Talk **Mathematical Practices**

If you measured the length of your classroom in yards and then in feet, which unit would have a greater number of units? **Explain.**

On Your Own

Complete.

5. 4 yards = _____ feet

6. 10 yards = _____ feet

7. 7 feet = _____ inches

MATHEMATICAL PRACTICE 4 **Use Symbols** **Algebra** **Compare using <, >, or =.**

8. 1 foot ◯ 13 inches

9. 2 yards ◯ 6 feet

10. 6 feet ◯ 60 inches

Problem Solving • Applications

Real World

11. THINK SMARTER Joanna has 3 yards of fabric. She needs 100 inches of fabric to make curtains. Does she have enough fabric to make curtains? Explain. Make a table to help.

Yards	Inches
1	
2	
3	

_____

_____

_____

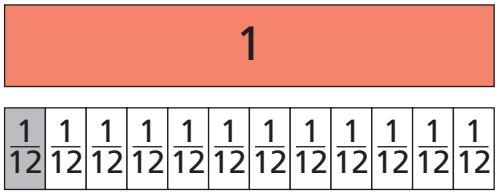
12. THINK SMARTER Select the measures that are equal. Mark all that apply.

(A) 4 feet (C) 36 feet (E) 15 feet

(B) 12 yards (D) 480 inches (F) 432 inches

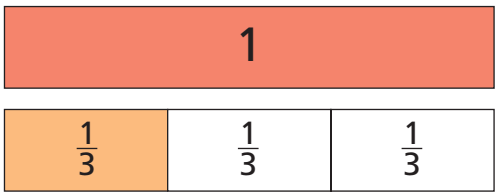
13. GO DEEPER Jasmine and Luke used fraction strips to compare the size of a foot to the size of an inch using fractions. They drew models to show their answers. Whose answer makes sense? Whose answer is nonsense? Explain your reasoning.

Jasmine's Work



1 inch is $\frac{1}{12}$ of a foot.

Luke's Work



1 inch is $\frac{1}{3}$ of a foot.

a. MATHEMATICAL PRACTICE 3 **Apply** For the answer that is nonsense, write an answer that makes sense.

b. Look back at Luke's model. Which two units could you compare using his model? Explain.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Customary Units of Weight

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

Measurement and Data—4.MD.1
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.1, MP.6, MP.7

Unlock the Problem

Real World

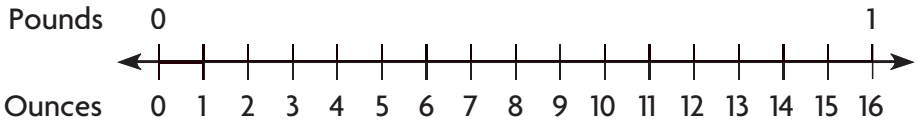
Ounces and **pounds** are customary units of weight. How does the size of a pound compare to the size of an ounce?

▲ You can use a spring scale to measure weight.

Activity

Materials ■ color pencils

The number line below shows the relationship between pounds and ounces.



STEP 1 Use a color pencil to shade 1 pound on the number line.

STEP 2 Use a different color pencil to shade 1 ounce on the number line.

STEP 3 Compare the size of 1 pound to the size of 1 ounce.

You need _____ ounces to make _____ pound.

So, 1 pound is _____ times as heavy as 1 ounce.

Math Talk **Mathematical Practices**

Which is greater, 9 pounds or 9 ounces? **Explain.**

- MATHEMATICAL PRACTICE 6 **Explain** how the number line helped you to compare the sizes of the units.

_____

_____

_____

_____

Example Compare measures.

Nancy needs 5 pounds of flour to bake pies for a festival. She has 90 ounces of flour. How can she determine if she has enough flour to bake the pies?

STEP 1 Make a table that relates pounds and ounces.

Pounds	Ounces
1	16
2	
3	
4	
5	

Think:

1 pound × 16 = 16 ounces

2 pounds × 16 = _____

3 pounds × _____ = _____

4 pounds × _____ = _____

5 pounds × _____ = _____

STEP 2 Compare 90 ounces and 5 pounds.

90 ounces ↓ _____ ◯ _____ ↓ 5 pounds

Think: Write each measure in ounces and compare using <, >, or =.

Nancy has 90 ounces of flour. She needs 5 pounds of flour.

90 ounces is _____ than 5 pounds.

So, Nancy _____ enough flour to make the pies.

Try This! There are 2,000 pounds in 1 **ton**.
Make a table that relates tons and pounds.

Tons	Pounds
1	2,000
2	
3	

1 ton is _____ times as heavy as 1 pound.

Name _____

Share and Show

MATH BOARD

1. 4 tons = _____ pounds

Think: 4 tons × _____ = _____

Customary Units of Weight
1 pound (lb) = 16 ounces (oz)
1 ton (T) = 2,000 pounds

Complete.

2. 5 tons = _____ pounds

3. 6 pounds = _____ ounces

On Your Own

Math Talk **Mathematical Practices**

What equation can you use to solve Exercise 4? **Explain.**

Complete.

4. 7 pounds = _____ ounces

5. 6 tons = _____ pounds

MATHEMATICAL PRACTICE 4 **Use Symbols** **Algebra** **Compare using >, <, or =.**

6. 1 pound ◯ 15 ounces

7. 2 tons ◯ 2 pounds

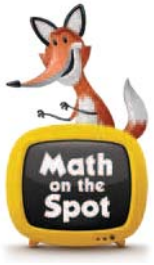
Problem Solving • Applications

Real World

8. A landscaping company ordered 8 tons of gravel. They sell the gravel in 50-pound bags. How many pounds of gravel did the company order?

_____

9. THINK SMARTER If you could draw a number line that shows the relationship between tons and pounds, what would it look like? Explain.



_____

_____

_____

10. THINK SMARTER Write the symbol that compares the weights correctly.

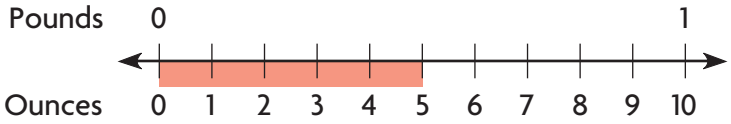
< = >

160 ounces _____ 10 pounds

600 pounds _____ 3 tons

11. GO DEEPER Alexis bought $\frac{1}{2}$ pound of grapes. How many ounces of grapes did she buy?

Dan drew the number line below to solve the problem. He says his model shows that there are 5 ounces in $\frac{1}{2}$ pound. What is his error?



Look at the way Dan solved the problem. Find and describe his error.

Draw a correct number line and solve the problem.

So, Alexis bought _____ ounces of grapes.

- MATHEMATICAL PRACTICE 6 Look back at the number line you drew. How many ounces are in $\frac{1}{4}$ pound? **Explain.**

FOR MORE PRACTICE: Standards Practice Book

Name _____

Customary Units of Liquid Volume

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

Measurement and Data—4.MD.1
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.3, MP.7, MP.8

Unlock the Problem

Liquid volume is the measure of the space a liquid occupies. Some basic units for measuring liquid volume are **gallons**, **half gallons**, **quarts**, **pints**, and **cups**.

The bars below model the relationships among some units of liquid volume. The largest units are gallons. The smallest units are **fluid ounces**.

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 4 cups

1 gallon

1 gallon															
1 half gallon								1 half gallon							
1 quart				1 quart				1 quart				1 quart			
1 pint		1 pint		1 pint		1 pint		1 pint		1 pint		1 pint		1 pint	
1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup	1 cup
8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces	8 fluid ounces

Example How does the size of a gallon compare to the size of a quart?

Math Talk **Mathematical Practices**
Describe the pattern in the units of liquid volume.

STEP 1 Draw two bars that represent this relationship. One bar should show gallons and the other bar should show quarts.

STEP 2 Shade 1 gallon on one bar and shade 1 quart on the other bar.

STEP 3 Compare the size of 1 gallon to the size of 1 quart.

So, 1 gallon is _____ times as much as 1 quart.

Example Compare measures.

Serena needs to make 3 gallons of lemonade for the lemonade sale. She has a powder mix that makes 350 fluid ounces of lemonade. How can she decide if she has enough powder mix?

STEP 1 Use the model on page 483. Find the relationship between gallons and fluid ounces.

1 gallon = _____ cups

1 cup = _____ fluid ounces

1 gallon = _____ cups × _____ fluid ounces

1 gallon = _____ fluid ounces

STEP 2 Make a table that relates gallons and fluid ounces.

Gallons	Fluid Ounces
1	128
2	
3	

Think:

1 gallon = 128 fluid ounces

2 gallons × 128 = _____ fluid ounces

3 gallons × 128 = _____ fluid ounces

STEP 3 Compare 350 fluid ounces and 3 gallons.

350 fluid ounces ↓ _____ ◯ _____ ↓ 3 gallons

Think: Write each measure in fluid ounces and compare using <, >, or =.

Serena has enough mix to make 350 fluid ounces.
She needs to make 3 gallons of lemonade.

350 fluid ounces is _____ than 3 gallons.

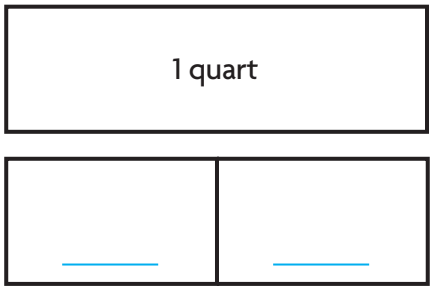
So, Serena _____ enough mix to make 3 gallons of lemonade.

Name _____

Share and Show

MATH BOARD

1. Compare the size of a quart to the size of a pint. Use a model to help.



Customary Units of Liquid Volume
1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 quart (qt) = 4 cups
1 gallon (gal) = 4 quarts
1 gallon (gal) = 8 pints
1 gallon (gal) = 16 cups

1 quart is _____ times as much as _____ pint.

Complete.

2. 2 pints = _____ cups

3. 3 gallons = _____ quarts

4. 6 quarts = _____ cups

Math Talk **Mathematical Practices**

Explain how the conversion chart above relates to the bar model in Exercise 1.

On Your Own

Complete.

5. 4 gallons = _____ pints

6. 5 cups = _____ fluid ounces

MATHEMATICAL PRACTICE 4 **Use Symbols** **Algebra** **Compare using >, <, or =.**

7. 2 gallons ◯ 32 cups

8. 4 pints ◯ 6 cups

9. 5 quarts ◯ 11 pints

Problem Solving • Applications

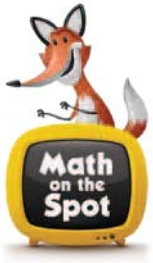
Real World

10. THINK SMARTER A soccer team has 25 players. The team's thermos holds 4 gallons of water. If the thermos is full, is there enough water for each player to have 2 cups? Explain. Make a table to help.

_____

_____

_____



Gallons	Cups
1	
2	
3	
4	

11. MATHEMATICAL PRACTICE 3 **Verify the Reasoning of Others** Whose statement makes sense? Whose statement is nonsense? Explain your reasoning.

1 pint is $\frac{1}{4}$ of a gallon.

Zach's Statement

1 pint is $\frac{1}{8}$ of a gallon.

Angela's Statement

12. GO DEEPER Peter's glasses each hold 8 fluid ounces. How many glasses of juice can Peter pour from a bottle that holds 2 quarts?

13. THINK SMARTER + A pitcher contains 5 quarts of water. Josy says the pitcher contains 10 cups of water. Explain Josy's error. Then find the correct number of cups the pitcher contains.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Line Plots

Essential Question How can you make and interpret line plots with fractional data?

Measurement and Data—4.MD.4
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.4, MP.5, MP.7

Unlock the Problem

The data show the lengths of the buttons in Jen's collection. For an art project, she wants to know how many buttons are longer than $\frac{1}{4}$ inch.

You can use a line plot to solve the problem. A **line plot** is a graph that shows the frequency of data along a number line.

Length of Buttons in Jen's Collection (in inches)
$\frac{1}{4}, \frac{3}{4}, \frac{1}{4}, \frac{4}{4}, \frac{1}{4}, \frac{4}{4}$

Make a line plot to show the data.

Example 1

STEP 1 Order the data from least to greatest length and complete the tally table.

_____

Buttons in Jen's Collection	
Length (in inches)	Tally
$\frac{1}{4}$	
$\frac{3}{4}$	
$\frac{4}{4}$	

STEP 2 Label the fraction lengths on the number line below from the least value of the data to the greatest.

STEP 3 Plot an *X* above the number line for each data point. Write a title for the line plot.

_____ _____ _____ _____

_____

So, _____ buttons are longer than $\frac{1}{4}$ inch.

Math Talk **Mathematical Practices**

Explain how you labeled the numbers on the number line in Step 2.

1. How many buttons are in Jen's collection? _____

2. What is the difference in length between the longest button and the shortest button in Jen's collection? _____

Think: To find the difference, subtract the numerators. The denominators stay the same.

Example 2

Some of the students in Ms. Lee's class walk to school. The data show the distances these students walk. What distance do most students walk?

Distance Students Walk to School (in miles)
$\frac{1}{2}, \frac{1}{2}, \frac{1}{4}, \frac{3}{4}, \frac{1}{4}, \frac{1}{2}, \frac{1}{2}$

Make a line plot to show the data.

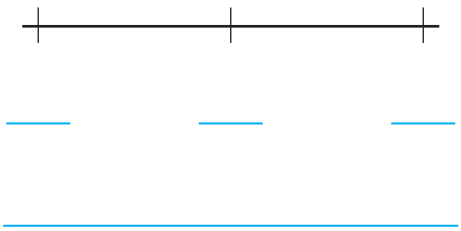
STEP 1 Order the data from least to greatest distance and complete the tally table.

_____

Distance Students Walk to School	
Distance (in miles)	Tally

STEP 2 Label the fraction lengths on the number line below from the least value of the data to the greatest.

STEP 3 Plot an *X* above the number line for each data point. Write a title for the line plot.



So, most students walk _____.

3. How many more students walk $\frac{1}{2}$ mile than $\frac{1}{4}$ mile to school?

_____

4. What is the difference between the longest distance and the shortest distance that students walk?

_____

5. What if a new student joins Ms. Lee's class who walks $\frac{3}{4}$ mile to school? How would the line plot change? Explain.

_____

Name _____

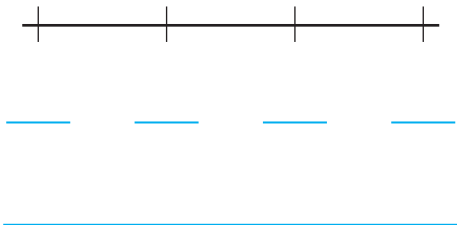
Share and Show

MATH BOARD

1. A food critic collected data on the lengths of time customers waited for their food. Order the data from least to greatest time. Make a tally table and a line plot to show the data.

Time Customers Waited for Food (in hours)
$\frac{1}{2}, \frac{1}{4}, \frac{3}{4}, \frac{1}{4}, \frac{1}{4}, \frac{1}{2}, 1$

Time Customers Waited for Food	
Time (in hours)	Tally



Math Talk **Mathematical Practices**

Explain how the line plot helped you answer the question for Exercise 2.

Use your line plot for 2 and 3.

2. On how many customers did the food critic collect data? _____

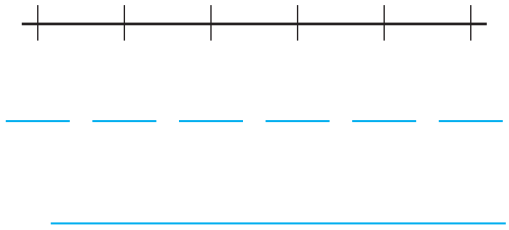
3. What is the difference between the longest time and the shortest time that customers waited? _____

On Your Own

4. MATHEMATICAL PRACTICE 4 **Use Models** The data show the lengths of the ribbons Mia used to wrap packages. Make a tally table and a line plot to show the data.

Ribbon Length Used to Wrap Packages (in yards)
$\frac{1}{6}, \frac{2}{6}, \frac{5}{6}, \frac{3}{6}, \frac{2}{6}, \frac{6}{6}, \frac{3}{6}, \frac{2}{6}$

Ribbon Used to Wrap Packages	
Length (in yards)	Tally

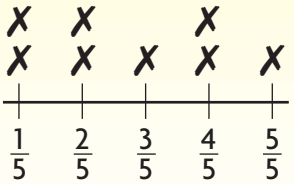


5. What is the difference in length between the longest ribbon and the shortest ribbon Mia used? _____

Unlock the Problem

Real World

6. GO DEEPER The line plot shows the distances the students in Mr. Boren's class ran at the track in miles. Altogether, did the students run more or less than 5 miles?



Distance Students Ran at the Track (in miles)

a. What are you asked to find? _____

_____

b. What information do you need to use? _____

_____

c. How will the line plot help you solve the problem? _____

_____

d. What operation will you use to solve the problem? _____

e. Show the steps to solve the problem.

_____

_____

f. Complete the sentences.

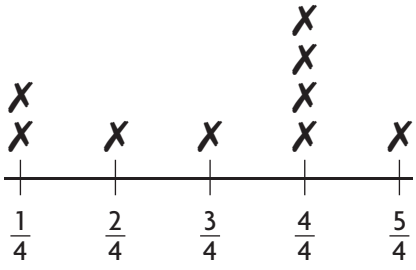
The students ran a total of _____ miles.

_____ miles _____ 5 miles; so, altogether the students ran _____ than 5 miles.

7. THINK SMARTER Lena collects antique spoons. The line plot shows the lengths of the spoons in her collection. If she lines up all of her spoons in order of size, what is the size of the middle spoon? Explain.

_____

_____



Length of Spoons (in feet)

Personal Math Trainer

8. THINK SMARTER + The table shows the distances some students hiked. Complete the line plot to show the data.

Distance Students Hiked (in miles)
$\frac{4}{8}, \frac{5}{8}, \frac{7}{8}, \frac{7}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}, \frac{7}{8}, \frac{6}{8}$

_____ _____ _____ _____

Distance Students Hiked

FOR MORE PRACTICE: Standards Practice Book

Name _____

Mid-Chapter Checkpoint

Vocabulary

Choose the best term from the box to complete the sentence.

Vocabulary
pint
pound
yard

1. A _____ is a customary unit used to measure weight. (p. 479)
2. The cup and the _____ are both customary units for measuring liquid volume. (p. 483)

Concepts and Skills

Complete the sentence. Write *more* or *less*. (4.MD.1)

3. A cat weighs _____ than one ounce.
4. Serena's shoe is _____ than one yard long.

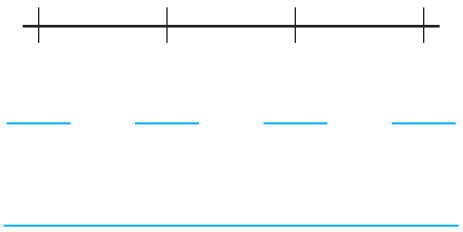
Complete. (4.MD.1)

5. 5 feet = _____ inches
6. 4 tons = _____ pounds
7. 4 cups = _____ pints

8. Mrs. Byrne's class went raspberry picking. The data show the weights of the cartons of raspberries the students picked. Make a tally table and a line plot to show the data. (4.MD.4)

Weight of Cartons of Raspberries Picked (in pounds)
$\frac{3}{4}, \frac{1}{4}, \frac{2}{4}, \frac{4}{4}, \frac{1}{4}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{3}{4}$

Cartons of Raspberries Picked	
Weight (in pounds)	Tally



Use your line plot for 9 and 10. (4.MD.4)

9. What is the difference in weight between the heaviest carton and lightest carton of raspberries? _____
10. How many pounds of raspberries did Mrs. Byrne's class pick in all? _____

11. A jug contains 2 gallons of water. How many quarts of water does the jug contain? (4.MD.1)

12. Serena bought 4 pounds of dough to make pizzas. The recipe gives the amount of dough needed for a pizza in ounces. How many ounces of dough did she buy? (4.MD.1)

13. Vaughn threw the shot put 9 yards at a track meet. The official used a tape measure to measure the distance in feet. How many feet did he throw the shot put? (4.MD.1)

14. The watering can that Carlos uses in his vegetable garden holds 5 of a certain unit of liquid volume. When full, how much water is in the watering can? (4.MD.1)

Name _____

Metric Units of Length

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

Measurement and Data—4.MD.1
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.1, MP.7, MP.8

Investigate

Hands On

Materials ■ ruler (meter) ■ scissors ■ tape

Meters (m), **decimeters** (dm), centimeters (cm), and **millimeters** (mm) are all metric units of length.

Build a meterstick to show how these units are related.

A. Cut out the meterstick strips.

B. Place the strips end-to-end to build 1 meter. Tape the strips together.

C. Look at your meter strip. What patterns do you notice about the sizes of the units?

1 meter is _____ times as long as 1 decimeter.

1 decimeter is _____ times as long as 1 centimeter.

1 centimeter is _____ times as long as 1 millimeter.

Describe the pattern you see.

_____

_____

Math Idea
If you lined up 1,000 metersticks end-to-end, the length of the metersticks would be 1 kilometer.

Draw Conclusions

1. Compare the size of 1 meter to the size of 1 centimeter. Use your meterstick to help.

_____

2. Compare the size of 1 meter to the size of 1 millimeter. Use your meterstick to help.

3. THINK SMARTER What operation could you use to find how many centimeters are in 3 meters? Explain.

Make Connections

You can use different metric units to describe the same length. For example, you can measure the length of a book as 3 decimeters or as 30 centimeters. Since the metric system is based on the number 10, decimals or fractions can be used to describe metric lengths as equivalent units.

Think of 1 meter as one whole. Use your meter strip to write equivalent units as fractions and decimals.

1 meter = 10 decimeters	1 meter = 100 centimeters
Each decimeter is	Each centimeter is
_____ or _____ of a meter.	_____ or _____ of a meter.

Complete the sentence.

- A length of 51 centimeters is _____ or _____ of a meter.
- A length of 8 decimeters is _____ or _____ of a meter.
- A length of 82 centimeters is _____ or _____ of a meter.

Math Talk

Mathematical Practices

Explain how you are able to locate and write decimeters and centimeters as parts of a meter on the meterstick.

Name _____

Share and Show

MATH BOARD

Metric Units of Length

1 centimeter (cm) = 10 millimeters (mm)
1 decimeter (dm) = 10 centimeters
1 meter (m) = 10 decimeters
1 meter (m) = 100 centimeters
1 meter (m) = 1,000 millimeters

Complete.

1. 2 meters = _____ centimeters

2. 3 centimeters = _____ millimeters

3. 5 decimeters = _____ centimeters

MATHEMATICAL PRACTICE 4 **Use Symbols** **Algebra** **Compare using <, >, or =.**

4. 4 meters ◯ 40 decimeters

5. 5 centimeters ◯ 5 millimeters

6. 6 decimeters ◯ 65 centimeters

7. 7 meters ◯ 700 millimeters

Describe the length in meters. Write your answer as a fraction and as a decimal.

8. 65 centimeters = _____ or _____ meter

9. 47 centimeters = _____ or _____ meter

10. 9 decimeters = _____ or _____ meter

11. 2 decimeters = _____ or _____ meter

Problem Solving • Applications

Real World

12. Lucille runs the 50-meter dash in her track meet. How many decimeters long is the race?

_____

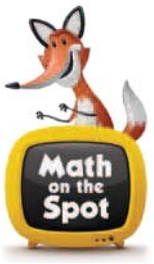
13. GO DEEPER Alexis is knitting a blanket 2 meters long. Every 2 decimeters, she changes the color of the yarn to make stripes. How many stripes will the blanket have? Explain.

_____

_____

_____

14. THINK SMARTER Julianne's desk is 75 centimeters long. She says her desk is 7.5 meters long. Describe her error.



15. THINK SMARTER Write the equivalent measurements in each column.

5,000 millimeters	500 centimeters	50 centimeters
$\frac{55}{100}$ meter	0.500 meter	0.55 meter
$\frac{500}{1,000}$ meter	550 millimeters	50 decimeters

5 meters	55 centimeters	500 millimeters

16. THINK SMARTER Aruna was writing a report on pecan trees. She made the table of information to the right.

Write a problem that can be solved by using the data.

Pecan Tree	
Average Measurements	
Length of nuts	3 cm to 5 cm
Height	21 m to 30 m
Width of trunk	18 dm
Width of leaf	10 cm to 20 cm

Pose a problem.

Solve your problem.

- MATHEMATICAL PRACTICE 1 **Describe** how you could change the problem by changing a unit in the problem. Then solve the problem.

FOR MORE PRACTICE: Standards Practice Book

Name _____

Metric Units of Mass and Liquid Volume

Essential Question How can you compare metric units of mass and liquid volume?

Measurement and Data—4.MD.1
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.2, MP.7

Unlock the Problem

Real World

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.

Metric Units of Mass	Metric Units of Liquid Volume
1 kilogram (kg) = 1,000 grams (g)	1 liter (L) = 1,000 milliliters (mL)

Example 1 Compare kilograms and grams.

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

number of kilograms		grams in 1 kilogram		total grams
9	×	1,000	=	_____

So, Becky used _____ grams of soil to plant her bluebonnets.

- Are kilograms heavier or lighter 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?

_____

Example 2 Compare liters and milliliters.

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

number of liters		milliliters in 1 liter		total milliliters
5	×	1,000	=	_____

So, Becky used _____ milliliters of water.

Math Talk **Mathematical Practices**

Compare the size of a kilogram to the size of a gram. Then compare the size of a liter to the size of a milliliter.

Share and Show

MATH BOARD

1. There are 3 liters of water in a pitcher. How many milliliters of water are in the pitcher?

There are _____ milliliters in 1 liter. Since I am changing from a larger unit to a smaller unit, I can _____ 3 by 1,000 to find the number of milliliters in 3 liters.

So, there are _____ milliliters of water in the pitcher.

Complete.

2. 4 liters = _____ milliliters

3. 6 kilograms = _____ grams

Math Talk Mathematical Practices

Explain how you found the number of grams in 6 kilograms in Exercise 3.

On Your Own

Complete.

4. 8 kilograms = _____ grams

5. 7 liters = _____ milliliters

MATHEMATICAL PRACTICE 4 **Use Symbols** **Algebra** Compare using <, >, or =.

6. 1 kilogram ◯ 900 grams

7. 2 liters ◯ 2,000 milliliters

MATHEMATICAL PRACTICE 7 **Look for a Pattern** **Algebra** Complete.

8.

Liters	Milliliters
1	1,000
2	
3	
	4,000
5	
6	
	7,000
8	
9	
10	

9.

Kilograms	Grams
1	1,000
2	
	3,000
4	
5	
6	
7	
	8,000
9	
10	

Name _____

Problem Solving • Applications

10. Frank wants to fill a fish tank with 8 liters of water. How many milliliters is that?

11. Kim has 3 water bottles. She fills each bottle with 1 liter of water. How many milliliters of water does she have?

12. Jared's empty backpack has a mass of 3 kilograms. He doesn't want to carry more than 7 kilograms on a trip. How many grams of equipment can Jared pack?

WRITE Math
Show Your Work

13. GO DEEPER A large cooler contains 20 liters of iced tea and a small cooler contains 5 liters of iced tea. How many more milliliters of iced tea does the large cooler contain than the small cooler?

14. THINK SMARTER A 500-gram bag of granola costs $4, and a 2-kilogram bag of granola costs $15. What is the least expensive way to buy 2,000 grams of granola? Explain.

15. MATHEMATICAL PRACTICE 3 **Verify the Reasoning of Others** The world's largest apple had a mass of 1,849 grams. Sue said the mass was greater than 2 kilograms. Does Sue's statement make sense? Explain.

Unlock the Problem

Real World

16. THINK SMARTER Lori bought 600 grams of cayenne pepper and 2 kilograms of black pepper. How many grams of pepper did she buy in all?

black pepper

cayenne pepper

a. What are you asked to find?

_____

b. What information will you use?

_____

c. Tell how you might solve the problem.

_____

_____

_____

d. Show how you solved the problem.

_____

_____

_____

_____

e. Complete the sentences.

Lori bought _____ grams of cayenne pepper.

She bought _____ grams of black pepper.

_____ + _____ = _____ grams

So, Lori bought _____ grams of pepper in all.

17. WRITE Math Jill has two rocks. One has a mass of 20 grams and the other has a mass of 20 kilograms. Which rock has the greater mass? Explain.

_____

_____

_____

18. THINK SMARTER For numbers 18a–18c, choose Yes or No to tell whether the measurements are equivalent.

18a.	5,000 grams and 5 kilograms	○ Yes	○ No
18b.	300 milliliters and 3 liters	○ Yes	○ No
18c.	8 grams and 8,000 kilograms	○ Yes	○ No

Name _____

Units of Time

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

Measurement and Data—4.MD.1
Also 4.MD.2

MATHEMATICAL PRACTICES
MP.1, MP.5, MP.7

Unlock the Problem

The analog clock below has an hour hand, a minute hand, and a **second** hand to measure time. The time is 4:30:12.

Read Math

Read 4:30:12 as 4:30 and 12 seconds, or 30 minutes and 12 seconds after 4.

- Are there more minutes or seconds in one hour?

_____

There are 60 seconds in a minute and 60 minutes in an hour. The clocks show how far the hands move for each length of time.

Start Time: 3:00:00

1 second elapses.

The time is now 3:00:01.

1 minute, or 60 seconds, elapses. The second hand has made a full turn clockwise.

The time is now 3:01:00.

1 hour, or 60 minutes, elapses. The minute hand has made a full turn clockwise.

The time is now 4:00:00.

Example 1 How does the size of an hour compare to the size of a second?

There are _____ minutes in an hour.

There are _____ seconds in a minute.

60 minutes × _____ = _____ seconds

Think: Multiply the number of minutes in an hour by the number of seconds in a minute.

There are _____ seconds in a hour.

So, 1 hour is _____ times as long as 1 second.

Math Talk **Mathematical Practices**

How many full turns clockwise does a minute hand make in 3 hours? **Explain.**

Example 2 Compare measures.

Larissa spent 2 hours on her science project. Cliff spent 200 minutes on his science project. Who spent more time?

STEP 1 Make a table that relates hours and minutes.

Hours	Minutes
1	60
2	
3	

STEP 2 Compare 2 hours and 200 minutes.

2 hours ____ 200 minutes

Think: Write each measure in minutes and compare using <, >, or =.

2 hours is _____ than 200 minutes.

So, _____ spent more time than _____ on the science project.

Activity Compare the length of a week to the length of a day.

Materials ■ color pencils

The number line below shows the relationship between days and weeks.

STEP 1 Use a color pencil to shade 1 week on the number line.

STEP 2 Use a different color pencil to shade 1 day on the number line.

STEP 3 Compare the size of 1 week to the size of 1 day.

There are _____ days in _____ week.

So, 1 week is _____ times as long as 1 day.

Name _____

Share and Show

MATH BOARD

1. Compare the length of a year to the length of a month. Use a model to help.

1 year is _____ times as long as _____ month.

Units of Time
1 minute (min) = 60 seconds (s)
1 hour (hr) = 60 minutes
1 day (d) = 24 hours
1 week (wk) = 7 days
1 year (yr) = 12 months (mo)
1 year (yr) = 52 weeks

Math Talk **Mathematical Practices**

Explain how the number line helped you compare the length of a year and the length of a month.

Complete.

2. 2 minutes = _____ seconds

3. 4 years = _____ months

On Your Own

Complete.

4. 3 minutes = _____ seconds

5. 4 hours = _____ minutes

MATHEMATICAL PRACTICE 4 **Use Symbols** **Algebra** **Compare using >, <, or =.**

6. 3 years ◯ 35 months

7. 2 days ◯ 40 hours

Problem Solving • Applications

Real World

8. GO DEEPER Damien has lived in the apartment building for 5 years. Ken has lived there for 250 weeks. Who has lived in the building longer? Explain. Make a table to help.

Years	Weeks
1	
2	
3	
4	
5	

9. THINK SMARTER How many hours are in a week? Explain.

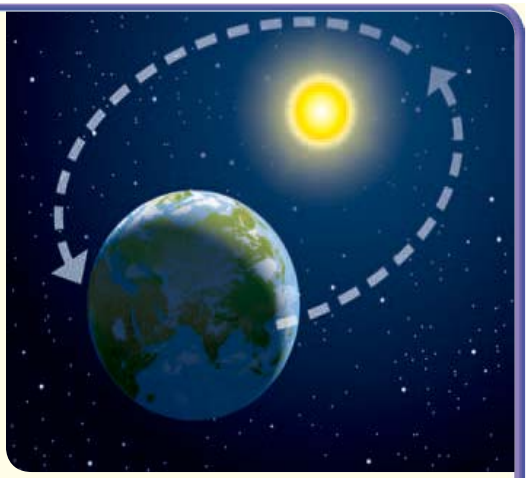
10. MATHEMATICAL PRACTICE 5 **Communicate** Explain how you know that 9 minutes is less than 600 seconds.

11. THINK SMARTER Draw lines to match equivalent time intervals.

1 hour	2 hours	5 hours	12 hours	48 hours
2 days	120 minutes	4 days	3,600 seconds	300 minutes

Connect to Science

One day is the length of time it takes Earth to make one complete rotation. One year is the time it takes Earth to revolve around the sun. To make the calendar match Earth's orbit time, there are leap years. Leap years add one extra day to the year. A leap day, February 29, is added to the calendar every four years.



1 year = 365 days
1 leap year = 366 days

12. How many days are there in 4 years, if the fourth year is a leap year? Explain. Make a table to help.

Years	Days
1	
2	
3	
4	

13. Parker was born on February 29, 2008. The second time he is able to celebrate on his actual birthday is in 2016. How many days old will Parker be on February 29, 2016?

FOR MORE PRACTICE: Standards Practice Book

Name _____

Problem Solving • Elapsed Time

Essential Question How can you use the strategy *draw a diagram* to solve elapsed time problems?

Measurement and Data—4.MD.2
Also 4.MD.1

MATHEMATICAL PRACTICES
MP.3, MP.5, MP.8

Unlock the Problem

Real World

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?

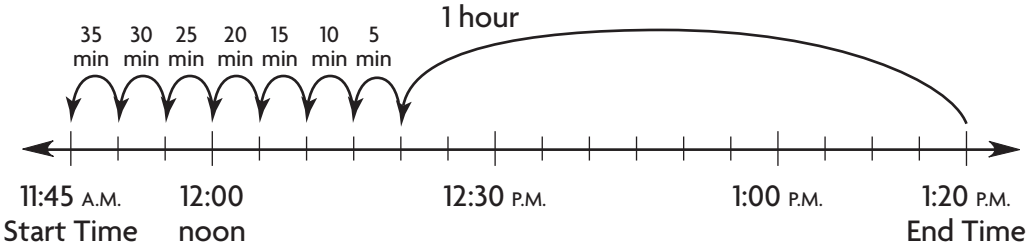
Use the graphic organizer to help you solve the problem.

Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?
I need to find the time that Dora and Kyle _____.	I need to use the _____ and the time that they _____.	I can draw a time line to help me count backward and find the _____.

Solve the Problem

I draw a time line that shows the end time 1:20 P.M. Next, I count backward 1 hour and then 5 minutes at a time until I have 35 minutes.



So, Dora and her brother Kyle started doing yard work at _____.

1. 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?

_____

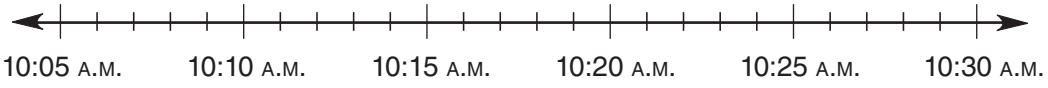
Try Another Problem

Ben started riding his bike at 10:05 A.M. He stopped 23 minutes later when his friend Robbie asked him to play kickball. At what time did Ben stop riding his bike?

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



2. How did your diagram help you solve the problem?

_____

_____

_____

Math Talk **Mathematical Practices**

Describe another way you could find the time an activity started or ended given the elapsed time and either the start or end time.

Name _____

Share and Show

MATH BOARD

1. Evelyn has dance class every Saturday. It lasts 1 hour and 15 minutes and is over at 12:45 P.M. At what time does Evelyn's dance class begin?

First, write the problem you need to solve.

_____

Next, draw a time line to show the end time and the elapsed time.

Finally, find the start time.

Evelyn's dance class begins at _____ .

2. THINK SMARTER What if Evelyn's dance class started at 11:00 A.M. and lasted 1 hour and 25 minutes? At what time would her class end? Describe how this problem is different from Problem 1.

_____

_____

3. Beth got on the bus at 8:06 A.M. Thirty-five minutes later, she arrived at school. At what time did Beth arrive at school?

_____

_____

4. Lyle went fishing for 1 hour and 30 minutes until he ran out of bait at 6:40 P.M. At what time did Lyle start fishing?

_____

_____

Unlock the Problem

- Use the Problem Solving MathBoard.
- Choose a strategy you know.
- Underline important facts.

On Your Own

5. Mike and Jed went skiing at 10:30 A.M. They skied for 1 hour and 55 minutes before stopping for lunch. At what time did Mike and Jed stop for lunch?

_____

6. GO DEEPER Mike can run a mile in 12 minutes. He starts his run at 11:30 AM. and runs 4 miles. What time does Mike finish his run?

_____

7. MATHEMATICAL PRACTICE 5 **Communicate** Explain how you can use a diagram to determine the start time when the end time is 9:00 A.M. and the elapsed time is 26 minutes. What is the start time?

WRITE Math
Show Your Work

_____

_____

_____

_____

8. THINK SMARTER Bethany finished her math homework at 4:20 P.M. She did 25 multiplication problems in all. If each problem took her 3 minutes to do, at what time did Bethany start her math homework?

_____

9. THINK SMARTER Vincent began his weekly chores on Saturday morning at 11:20 A.M. He finished 1 hour and 15 minutes later. Draw a time line to show the end time.

Vincent finished his chores at _____ P.M.

Name _____

Mixed Measures

Essential Question How can you solve problems involving mixed measures?

Measurement and Data—4.MD.2
Also 4.MD.1

MATHEMATICAL PRACTICES
MP.1, MP.2, MP.8

Unlock the Problem

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?

- Is the mixed measure greater than or less than 6 feet?

- How many inches are in 1 foot?

Change a mixed measure.

Think of 5 feet 10 inches as 5 feet + 10 inches.

Write feet as inches.

5 feet
+ 10 inches

Think: 5 feet × 12 = 60 inches →

[ ] inches
+ [ ] inches
[ ] inches

So, the picnic table is _____ inches long.

Example 1 Add mixed measures.

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?

STEP 1 Add the minutes.

3 hr 45 min
+ 2 hr 10 min
[ ] min

STEP 2 Add the hours.

3 hr 45 min
+ 2 hr 10 min
[ ] hr 55 min

So, it took Herman _____ to build the table.

Math Talk **Mathematical Practices**

How is adding mixed measures similar to adding tens and ones? How is it different? **Explain.**

- What if Herman worked an extra 5 minutes on the picnic table? How long would he have worked on the table then? Explain.

_____

_____

Example 2 Subtract mixed measures.

Alicia is building a fence around the picnic area. She has a pole that is 6 feet 6 inches long. She cuts off 1 foot 7 inches from one end. How long is the pole now?

STEP 1 Subtract the inches.

Think: 7 inches is greater than 6 inches. You need to regroup to subtract.

6 ft 6 in. = 5 ft 6 in. + 12 in.

= 5 ft _____ in.

5 18
6 ft 6 in.
− 1 ft 7 in.
_____ in.

ERROR Alert
Be sure to check that you are regrouping correctly. There are 12 inches in 1 foot.

STEP 2 Subtract the feet.

5 18
6 ft 6 in.
− 1 ft 7 in.
_____ ft 11 in.

So, the pole is now _____ long.

Try This! Subtract.

3 pounds 5 ounces − 1 pound 2 ounces

Share and Show

MATH BOARD

1. A truck is carrying 2 tons 500 pounds of steel. How many pounds of steel is the truck carrying?

Think of 2 tons 500 pounds as 2 tons + 500 pounds.
Write tons as pounds.

2 tons
+ 500 pounds

Think: 2 tons × 2,000 = _____ pounds → _____ pounds

_____ pounds
+ _____ pounds
_____ pounds

So, the truck is carrying _____ pounds of steel.

Name _____

Rewrite each measure in the given unit.

2. 1 yard 2 feet

_____ feet

3. 3 pints 1 cup

_____ cups

4. 3 weeks 1 day

_____ days

Add or subtract.

5.
$$\begin{array}{r} 2 \text{ lb } 4 \text{ oz} \\ +\ 1 \text{ lb } 6 \text{ oz} \\ \hline \end{array}$$

6.
$$\begin{array}{r} 3 \text{ gal } 4 \text{ qt} \\ -\ 1 \text{ gal } 5 \text{ qt} \\ \hline \end{array}$$

7.
$$\begin{array}{r} 5 \text{ hr } 20 \text{ min} \\ -\ 3 \text{ hr } 15 \text{ min} \\ \hline \end{array}$$

Math Talk

Mathematical Practices

How do you know when you need to regroup to subtract? **Explain**.

On Your Own

Rewrite each measure in the given unit.

8. 1 hour 15 minutes

_____ minutes

9. 4 quarts 2 pints

_____ pints

10. 10 feet 10 inches

_____ inches

Add or subtract.

11.
$$\begin{array}{r} 2 \text{ tons } 300 \text{ lb} \\ -\ 1 \text{ ton } \ 300 \text{ lb} \\ \hline \end{array}$$

12.
$$\begin{array}{r} 10 \text{ gal } 8 \text{ c} \\ +\ \ 8 \text{ gal } 9 \text{ c} \\ \hline \end{array}$$

13.
$$\begin{array}{r} 7 \text{ lb } \ 6 \text{ oz} \\ -\ 2 \text{ lb } 12 \text{ oz} \\ \hline \end{array}$$

Problem Solving • Applications

Real World

14. MATHEMATICAL PRACTICE 3 **Apply** Ahmed fills 6 pitchers with juice. Each pitcher contains 2 quarts 1 pint. How many pints of juice does he have in all?

_____

15. **Sense or Nonsense?** Sam and Dave each solve the problem at the right. Sam says the sum is 4 feet 18 inches. Dave says the sum is 5 feet 6 inches. Whose answer makes sense? Whose answer is nonsense? Explain.

$$\begin{array}{r} 2 \text{ ft } 10 \text{ in.} \\ +\ 2 \text{ ft } \ 8 \text{ in.} \\ \hline \end{array}$$

_____

_____

16. THINK SMARTER Jackson has a rope 1 foot 8 inches long. He cuts it into 4 equal pieces. How many inches long is each piece?

_____

Unlock the Problem Real World

17. Theo is practicing for a 5-kilometer race. He runs 5 kilometers every day and records his time. His normal time is 25 minutes 15 seconds. Yesterday it took him only 23 minutes 49 seconds. How much faster was his time yesterday than his normal time?

a. What are you asked to find?

_____

_____

b. What information do you know?

_____

_____

c. How will you solve the problem?

_____

d. Solve the problem.

_____

e. Fill in the sentence.

Yesterday, Theo ran 5 kilometers in a time that was _____ faster than his normal time.

18. GO DEEPER Don has 5 pieces of pipe. Each piece is 3 feet 6 inches long. If Don joins the pieces end to end to make one long pipe, how long will the new pipe be?

_____

Personal Math Trainer

19. THINK SMARTER + Ana mixes 2 quarts 1 pint of apple juice and 1 quart 3 cups of cranberry juice. Will her mixture be able to fit in a 1 gallon pitcher? Explain.

_____

_____

_____

_____

_____

FOR MORE PRACTICE: Standards Practice Book

Name _____

Patterns in Measurement Units

Essential Question How can you use patterns to write number pairs for measurement units?

Measurement and Data—4.MD.1

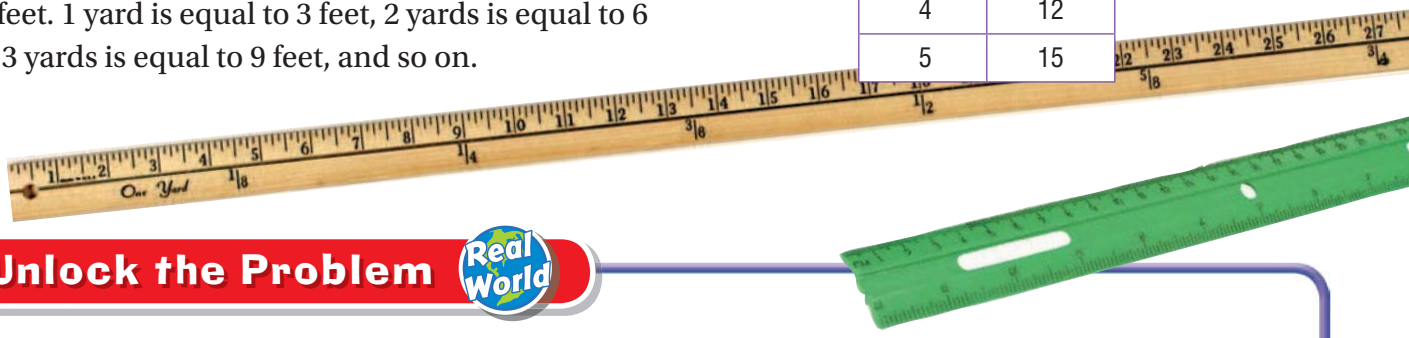
MATHEMATICAL PRACTICES

MP.4, MP.5, MP.7

CONNECT The table at the right relates yards and feet. You can think of the numbers in the table as number pairs. 1 and 3, 2 and 6, 3 and 9, 4 and 12, and 5 and 15 are number pairs.

Yards	Feet
1	3
2	6
3	9
4	12
5	15

The number pairs show the relationship between yards and feet. 1 yard is equal to 3 feet, 2 yards is equal to 6 feet, 3 yards is equal to 9 feet, and so on.



Unlock the Problem

Real World

Lillian made the table below to relate two units of time. What units of time does the pattern in the table show?

Activity **Use the relationship between the number pairs to label the columns of the table.**

_____	_____
1	7
2	14
3	21
4	28
5	35

- List the number pairs.

_____

- Describe the relationship between the numbers in each pair.

_____

_____

- Label the columns of the table.

Think: What unit of time is 7 times as great as another unit?

Math Talk **Mathematical Practices**

Look at each number pair in the table. Could you change the order of the numbers in the number pairs? **Explain** why or why not.

Try This! Jasper made the table below to relate two customary units of liquid volume. What customary units of liquid volume does the pattern in the table show?

- List the number pairs.

_____

- Describe the relationship between the numbers in each pair.

_____

_____

_____

- Label the columns of the table.

_____	_____
1	4
2	8
3	12
4	16
5	20

Think: What customary unit of liquid volume is 4 times as great as another unit?

- What other units could you have used to label the columns of the table above? Explain.

_____

_____

_____

Share and Show

1. The table shows a pattern for two units of time. Label the columns of the table with the units of time.

Think: What unit of time is 24 times as great as another unit?

_____	_____
1	24
2	48
3	72
4	96
5	120

Mathematical Practices

Explain how you labeled the columns of the table.

Name _____

Each table shows a pattern for two customary units. Label the columns of the table.

2.

_____	_____
1	2
2	4
3	6
4	8
5	10

3.

_____	_____
1	16
2	32
3	48
4	64
5	80

On Your Own

Each table shows a pattern for two units of time. Label the columns of the table.

4.

_____	_____
1	60
2	120
3	180
4	240
5	300

5.

_____	_____
1	12
2	24
3	36
4	48
5	60

Each table shows a pattern for two metric units of length. Label the columns of the table.

6.

_____	_____
1	10
2	20
3	30
4	40
5	50

7.

_____	_____
1	100
2	200
3	300
4	400
5	500

8. GO DEEPER List the number pairs for the table in Exercise 6. Describe the relationship between the numbers in each pair.

_____

_____

_____

Problem Solving • Applications

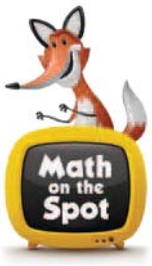
9. What's the Error? Maria wrote *Weeks* as the label for the first column of the table and *Years* as the label for the second column. Describe her error.

?	?
1	52
2	104
3	156
4	208
5	260

10. MATHEMATICAL PRACTICE 3 Verify the Reasoning of Others The table shows a pattern for two metric units. Lou labels the columns *Meters* and *Millimeters*. Zayna labels them *Liters* and *Milliliters*. Whose answer makes sense? Whose answer is nonsense? Explain.

?	?
1	1,000
2	2,000
3	3,000
4	4,000
5	5,000

11. THINK SMARTER Look at the following number pairs: 1 and 365, 2 and 730, 3 and 1,095. The number pairs describe the relationship between which two units of time? Explain.



12. THINK SMARTER The tables show patterns for some units of measurement. Write the correct labels in each table.

Ounces | Days | Feet | Gallons | Hours | Inches | Pounds | Quarts

____	____
1	12
2	24
3	36
4	48

____	____
1	24
2	48
3	72
4	96

____	____
1	4
2	8
3	12
4	16

Name _____

Chapter 12 Review/Test

1. Mrs. Miller wants to estimate the width of the steps in front of her house. Select the best benchmark for her to use.

   (A) her fingertip

   (B) the thickness of a dime

   (C) the width of a license plate

   (D) how far she can walk in 20 minutes

2. Franco played computer chess for 3 hours. Lian played computer chess for 150 minutes. Compare the times spent playing computer chess. Complete the sentence.

   _____ played for _____ longer than _____.

3. Select the measures that are equal. Mark all that apply.

   (A) 6 feet

   (B) 15 yards

   (C) 45 feet

   (D) 600 inches

   (E) 12 feet

   (F) 540 inches

4. Jackie made 6 quarts of lemonade. Jackie says she made 3 pints of lemonade. Explain Jackie's error. Then find the correct number of pints of lemonade.

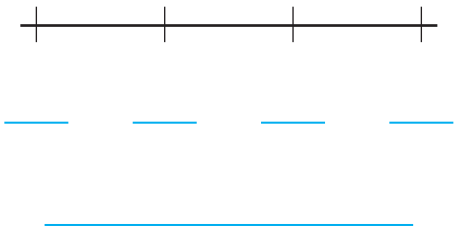
5. Josh practices gymnastics each day after school. The data shows the lengths of time Josh practiced gymnastics for 2 weeks.

Time Practicing Gymnastics (in hours)
$\frac{1}{4}, \frac{1}{4}, \frac{3}{4}, \frac{3}{4}, \frac{1}{2}, 1, 1, 1, \frac{3}{4}, 1$

Part A

Make a tally table and line plot to show the data.

Time Practicing Gymnastics	
Time (in hours)	Tally



Part B

Explain how you used the tally table to label the numbers and plot the *X*s.

Part C

What is the difference between the longest time and shortest time Josh spent practicing gymnastics?

_____ hour

6. Select the correct word to complete the sentence.

Juan brings a water bottle with him to soccer practice.

A full water bottle holds [1 liter / 10 milliliters / 1 meter] of water.

Name _____

7. Write the symbol that compares the weights correctly.

<	=	>

128 ounces _____ 8 pounds

8,000 pounds _____ 3 tons

8. Dwayne bought 5 yards of wrapping paper. How many inches of wrapping paper did he buy?

_____ inches

9. A sack of potatoes weighs 14 pounds 9 ounces. After Wendy makes potato salad for a picnic, the sack weighs 9 pounds 14 ounces. What is the weight of the potatoes Wendy used for the potato salad? Write the numbers to show the correct subtraction.

4	5	11	13	19	25	39

	14 pounds	9 ounces
	− 9 pounds	14 ounces
☐ pounds		☐ ounces

10. Sabita made this table to relate two customary units of liquid volume.

_____	_____
1	2
2	4
3	6
4	8
5	10

Part A

List the number pairs for the table. Then describe the relationship between the numbers in each pair.

Part B

Label the columns of the table. Explain your answer.

11. The table shows the distances some students swam in miles. Complete the line plot to show the data.

Distance Students Swam(in miles)
$\frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{3}{8}, \frac{5}{8}, \frac{3}{8}, \frac{2}{8}, \frac{4}{8}, \frac{3}{8}, \frac{1}{8}, \frac{4}{8}, \frac{4}{8}$

Distance Students Swam (in miles)

What is the difference between the longest distance and the shortest distance the students swam?

☐ mile

12. An elephant living in a wildlife park weighs 4 tons. How many pounds does the elephant weigh?

_____ pounds

13. Katia bought two melons. She says the difference in mass between the melons is 5,000 grams. Which two melons did Katia buy?

(A) watermelon: 8 kilograms

(B) cantaloupe: 5 kilograms

(C) honeydew: 3 kilograms

(D) casaba melon: 2 kilograms

(E) crenshaw melon: 1 kilogram

14. Write the equivalent measurements in each column.

3,000 millimeters	300 centimeters	30 centimeters
$\frac{35}{100}$ meter	0.300 meter	0.35 meter
$\frac{300}{1,000}$ meter	350 millimeters	30 decimeters

3 meters	35 centimeters	300 millimeters

Name _____

15. Cheryl is making a mixed fruit drink for a party. She mixes 7 pints each of apple juice and cranberry juice. How many fluid ounces of mixed fruit drink does Cheryl make?

_____ fluid ounces

16. Hamid's soccer game will start at 11:00 A.M., but the players must arrive at the field three-quarters of an hour early to warm up. The game must end by 1:15 P.M.

Part A

Hamid says he has to be at the field at 9:45 A.M. is Hamid correct? Explain your answer.

Part B

The park closes at 6:30 P.M. There is a 15-minute break between each game played at the park, and each game takes the same amount of time as Hamid's soccer game. How many more games can be played before the park closes? Explain your answer.

17. For numbers 17a–17e, select Yes or No to tell whether the measurements are equivalent.

17a.	7,000 grams and 7 kilograms	○ Yes	○ No
17b.	200 milliliters and 2 liters	○ Yes	○ No
17c.	6 grams and 6,000 kilograms	○ Yes	○ No
17d.	5 liters and 5,000 milliliters	○ Yes	○ No
17e.	2 milliliters and 2,000 liters	○ Yes	○ No

18. Draw lines to match equivalent time intervals.

$\frac{1}{2}$ hour 2 hours 3 hours 8 hours 72 hours

3 days 180 minutes 1,800 seconds 480 minutes 7,200 seconds

19. Anya arrived at the library on Saturday morning at 11:10 A.M. She left the library 1 hour 20 minutes later. Draw a time line to show the end time.

Anya left the library at _____ P.M.

20. The tables show patterns for some units of measurement. Write the correct labels in each table.

Pints Days Feet Cups Week Yards Inches Quarts

1	3
2	6
3	9
4	12

1	7
2	14
3	21
4	28

1	4
2	8
3	12
4	16

21. An Olympic swimming pool is 25 meters wide. How many decimeters wide is an Olympic swimming pool?

_____ decimeters wide

22. Frankie is practicing for a 5-kilometer race. His normal time is 31 minutes 21 seconds. Yesterday it took him only 29 minutes 38 seconds.

How much faster was Frankie yesterday than his normal time?

_____

Chapter 13

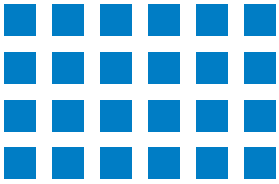
Algebra: Perimeter and Area

Show What You Know

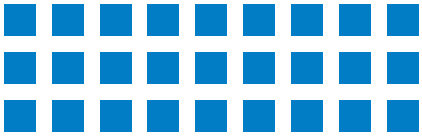
Check your understanding of important skills.

Name _____

Missing Factors Find the missing factor.

1. 

_____ × 6 = 24

2. 

3 × _____ = 27

Add Whole Numbers Find the sum.

3. 17 + 153 + 67 = _____

4. 8 + 78 + 455 = _____

5. 211 + 52 + 129 + 48 = _____

6. 42 + 9 + 336 + 782 = _____

Multiply Whole Numbers Find the product.

7. $\begin{array}{r} 78 \\ \times\ 6 \\ \hline \end{array}$

8. $\begin{array}{r} 29 \\ \times\ 7 \\ \hline \end{array}$

9. $\begin{array}{r} 42 \\ \times\ 5 \\ \hline \end{array}$

10. $\begin{array}{r} 57 \\ \times\ 9 \\ \hline \end{array}$

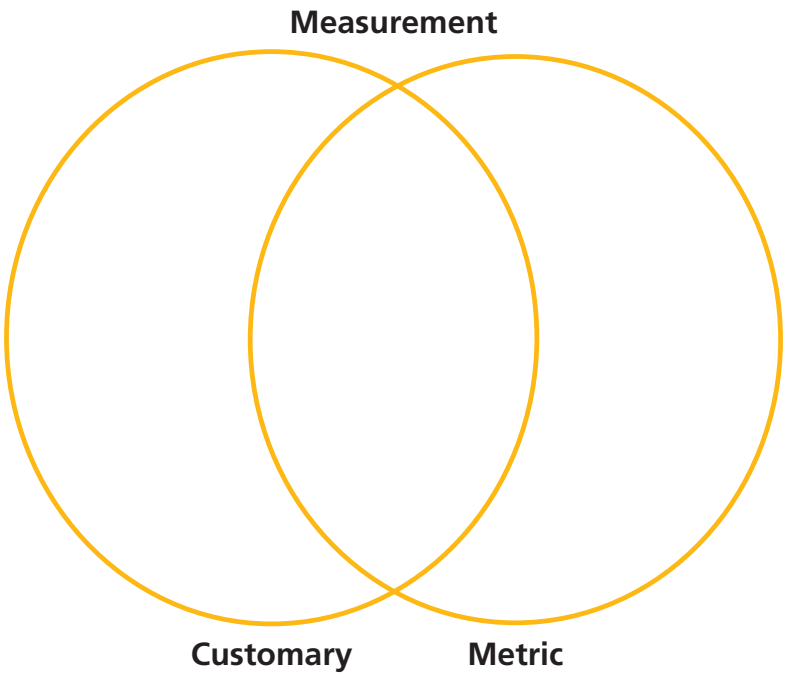
Native Americans once lived near Cartersville, Georgia, in an area that is now a state park. They constructed burial mounds that often contained artifacts, such as beads, feathers, and copper ear ornaments. One of the park's mounds is 63 feet in height. Be a Math Detective. If the top of the mound is rectangular in shape with a perimeter of 322 yards, what could be the side lengths of the rectangle?

Personal Math Trainer
Online Assessment and Intervention

Vocabulary Builder

Visualize It

Sort words with a ✓ using the Venn diagram.



Review Words

- ✓ centimeter
- ✓ foot
- ✓ inch
- ✓ kilometer
- ✓ meter
- ✓ mile
- ✓ yard

Preview Words

- ✓ area
- base
- ✓ formula
- ✓ height
- ✓ perimeter
- square unit

Understand Vocabulary

Write the word or term that answers the riddle.

1. I am the number of square units needed to cover a surface.

   _____

2. I am the distance around a shape.

   _____

3. I am a unit of area that measures 1 unit by 1 unit.

   _____

4. I am a set of symbols that expresses a mathematical rule.

   _____

Name _____

Perimeter

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

Measurement and Data—4.MD.3

MATHEMATICAL PRACTICES
MP.1, MP.7, MP.8

Unlock the Problem

Julio is putting a stone border around his rectangular garden. The length of the garden is 7 feet. The width of the garden is 5 feet. How many feet of stone border does Julio need?

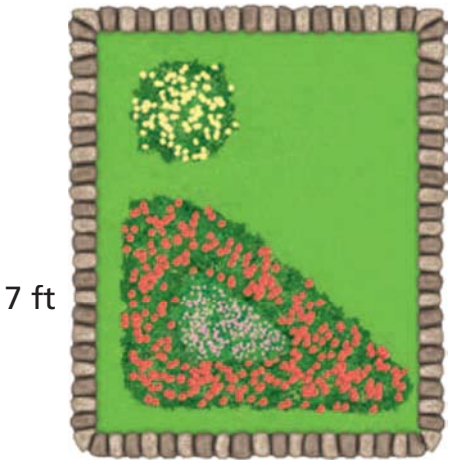
- Circle the numbers you will use.
- What are you asked to find?

_____

_____

Perimeter is the distance around a shape.

To find how many feet of stone border Julio needs, find the perimeter of the garden.



Use addition.

Perimeter of a Rectangle = length + width + length + width

7 + 5 + 7 + 5 = _____

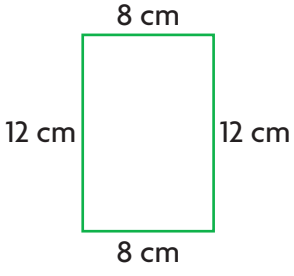
The perimeter is _____ feet.

So, Julio needs _____ feet of stone border.

Use multiplication.

A Find Perimeter of a Rectangle

Perimeter = (2 × length) + (2 × width)



Perimeter = (2 × 12) + (2 × 8)

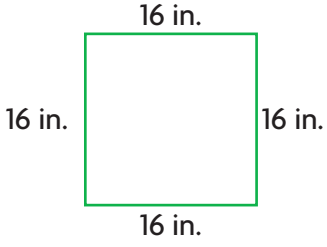
= 24 + 16

= _____

So, the perimeter is _____ centimeters.

B Find Perimeter of a Square

Perimeter = 4 × one side



Perimeter = 4 × 16

= _____

So, the perimeter is _____ inches.

Math Talk **Mathematical Practices**

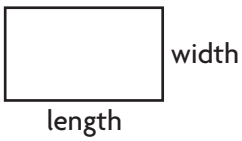
Explain how using addition and using multiplication to find the perimeter of a rectangle are related.

Use a Formula

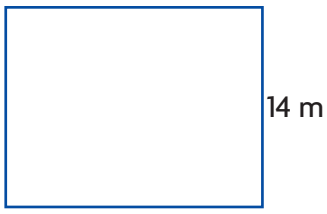
A **formula** is a mathematical rule. You can use a formula to find perimeter.

$P = (2 \times l) + (2 \times w)$

↑ perimeter ↑ length ↑ width



Example Find the perimeter of the rectangle.



$P = (2 \times l) + (2 \times w)$

$= (2 \times$ _____ $) + (2 \times$ _____ $)$ Think: Write the measures you know.

$=$ _____ $+$ _____ Think: Do what is in parentheses first.

$=$ _____

The perimeter of the rectangle is _____.

1. Can you use the Distributive Property to write the formula $P = (2 \times l) + (2 \times w)$ another way? Explain.

_____

_____

_____

_____

Try This! Write a formula for the perimeter of a square.

Use the letter _____ for perimeter.

Use the letter _____ for the length of a side.

Formula: _____

2. Justify the formula you wrote for the perimeter of a square.

_____

_____

_____

_____

Name _____

Formulas for Perimeter

Rectangle:
$P = (2 \times l) + (2 \times w)$ or
$P = 2 \times (l + w)$

Square:
$P = 4 \times s$

Share and Show

MATH BOARD

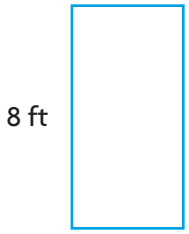
1. Find the perimeter of the rectangle.

$P = (\_\_\_\_ \times \_\_\_\_) + (\_\_\_\_ \times \_\_\_\_)$

$= (\_\_\_\_ \times \_\_\_\_) + (\_\_\_\_ \times \_\_\_\_)$

$= \_\_\_\_ + \_\_\_\_$

$= \_\_\_\_$



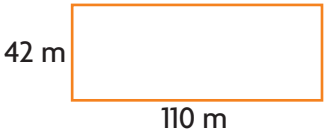
The perimeter is _____ feet.

Find the perimeter of the rectangle or square.

2.

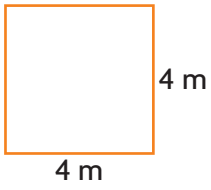
_____ yards

3.



_____ meters

4.



_____ meters

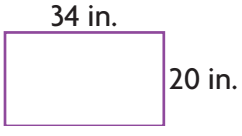
Math Talk **Mathematical Practices**

Can you use the formula $P = (2 \times l)\ (2 \times w)$ to find the perimeter of a square? **Explain.**

On Your Own

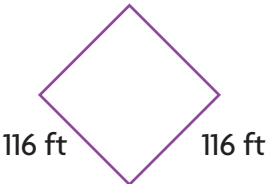
Find the perimeter of the rectangle or square.

5.



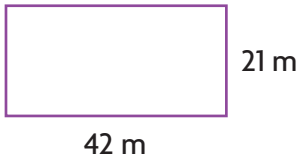
_____ inches

6.



_____ feet

7.



_____ meters

8. Robert wants to put lights around the edge of his yard. The yard is 40 feet long and 25 feet wide. How many feet of lights does he need?

_____

9. MATHEMATICAL PRACTICE 1 **Analyze** What is the side length of a square with a perimeter of 60 meters?

_____

Unlock the Problem

Real World

10. THINK SMARTER Alejandra plans to sew fringe on a scarf. The scarf is shaped like a rectangle. The length of the scarf is 48 inches.The width is one half the length. How much fringe does Alejandra need?

a. Draw a picture of the scarf, and label the given measurements on your drawing.

b. What do you need to find?

_____

c. What formula will you use?

_____

d. Show the steps you use to solve the problem.

e. Complete.

The length of the scarf is _____ inches.

The width is one half the length,

or _____ ÷ 2 = _____ inches.

So, the perimeter is (_____ × _____) +

(_____ × _____) = _____ inches.

f. Alejandra needs _____ of fringe.

11. GO DEEPER Marcia will make a frame for her picture. The length of the picture is 15 inches. The width is one third of the length. How much wood does Marcia need for the frame?

_____

12. THINK SMARTER Maya is building a sandbox that is 144 inches long. The width is one fourth the length. What is the perimeter of the sandbox? Show your work. Explain.

FOR MORE PRACTICE:
Standards Practice Book

Name _____

Area

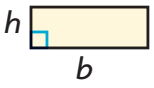
Essential Question How can you use a formula to find the area of a rectangle?

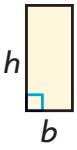
Measurement and Data—4.MD.3

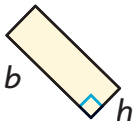
MATHEMATICAL PRACTICES
MP.3, MP.6, MP.7

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.





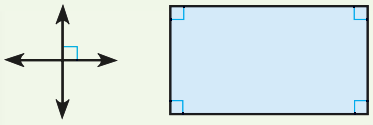


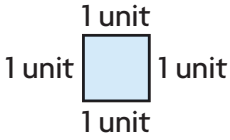
Area is the number of **square units** needed to cover a flat surface without gaps or overlaps. A square unit is a square that is 1 unit long and 1 unit wide. To find the area of a figure, count the number of square units inside the figure.

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

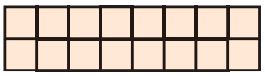
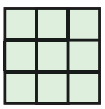
Remember

Perpendicular lines and perpendicular line segments form right angles.





Complete the table to find the area.

Figure	Base	Height	Area
	5 units		
			
			

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: _____

Math Talk **Mathematical Practices**

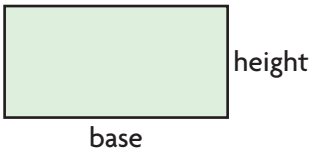
How do you decide which side of a rectangle to use as the base?

Use a Formula

You can use a formula to find the area.

$A = b \times h$

↑ area ↑ base ↑ height



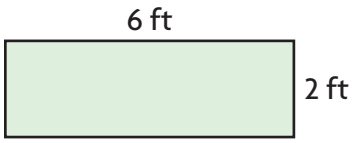
Math Idea

You can think of the base and height of a rectangle as length (l) and width (w), since the length and width are perpendicular. You can write the formula for the area (A) of a rectangle as $A = l \times w$.

Examples

Use a formula to find the area of a rectangle and a square.

A



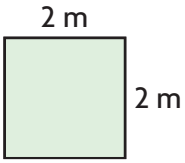
$A = b \times h$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$

The area is _____.

B



$A = b \times h$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$

The area is _____.

Try This!

Write a formula for the area of a square.

Use the letter _____ for area.

Use the letter _____ for the length of a side.

Formula: _____

Share and Show

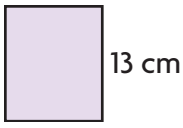
MATH BOARD

1. Find the area of the rectangle.

$A = b \times \_\_\_\_$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$



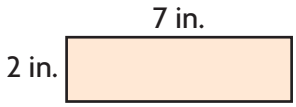
Name _____

Formulas for Area

Rectangle:	Square:
$A = b \times h$	$A = s \times s$

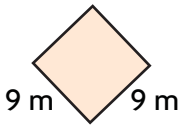
Find the area of the rectangle or square.

2.



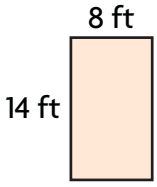
_____

3.



_____

4.



_____

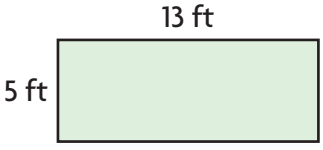
On Your Own

Math Talk **Mathematical Practices**

Explain how to find the area of a square if you only know the length of one side is 23 feet.

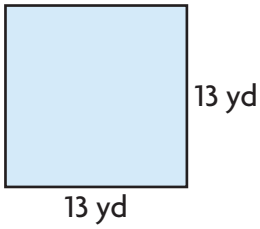
Find the area of the rectangle or square.

5.



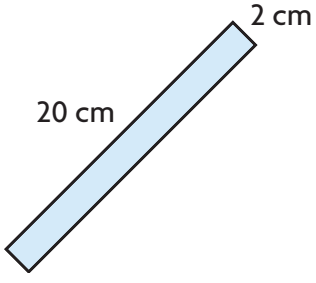
_____

6.



_____

7.



_____

Practice: Copy and Solve **Find the area of the rectangle.**

8. base: 16 feet

height: 6 feet

_____

9. base: 9 yards

height: 17 yards

_____

10. base: 14 centimeters

height: 11 centimeters

_____

11. Frank will paint a wall that measures 10 feet by 14 feet. What is the area of the wall that Frank will paint?

_____

12. MATHEMATICAL PRACTICE 2 **Reason Quantitatively**

Carmen sewed a baby quilt that measures 36 inches on each side. What is the area of the quilt?

_____

Unlock the Problem Real World

13. THINK SMARTER Nancy and Luke are drawing plans for rectangular flower gardens. In Nancy's plan, the garden is 18 feet by 12 feet. In Luke's plan, the garden is 15 feet by 15 feet. Who drew the garden plan with the greater area? What is the area?

a. What do you need to find? _____

_____

b. What formula will you use? _____

c. What units will you use to write the answer? _____

d. Show the steps to solve the problem.

e. Complete the sentences.

The area of Nancy's garden is

_____.

The area of Luke's garden is

_____.

_____ garden has the greater area.

14. GO DEEPER Victor wants to buy fertilizer for his yard. The yard measures 35 feet by 55 feet. The directions on the bag of fertilizer say that one bag will cover 1,250 sq ft. How many bags of fertilizer should Victor buy to be sure that he covers the entire yard?

_____

15. THINK SMARTER Tuan is an artist. He is painting on a large canvas which is 45 inches wide. The height of the canvas is 9 inches less than the width. What is the area of Tuan's canvas?

_____ square inches

FOR MORE PRACTICE: Standards Practice Book

Name _____

Area of Combined Rectangles

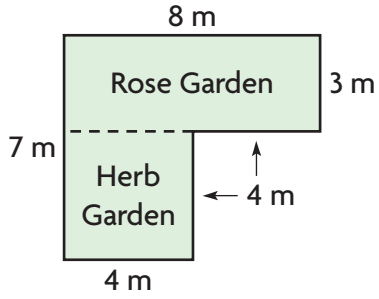
Essential Question How can you find the area of combined rectangles?

Measurement and Data—4.MD.3

MATHEMATICAL PRACTICES
MP.1, MP.4, MP.5

Unlock the Problem (Real World)

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?

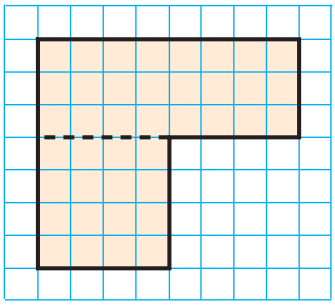


There are different ways to find the area of combined rectangles.

One Way Count square units.

Materials ■ grid paper

- Draw the garden on grid paper. Then find the area of each section by counting squares inside the shape.



1 square = 1 square meter

Rose Garden

Area = _____ square meters

Herb Garden

Area = _____ square meters

- Add the areas.

_____ + _____ = _____ square meters

Another Way Use the area formula for a rectangle.

A Rose Garden

$A = b \times h$

= _____ × _____

= _____ square meters

B Herb Garden

$A = b \times h$

= _____ × _____

= _____ square meters

- Add the areas.

_____ + _____ = _____ square meters

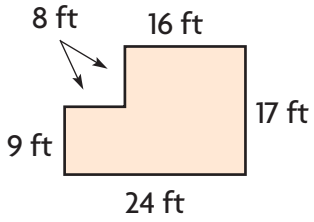
So, the total area is _____ square meters.

Math Talk Mathematical Practices

Is there another way you could divide the figure to find the total area? **Explain.**

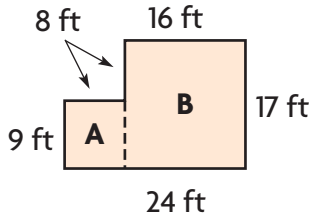
Example

Greg is laying carpet in the space outside his laundry room. The diagram shows where the carpet will be installed. The space is made of combined rectangles. What is the area of the carpeted space?



You can find the area using addition or subtraction.

One Way Use addition.



Rectangle A

$A = b \times h$

$= 8 \times$ _____

$=$ _____

Rectangle B

$A = b \times h$

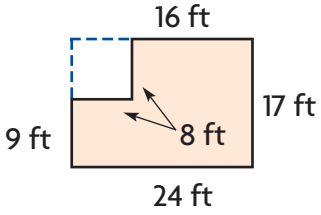
$=$ _____ $\times 17$

$=$ _____

Sum of the areas:

_____ + _____ = _____ square feet

Another Way Use subtraction.



Area of whole space

$A = b \times h$

$= 24 \times$ _____

$=$ _____

Area of missing section

$A = b \times h$

$=$ _____ $\times$ _____

$=$ _____

Difference between the areas:

_____ − _____ = _____ square feet

So, the area of the carpeted space is _____ square feet.

- Is there another way you could divide the figure to find the total area? Explain.

_____

_____

_____

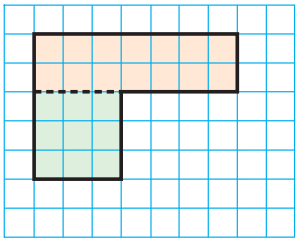
_____

Name _____

Share and Show

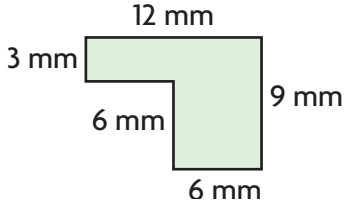
MATH BOARD

1. Explain how to find the total area of the figure.



Find the area of the combined rectangles.

2.



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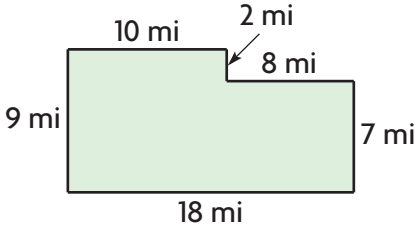

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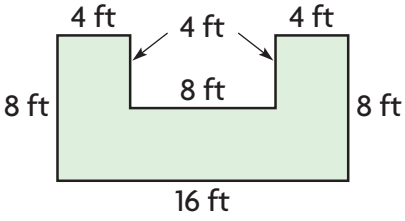


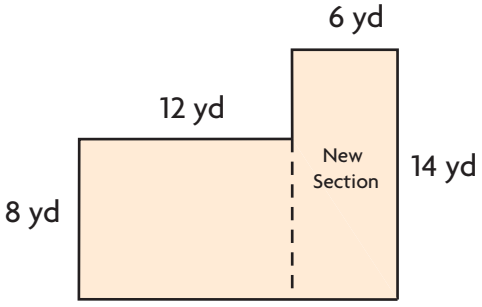
Math Talk — **Mathematical Practices**

Describe the characteristics of combined rectangles.

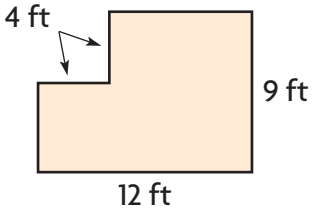
On Your Own

Find the area of the combined rectangles.

5. MATHEMATICAL PRACTICE 6 **Attend to Precision** Jamie's mom wants to enlarge her rectangular garden by adding a new rectangular section. The garden is now 96 square yards. What will the total area of the garden be after she adds the new section?



6. GO DEEPER Explain how to find the perimeter and area of the combined rectangles at the right.



Unlock the Problem Real World

7. THINK SMARTER The diagram shows the layout of Mandy's garden. The garden is the shape of combined rectangles. What is the area of the garden?

a. What do you need to find?

_____

b. How can you divide the figure to help you find the total area?

_____

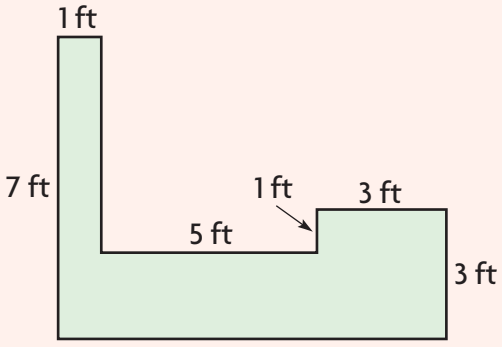
_____

c. What operations will you use to find the answer?

_____

d. Draw a diagram to show how you divided the figure. Then show the steps to solve the problem.

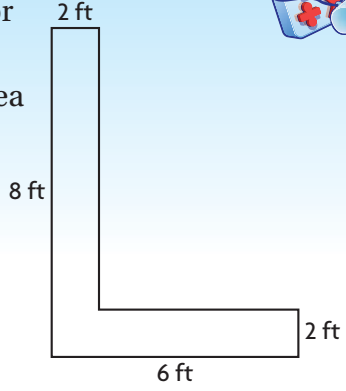
Mandy's Garden



So, the area of the garden is _____.

Personal Math Trainer

8. THINK SMARTER + Workers are painting a large letter L for an outdoor sign. The diagram shows the dimensions of the L. For numbers 8a–8c, select Yes or No to tell whether you can add the products to find the area that the workers will paint.



8a. 2×8 and 2×4 ○ Yes ○ No

8b. 2×6 and 2×8 ○ Yes ○ No

8c. 2×6 and 6×2 ○ Yes ○ No

FOR MORE PRACTICE: Standards Practice Book

Name _____

Mid-Chapter Checkpoint

Vocabulary

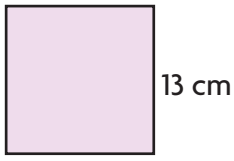
Choose the best term from the box.

Vocabulary
area
base
formula
perimeter
square unit (sq un)

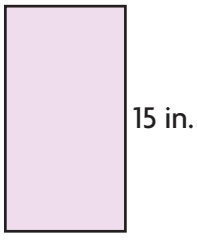
1. A square that is 1 unit wide and 1 unit long is a _____. (p. 529)
2. The _____ of a two-dimensional figure can be any side. (p. 529)
3. A set of symbols that expresses a mathematical rule is called a _____. (p. 526)
4. The _____ is the distance around a shape. (p. 525)

Concepts and Skills

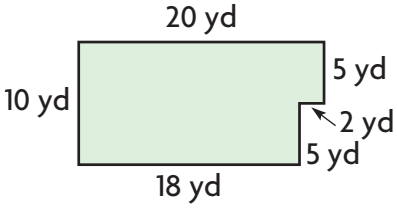
Find the perimeter and area of the rectangle or square. (4.MD.3)

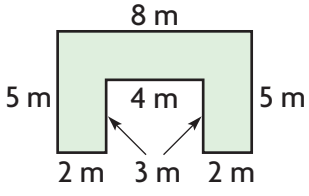
5. 

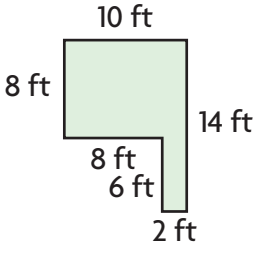
6. 

7. 

Find the area of the combined rectangles. (4.MD.3)

8. 

9. 

10. 

11. Which figure has the greatest perimeter? (4.MD.3)

Figure A

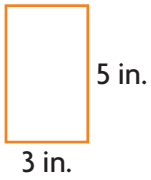


Figure C

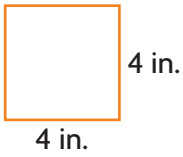


Figure B

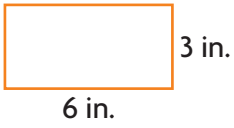
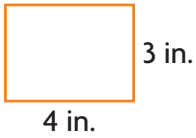


Figure D



12. Which figure has an area of 108 square centimeters? (4.MD.3)

Figure A

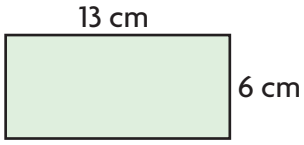


Figure C

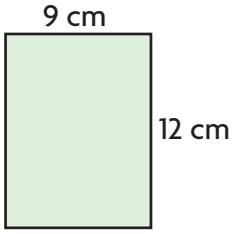


Figure B

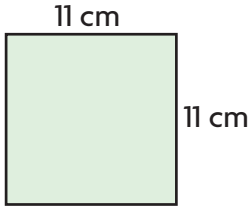
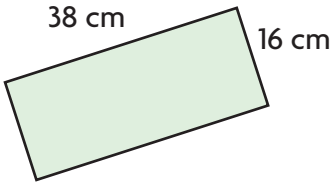


Figure D



13. Which of the combined rectangles has an area of 40 square feet? (4.MD.3)

Figure A

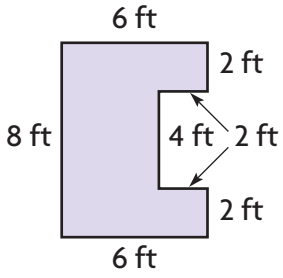


Figure C

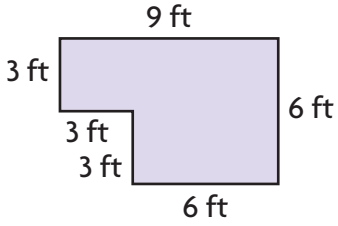


Figure B

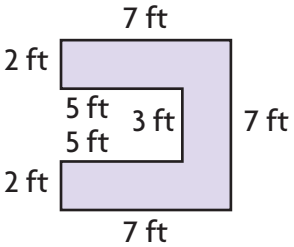
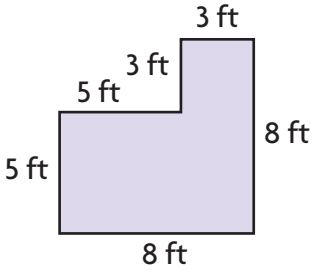


Figure D



Name _____

Find Unknown Measures

Essential Question How can you find an unknown measure of a rectangle given its area or perimeter?

Measurement and Data—4.MD.3

MATHEMATICAL PRACTICES
MP.2, MP.4, MP.7

Unlock the Problem

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?

- What do you need to find?

_____

- What information do you know?

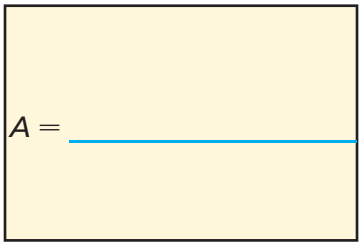
_____

Use a formula for area.

Example 1 Find an unknown measure given the area.

MODEL

Think: Label the measures you know. Use *n* for the unknown.



b = _____

So, the height of the mural is _____ feet.

RECORD

Use the model to write an equation and solve.

_____ = _____ _____ Write the formula for area.

_____ = _____ _____ Use the model to write an equation.

54 = 9 × _____ What times 9 equals 54?

The value of *n* is _____.

Think: *n* is the height of the mural.

Math Talk **Mathematical Practices**

Explain how you can use division to find an unknown factor.

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.

_____

_____

_____

Example 2 Find an unknown measure given the perimeter.

Gary is building an outdoor pen in the shape of a rectangle for his dog. He will use 24 meters of fencing. The pen will be 3 meters wide. How long will the pen be?

Use a formula for perimeter.

MODEL

Think: Label the measures you know. Use *n* for the unknown.

$w =$ _____

$l =$ _____

$P =$ _____

RECORD

Use the model to write an equation and solve.

$P = (2 \times l) + (2 \times w)$

_____ = (_____ _____) + (_____ _____)

_____ = (_____ _____) + _____

Think: $(2 \times n)$ is an unknown addend.

24 = _____ + 6 **Think:** What is 24 − 6?

The value of $(2 \times n)$ is 18.

To find the value of *n*, find the unknown factor.

$2 \times$ _____ = 18

The value of *n* is _____.

Think: *n* is the length of the pen.

So, the pen will be _____ long.

ERROR Alert

Check that you are using the correct formula. Are you given the area or the perimeter?

Try This! **The perimeter of a square is 24 feet. Find the side length.**

Draw a model.

Write an equation.

$P = 4 \times s$

Name _____

Share and Show

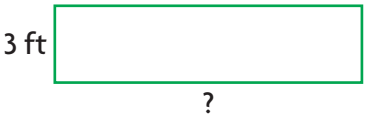
MATH BOARD

1. Find the unknown measure. The area of the rectangle is 36 square feet.

$A = b \times h$

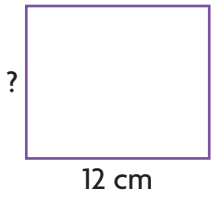
_____ $= b \times$ _____

The base of the rectangle is _____.



Find the unknown measure of the rectangle.

2.



Perimeter = 44 centimeters

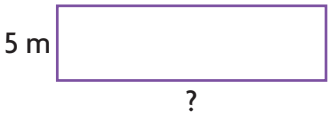
width = _____

3.

Area = 108 square inches

height = _____

4.



Area = 90 square meters

base = _____

Math Talk Mathematical Practices

Explain how using the area formula helps you find the base of a rectangle when you know its area and height.

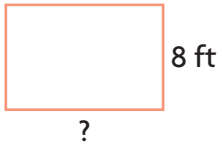
On Your Own

5.

Perimeter = 34 yards

length = _____

6.



Area = 96 square feet

base = _____

7.

Area = 126 square centimeters

height = _____

8. GO DEEPER A square has an area of 49 square inches. Explain how to find the perimeter of the square.

_____

_____

_____

_____

Problem Solving • Applications

9. MATHEMATICAL PRACTICE 7 **Identify Relationships** The area of a swimming pool is 120 square meters. The width of the pool is 8 meters. What is the length of the pool in centimeters?

_____

Personal Math Trainer

10. THINK SMARTER + An outdoor deck is 7 feet wide. The perimeter of the deck is 64 feet. What is the length of the deck? Use the numbers to write an equation and solve. A number may be used more than once.

7	9	5	14	25	50	64

$P = (2 \times l) + (2 \times w)$

$\square = (2 \times l) + (2 \times \square)$

$\square = 2 \times l + \square$

$\square = 2 \times l$

$\square = l$

So, the length of the deck is _____ feet.

Connect to Science

Mountain Lions

Mountain lions are also known as cougars, panthers, or pumas. Their range once was from coast to coast in North America and from Argentina to Alaska. Hunting and habitat destruction now restricts their range to mostly mountainous, unpopulated areas.

Mountain lions are solitary animals. A male's territory often overlaps two females' territories but never overlaps another male's. The average size of a male's territory is 108 square miles, but it may be smaller or larger depending on how plentiful food is.

11. THINK SMARTER A male mountain lion has a rectangular territory with an area of 96 square miles. If his territory is 8 miles wide, what is the length of his territory? _____

FOR MORE PRACTICE: Standards Practice Book

Name _____

Problem Solving • Find the Area

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

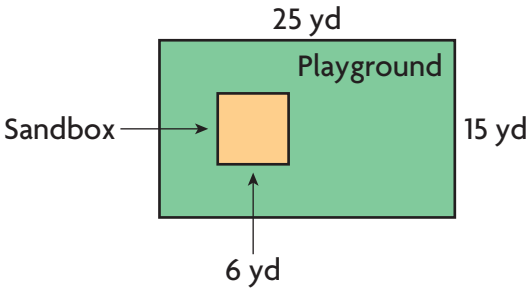
Measurement and Data—4.MD.3

MATHEMATICAL PRACTICES
MP.1, MP.4, MP.6

Unlock the Problem

A landscaper is laying grass for a rectangular playground. The grass will cover the whole playground except for a square sandbox. The diagram shows the playground and sandbox. How many square yards of grass will the landscaper use?

Use the graphic organizer below to solve the problem.



Read the Problem

What do I need to find?

I need to find how many _____ the landscaper will use.

What information do I need to use?

The grass will cover the _____.

The grass will not cover the _____.

The length and width of the playground are _____ and _____.

The side length of the square sandbox is _____.

How will I use the information?

I can solve simpler problems.

Find the area of the _____.

Find the area of the _____.

Then _____ the area of the _____ from the area of the _____.

Solve the Problem

First, find the area of the playground.

$A = b \times h$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$ square yards

Next, find the area of the sandbox.

$A = s \times s$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$ square yards

Last, subtract the area of the sandbox from the area of the playground.

$$\begin{array}{r} 375 \\ -\ 36 \\ \hline \end{array}$$

_____ square yards

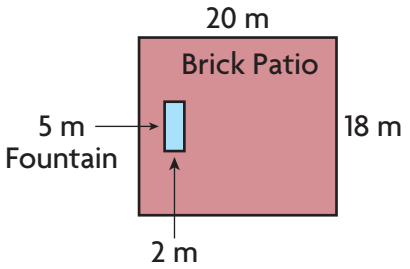
So, the landscaper will use _____ _____ of grass to cover the playground.

Math Talk **Mathematical Practices**

Explain how the strategy helped you to solve the problem.

Try Another Problem

Zach is laying a rectangular brick patio for a new museum. Brick will cover the whole patio except for a rectangular fountain, as shown in the diagram. How many square meters of brick does Zach need?



Read the Problem	Solve the Problem
What do I need to find?	
What information do I need to use?	
How will I use this information?	

- How many square meters of brick does Zach need? Explain.

Name _____

Share and Show

MATH BOARD

1. Lila is wallpapering one wall of her bedroom, as shown in the diagram. She will cover the whole wall except for the doorway. How many square feet of wallpaper does Lila need?

First, find the area of the wall.

$A = b \times h$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$ square feet

Next, find the area of the door.

$A = b \times h$

$= \_\_\_\_ \times \_\_\_\_$

$= \_\_\_\_$ square feet

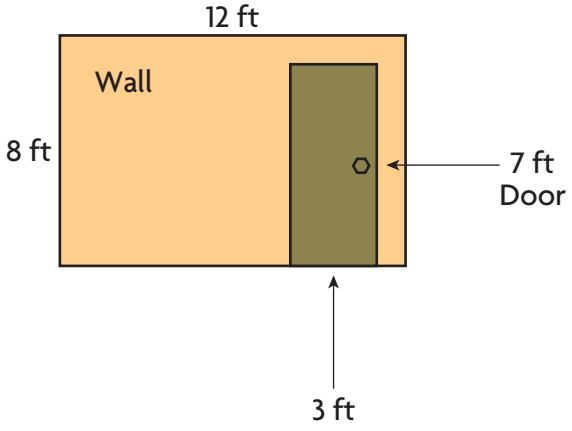
Last, subtract the area of the door from the area of the wall.

$\_\_\_\_ - \_\_\_\_ = \_\_\_\_$ square feet

So, Lila needs _____ of wallpaper.

Unlock the Problem

- Use the Problem Solving MathBoard
- Underline important facts.
- Choose a strategy you know.



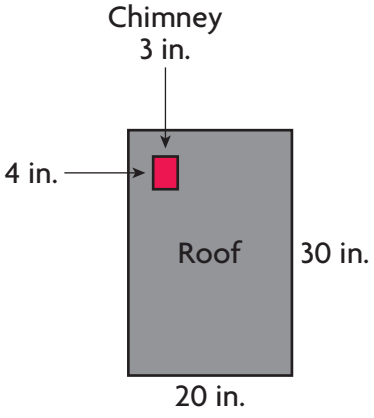
2. What if there was a square window on the wall with a side length of 2 feet? How much wallpaper would Lila need then? Explain.

_____

_____

_____

3. Ed is building a model of a house with a flat roof, as shown in the diagram. There is a chimney through the roof. Ed will cover the roof with square tiles. If the area of each tile is 1 square inch, how many tiles will he need? Explain.



_____

_____

_____

On Your Own

4. MATHEMATICAL PRACTICE 1 **Make Sense of Problems** Lia has a dog and a cat. Together, the pets weigh 28 pounds. The dog weighs 3 times as much as the cat. How much does each pet weigh?

5. THINK SMARTER Mr. Foster is covering two pictures with glass. One is 6 inches by 4 inches and the other one is 5 inches by 5 inches. Does he need the same number of square inches of glass for each picture? Explain.

WRITE Math
Show Your Work

6. GO DEEPER Claire says the area of a square with a side length of 100 centimeters is greater than the area of a square with a side length of 1 meter. Is she correct? Explain.

7. THINK SMARTER A rectangular floor is 12 feet long and 11 feet wide. Janine places a rug that is 9 feet long and 7 feet wide and covers part of the floor in the room. Select the word(s) to complete the sentence.

To find the number of square feet of the floor that is NOT covered by the rug,

add subtract multiply	the	area of the rug length of the rug area of the floor		from by to	the	width of the rug. area of the rug. area of the floor.	

FOR MORE PRACTICE:
Standards Practice Book

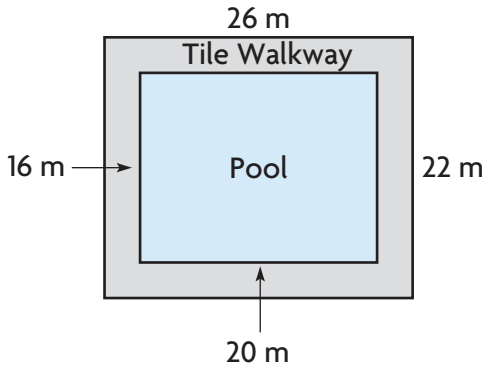
Name _____

Chapter 13 Review/Test

1. For numbers 1a–1e, select Yes or No to indicate if a rectangle with the given dimensions would have a perimeter of 50 inches.

1a.	length: 25 inches	width: 2 inches	○ Yes	○ No
1b.	length: 20 inches	width: 5 inches	○ Yes	○ No
1c.	length: 17 inches	width: 8 inches	○ Yes	○ No
1d.	length: 15 inches	width: 5 inches	○ Yes	○ No
1e.	length: 15 inches	width: 10 inches	○ Yes	○ No

2. The swimming club's indoor pool is in a rectangular building. Marco is laying tile around the rectangular pool.



Part A

What is the area of the pool and the area of the pool and the walkway? Show your work.

Part B

How many square meters of tile will Marco need for the walkway? Explain how you found your answer.

GO DIGITAL Assessment Options
Chapter Test

3. Match the dimensions of the rectangles in the top row with the correct area or perimeter in the bottom row.

length: 5 cm width: 9 cm	length: 6 cm width: 6 cm	length: 6 cm width: 5 cm	length: 9 cm width: 6 cm
area = 36 sq cm	perimeter = 22 cm	perimeter = 30 cm	area = 45 sq cm

4. Kyleigh put a large rectangular sticker on her notebook. The height of the sticker measures 18 centimeters. The base is half as long as the height. What area of the notebook does the sticker cover?

_____ square centimeters

5. A rectangular flower garden in Samantha's backyard has 100 feet around its edge. The width of the garden is 20 feet. What is the length of the garden? Use the numbers to write an equation and solve. A number may be used more than once.

10	20	50	30	40	60	100

$P = (2 \times l) + (2 \times w)$

$\square = (2 \times l) + (2 \times \square)$

$\square = 2 \times l + \square$

$\square = 2 \times l$

$\square = l$

So, the length of the garden $\square$ feet.

6. Gary drew a rectangle with a perimeter of 20 inches. Then he tried to draw a square with a perimeter of 20 inches.

Draw 3 different rectangles that Gary could have drawn. Then draw the square, if possible.

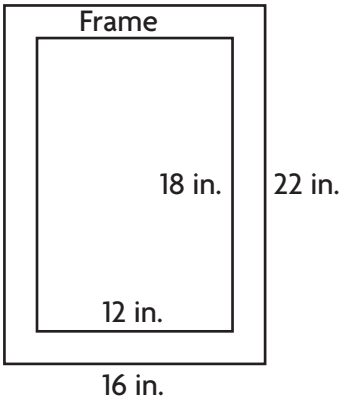
Name _____

7. Ami and Bert are drawing plans for rectangular vegetable gardens. In Ami's plan, the garden is 13 feet by 10 feet. In Bert's plan the garden is 12 feet by 12 feet. For numbers 7a–7d, select True or False for each statement.

7a.	The area of Ami's garden is 130 square feet.	○ True	○ False
7b.	The area of Bert's garden is 48 square feet.	○ True	○ False
7c.	Ami's garden has a greater area than Bert's garden.	○ True	○ False
7d.	The area of Bert's garden is 14 square feet greater than Ami's.	○ True	○ False

8. A farmer planted corn in a square field. One side of the field measures 32 yards. What is the area of the cornfield? Show your work.

9. Harvey bought a frame in which he put his family's picture.

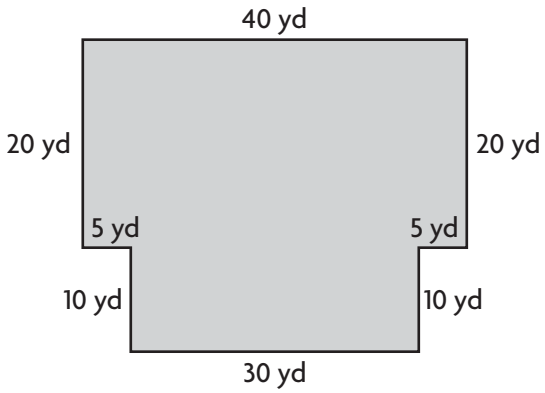


What is the area of the frame not covered by the picture?

_____ square inches

10. Kelly has 236 feet of fence to use to enclose a rectangular space for her dog. She wants the width to be 23 feet. Draw a rectangle that could be the space for Kelly's dog. Label the length and the width.

11. The diagram shows the dimensions of a new parking lot at Helen's Health Food store.



Use either addition or subtraction to find the area of the parking lot. Show your work.

12. Chad's bedroom floor is 12 feet long and 10 feet wide. He has an area rug on his floor that is 7 feet long and 5 feet wide. Which statement tells how to find the amount of the floor that is not covered by the rug? Mark all that apply.

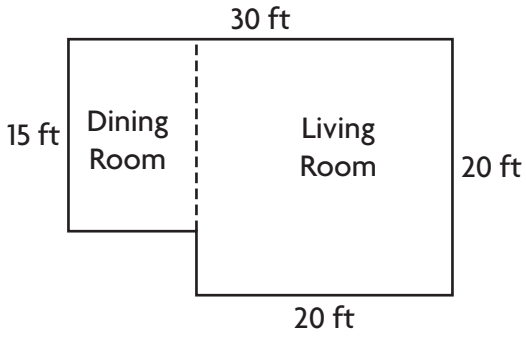
- (A) Add 12×10 and 7×5.
- (B) Subtract 35 from 12×10
- (C) Subtract 10×5 from 12×7.
- (D) Add $12 + 10 + 7 + 5$.
- (E) Subtract 7×5 from 12×10.
- (F) Subtract 12×10 from 7×5.

13. A row of plaques covers 120 square feet of space along a wall. If the plaques are 3 feet tall, what length of the wall do they cover?

_____ feet

Name _____

14. Ms. Bennett wants to buy carpeting for her living room and dining room.

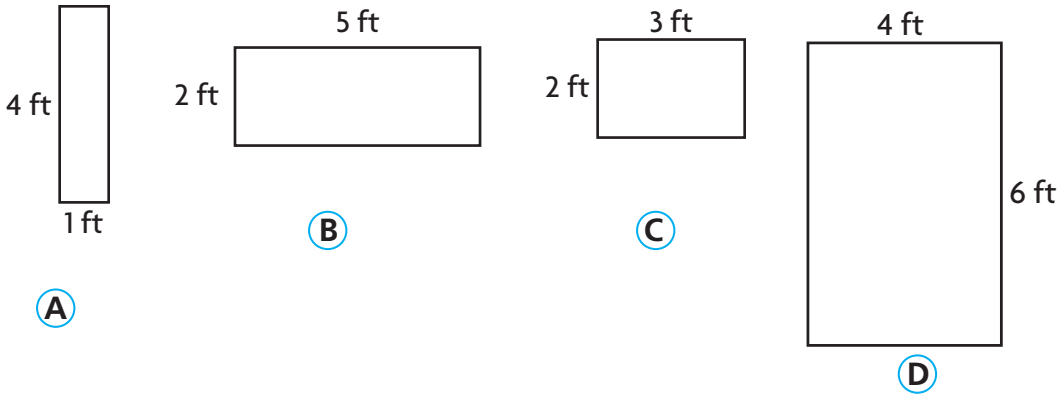


Explain how she can find the amount of carpet she needs to cover the floor in both rooms. Then find the amount of carpet she will need.

15. Lorenzo built a rectangular brick patio. He is putting a stone border around the edge of the patio. The width of the patio is 12 feet. The length of the patio is two feet longer than the width.

How many feet of stone will Lorenzo need? Explain how you found your answer.

16. Which rectangle has a perimeter of 10 feet? Mark all that apply.

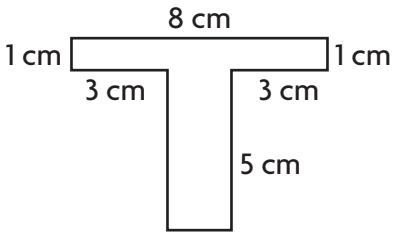


17. A folder is 11 inches long and 8 inches wide. Alyssa places a sticker that is 2 inches long and 1 inch wide on the notebook. Choose the words that correctly complete the sentence.

To find the number of square inches of the folder that is NOT covered by the sticker,

add subtract multiply	the	width of the sticker area of the sticker area of the notebook		from by to		the	width of the sticker. area of the sticker. area of the notebook.

18. Tricia is cutting her initial from a piece of felt.



For numbers 18a–18c, select Yes or No to tell whether you can add the products to find the number of square centimeters Tricia needs.

18a.	1×8 and 5×2	○ Yes	○ No
18b.	3×5 and 1×8	○ Yes	○ No
18c.	2×5 and 1×3 and 1×3	○ Yes	○ No

19. Mr. Butler posts his students' artwork on a bulletin board.

The width and length of the bulletin board are whole numbers. What could be the dimensions of the bulletin board Mr. Butler uses?

Area = 15 square feet