

# Points, Lines, Rays, and Angles



Dear Family,

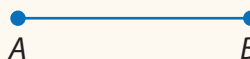
This week your child is learning about points, lines, rays, and angles.

Here are some vocabulary words that tell about the geometry concepts that your child is learning.

A **point** is a single location in space.  
Point  $A$  is shown at the right.



A **line segment** is a straight row of points that starts at one point and ends at another point. Line segment  $AB$  is written as  $\overline{AB}$ .



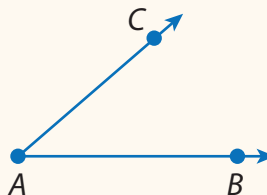
A **line** is a straight row of points that goes on forever in both directions.  
Line  $AB$  is written as  $\overleftrightarrow{AB}$ .



A **ray** is a straight row of points that starts at one point and goes on forever in one direction. Ray  $AB$  is written as  $\overrightarrow{AB}$ .



An **angle** is formed by two rays, lines, or line segments that meet at a common point called the **vertex**. The angle shown at the right can be named  $\angle A$ ,  $\angle CAB$ , or  $\angle BAC$ .



**Parallel lines** are always the same distance apart and never cross.



**Perpendicular lines** cross to form a right angle.



Invite your child to share what he or she knows about points, lines, rays, and angles by doing the following activity together.

## ACTIVITY POINTS, LINES, RAYS, AND ANGLES

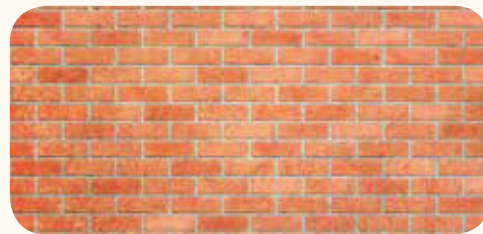
Do this activity with your child to identify lines, rays, and angles.

Together with your child, find examples of real-life objects that have parts that look like lines, rays, and angles.

- Give clues to describe the objects to each other without naming the objects. Use some of the geometry vocabulary words that your child is learning about.
- Try to guess each object from the other person's description of it.
- Here are some real-life examples you might use:



Guitar strings  
(parallel line segments)



Brick wall (perpendicular and  
parallel line segments)

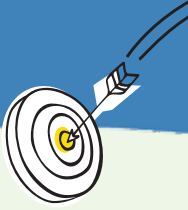


Ceiling fan (angles and  
line segments)



Fence (angles, parallel and  
perpendicular line segments)

# Explore Points, Lines, Rays, and Angles



## Learning Targets

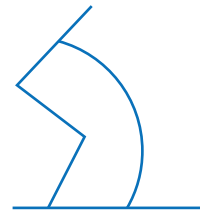
- Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
- Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.

**SMP** 1, 2, 3, 4, 5, 6

Previously, you have learned about shapes such as squares, rectangles, and triangles. Now you will learn more about what makes up these shapes. Use what you know to try to solve the problem below.

**Traci tries to teach her younger sister how to draw a rectangle. Traci tells her, “Draw a shape with four straight sides.” Traci’s sister draws the shape shown.**

**The drawing of the shape includes 4 straight sides, but it is not a rectangle. How can Traci make her directions more clear?**



## TRY IT



## Math Toolkit

- geoboards
- chenille stems
- rulers
- grid paper



## DISCUSS IT

**Ask your partner:** Do you agree with me? Why or why not?

**Tell your partner:** I agree with you about . . . because . . .

# CONNECT IT

## 1 LOOK BACK

Explain how Traci can make her directions more clear.

## 2 LOOK AHEAD

Certain words in geometry are used to describe shapes in detail. Read each description and use it to label the point or points in the figure at the right.

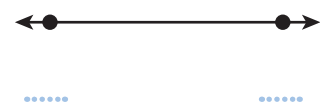
a. A **point** is a single location in space. A dot can show a point. You can name a point with a capital letter, such as point A.



b. A **line segment** is a straight row of points that starts at one point and ends at another point. You can write "line segment AB" as  $\overline{AB}$ .



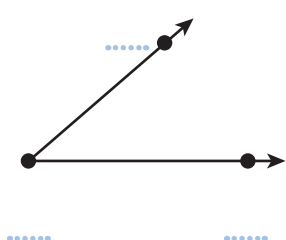
c. A **line** is a straight row of points that goes on forever in both directions. You can write "line AB" as  $\overleftrightarrow{AB}$ .



d. A **ray** is a straight row of points that starts at one point and goes on forever in one direction. You can write "ray AB" as  $\overrightarrow{AB}$ . When you name a ray, you always start with the endpoint.



e. Rays, lines, or line segments that meet at a common point, or **vertex**, form an **angle**. You can write "angle A" as  $\angle A$  or  $\angle CAB$  or  $\angle BAC$ . The vertex is always the middle letter.



## 3 REFLECT

Does a rectangle contain lines or line segments? Explain.



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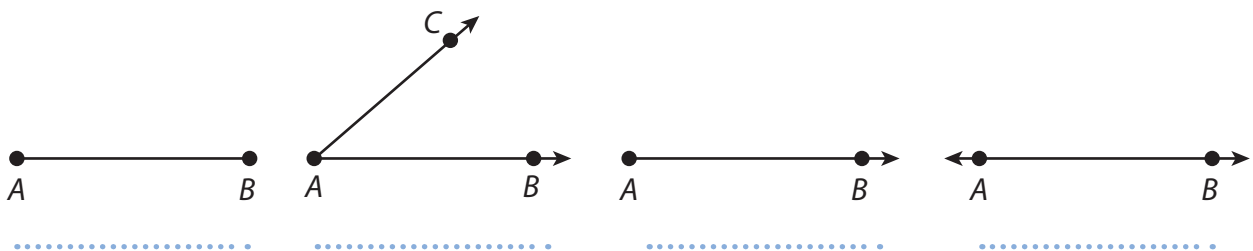
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# Prepare for Points, Lines, Rays, and Angles

- 1 Think about what you know about geometric figures. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

Word	In My Own Words	Example
point		
line segment		
line		
ray		
angle		

- 2 Label each figure as a *point*, *line segment*, *line*, *ray*, or *angle*.



3 Solve the problem. Show your work.

**Marshall tries to teach his younger sister how to draw a square. Marshall tells her, "Draw a shape with four straight sides." Marshall's sister draws the shape shown.**

**The drawing of the shape includes 4 straight sides, but it is not a square. How can Marshall make his directions more clear?**



**Solution** .....

.....

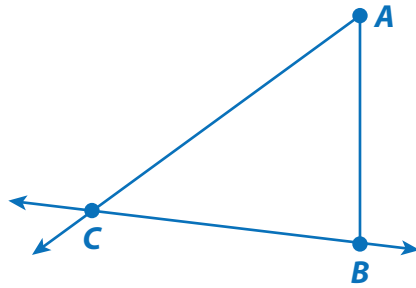
.....

4 Check your answer. Show your work.

# Develop Points, Lines, Line Segments, and Rays

Read and try to solve the problem below.

Kent draws a shape using three different geometric figures. Describe the three geometric figures that Kent uses in his shape.



## TRY IT



### Math Toolkit

- chenille stems
- rulers
- tracing paper



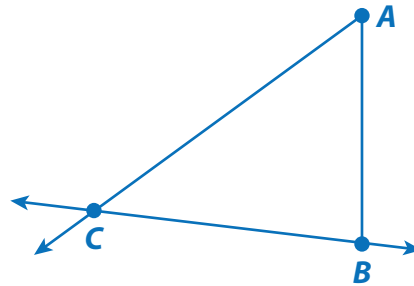
## DISCUSS IT

**Ask your partner:** How did you get started?

**Tell your partner:** I started by ...

Explore different ways to understand points, lines, line segments, and rays.

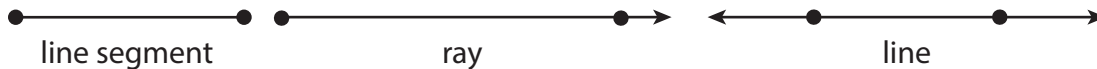
**Kent draws a shape using three different geometric figures. Describe the three geometric figures that Kent uses in his shape.**



### PICTURE IT

You can make some drawings to help describe the figures used in the shape.

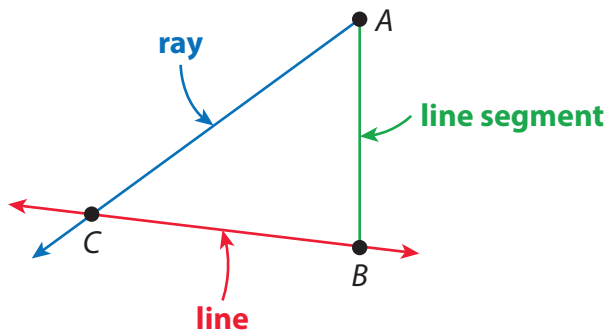
Each figure is straight. Draw the different kinds of straight rows of points that you know.



### MODEL IT

You can also use words to help describe the figures used in the shape.

Label the line segment, ray, and line that are drawn as the figures in Kent's shape. Look for endpoints and arrowheads.



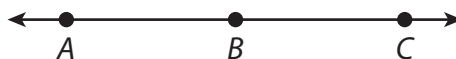


## CONNECT IT

Now you will use the problem from the previous page to help you understand how to identify line segments, angles, and rays and to help you solve a similar problem.

- 1 Name a real-world example of a line segment.
- 2 When two line segments, lines, or rays meet at a point, they form an angle. Name a real-world example of an angle.
- 3 Is a beam of light from a flashlight more like a line or a ray? Explain.

- 4 The drawing below represents one line, three line segments, four rays, and one angle. Name each of these figures.



## 5 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for understanding and describing points, lines, line segments, angles, and rays? Explain.

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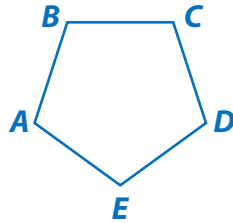
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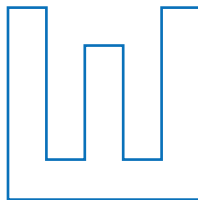
## APPLY IT

Use what you just learned to solve these problems.

- 6 How many lines are in this shape? How many rays? Explain how you know.



- 7 How many line segments are in this shape? Explain how you know.



- 8 Draw and label a point, line, line segment, and ray.

# Practice Points, Lines, Line Segments, and Rays

Study the Example showing a drawing with points, lines, line segments, and rays. Then solve problems 1–9.

## EXAMPLE

Amy makes a drawing of a letter “A” in her math notebook. Use geometry words to describe the drawing.

There are 4 points on the drawing: point A, point B, point C, and point D.

There is a line segment from point B to point D.

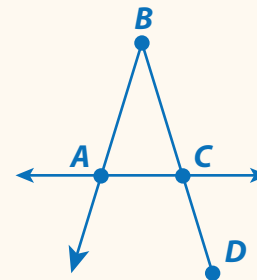
$\overline{BD}$

There is a line through points A and C.

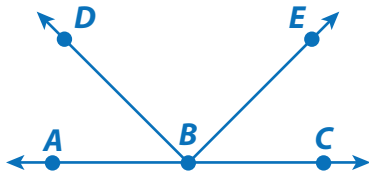
$\longleftrightarrow AC$

There is a ray from point B through point A.

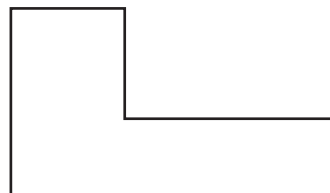
$\overrightarrow{BA}$



Use the drawing below to solve problems 1–4.



- 1 How many lines are in the drawing? .....
- 2 How many rays are in the drawing? .....
- 3 Write the name of the line in the drawing.
- 4 Write the names of the rays in the drawing.
- 5 Look at the shape at the right. How many line segments are in the shape? .....



## Vocabulary

**point** a single location in space.



**line segment** a straight row of points that starts at one point and ends at another point.



**line** a straight row of points that goes on forever in both directions.



**ray** a straight row of points that starts at one point and goes on forever in one direction.

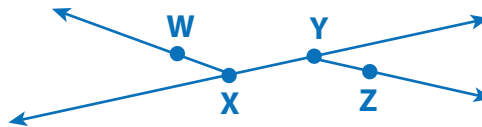


6 Label each sign below. Write *line(s)*, *line segment(s)*, or *ray(s)*.

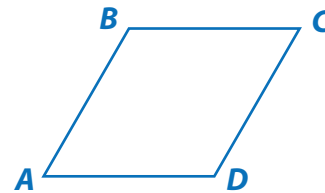


7 Look at the drawing below. Tell whether each line, line segment, ray, or angle is shown in the drawing.

	Yes	No
$\overleftrightarrow{XY}$	(A)	(B)
$\overleftrightarrow{XZ}$	(C)	(D)
$\overrightarrow{WX}$	(E)	(F)
$\overrightarrow{YX}$	(G)	(H)
$\overline{ZY}$	(I)	(J)
$\angle XYZ$	(K)	(L)



8 Use geometry words and symbols to describe the rhombus shown.



9 Read the description of a shape below. Then draw the shape.

- It has 3 line segments,  $\overline{RS}$ ,  $\overline{ST}$ ,  $\overline{TR}$ .
- Line segments  $\overline{RS}$  and  $\overline{TR}$  are the same length.
- It has 3 angles,  $\angle R$ ,  $\angle S$ , and  $\angle T$ .

# Develop Identifying Angles

Read and try to solve the problem below.

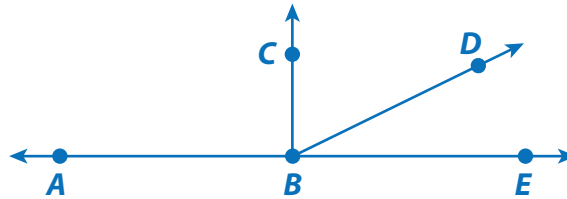
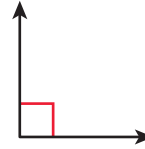
The angle shown at the right is a right angle.  
A right angle is a square corner.

Look at the figure below. Name the rays that make up each of the angles listed.

1. A right angle.

2. An angle that has a smaller opening than a right angle.

3. An angle that has a wider opening than a right angle, but does not open as wide as a straight line.



## TRY IT



### Math Toolkit

- chenille stems
- rulers
- tracing paper



## DISCUSS IT

**Ask your partner:** Can you explain that again?

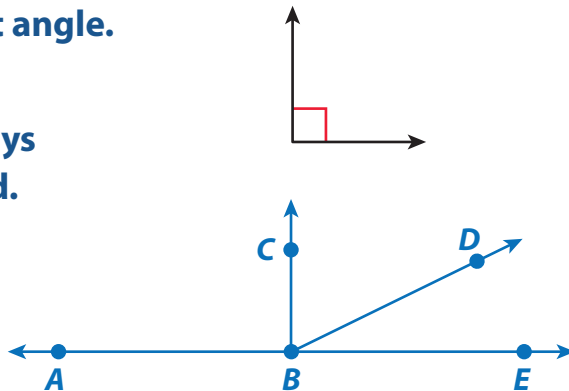
**Tell your partner:** I knew . . . so I . . .

Explore different ways to understand how to identify angles.

The angle shown at the right is a right angle.  
A right angle is a square corner.

Look at the figure below. Name the rays that make up each of the angles listed.

1. A right angle.
2. An angle that has a smaller opening than a right angle.
3. An angle that has a wider opening than a right angle, but does not open as wide as a straight line.

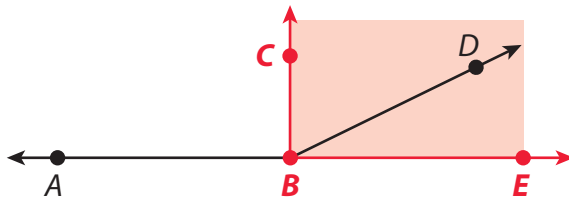


## PICTURE IT

You can make a drawing to help identify different types of angles.

Use shading to find the rays that make each angle.

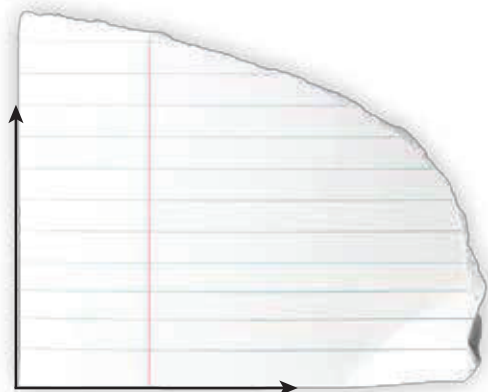
A right angle is shaded. Look at the rays along the edges of the shaded area.



## MODEL IT

You can also use a model to help identify different types of angles.

Compare the opening of an angle to a right angle by holding the corner of a sheet of paper next to the angle. The angle below opens as wide as a right angle.



## CONNECT IT

Now you will use the problem from the previous page to help you understand how to identify angles in figures.

- 1 **Model It** shows a right angle. Draw a right angle. Then use 3 points to name a right angle in the figure on the previous page. ....
  
- 2 An angle that has a smaller opening than a right angle is called an **acute angle**.  
Name an acute angle in the figure on the previous page. ....  
Draw an acute angle.
  
- 3 An angle that has a wider opening than a right angle, but does not open as wide as a straight line, is called an **obtuse angle**. Name an obtuse angle in the figure on the previous page. .... Draw an obtuse angle.
  
- 4 Explain how you can decide whether any angle is acute, right, or obtuse.

## 5 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for identifying angles? Explain.

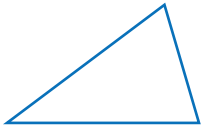
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## APPLY IT

Use what you just learned to solve these problems.

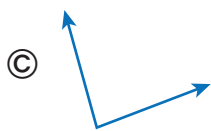
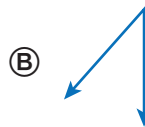
- 6 How many acute angles are in the shape below? Explain how you know.



- 7 Look at the shape below. How many obtuse angles are in the shape? Explain how you know.



- 8 Which angle is obtuse?





# Practice Identifying Angles

Study the Example showing how to identify angles in a shape.  
Then solve problems 1–10.

## EXAMPLE

Name and describe the angles in the shape shown.

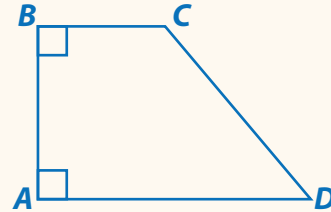
$\angle A$  is a right angle. It has a shape like a square corner.

$\angle B$  is also a right angle.

$\angle C$  is an obtuse angle. It has a wider opening than a right angle.

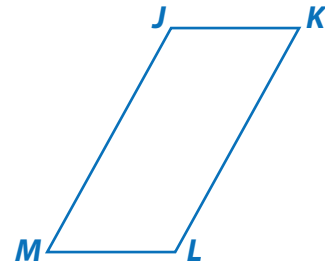
$\angle D$  is an acute angle. It has a smaller opening than a right angle.

The shape has 2 right angles, 1 acute angle, and 1 obtuse angle.

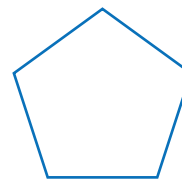


Use the shape at the right to solve problems 1–5.

- 1 How many right angles are in this shape? .....
- 2 How many acute angles are in this shape? .....
- 3 How many obtuse angles are in this shape? .....
- 4 Name the acute angles in the shape.
- 5 Name the obtuse angles in the shape.
- 6 Look at the shape of the sign at the right. Describe the number and kind of angles the shape has.



Jasmine draws the pentagon shown at the right. She says that all pentagons have 5 sides of equal length and 5 obtuse angles.



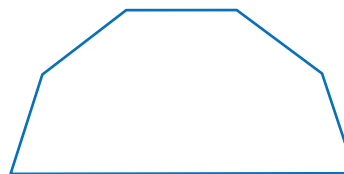
7 Draw a pentagon that is different from the one Jasmine drew. Describe the sides and angles of your pentagon.

8 In what way is Jasmine's thinking correct?

9 In what way is Jasmine's thinking incorrect?

10 Which statements correctly describe the shape below?

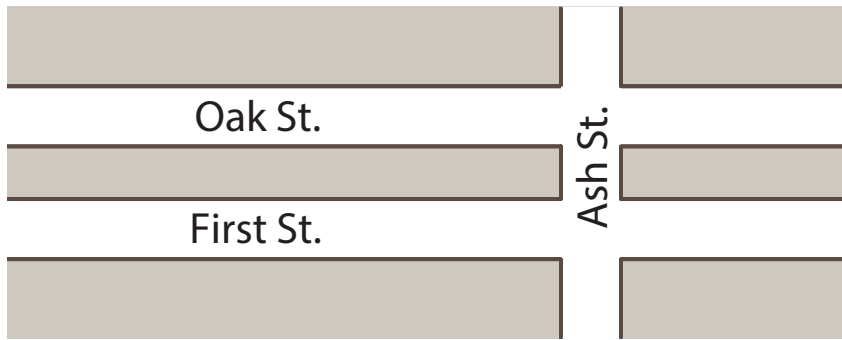
- Ⓐ The shape has acute angles.
- Ⓑ The shape has right angles.
- Ⓒ The shape has obtuse angles.
- Ⓓ The shape has 6 angles.
- Ⓔ The shape has more acute angles than obtuse angles.



# Develop Parallel and Perpendicular Lines

Read and try to solve the problem below.

Jordan looks at the street map below.



Describe the relationship between Oak Street and First Street.  
Then describe the relationship between Oak Street and Ash Street.

## TRY IT



### Math Toolkit

- geoboard
- straws
- tracing paper
- grid paper



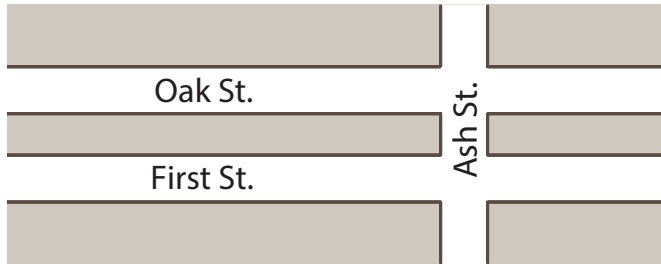
## DISCUSS IT

**Ask your partner:** Why did you choose that strategy?

**Tell your partner:** At first, I thought...

Explore different ways to understand parallel and perpendicular lines and line segments.

Jordan looks at the street map below.

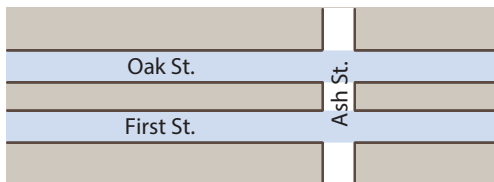


Describe the relationship between Oak Street and First Street.  
Then describe the relationship between Oak Street and Ash Street.

## PICTURE IT

You can use a sketch to help understand the problem.

Sketch a picture of Oak Street and First Street. Shade the streets.

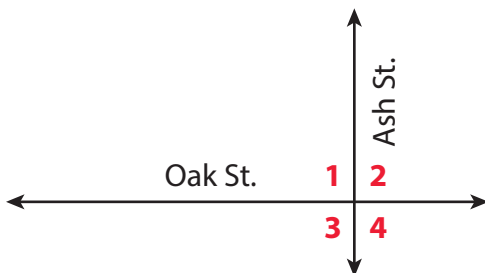


Notice that the streets do not cross.

## MODEL IT

You can also use a model to help understand the problem.

Look at Oak Street and Ash Street. Think of each street as a line. When the two lines cross, they form four angles.



## CONNECT IT

Now you will use the problem from the previous page to help you understand how to identify parallel and perpendicular lines.

- 1 Lines that are always the same distance apart and never cross are called **parallel lines**. Name a real-world example of parallel lines.
- 2 Suppose each street keeps going in a straight line. If Jordan travels on Oak Street and makes no turns, can he ever get to First Street? Explain.
- 3 Describe the angles that Oak Street and Ash Street make when they cross.
- 4 Lines that cross and form a right angle are called **perpendicular lines**. Name a real-world example of perpendicular lines.
- 5 Explain why 3 separate lines can all be parallel to each other, but cannot all be perpendicular to each other. Use a drawing to show your answer.

## 6 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for identifying parallel and perpendicular lines? Explain.

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.....

## APPLY IT

Use what you just learned to solve these problems.

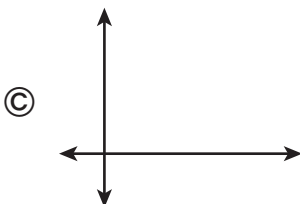
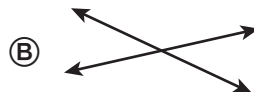
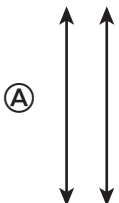
- 7 How many pairs of parallel sides does the shape below have?  
Explain how you know.



- 8 How many pairs of parallel sides does the shape below have?  
Explain how you know.



- 9 Which pair of lines are perpendicular?



## Practice Parallel and Perpendicular Lines

Study the Example showing how to identify parallel and perpendicular lines and line segments. Then solve problems 1–6.

### EXAMPLE

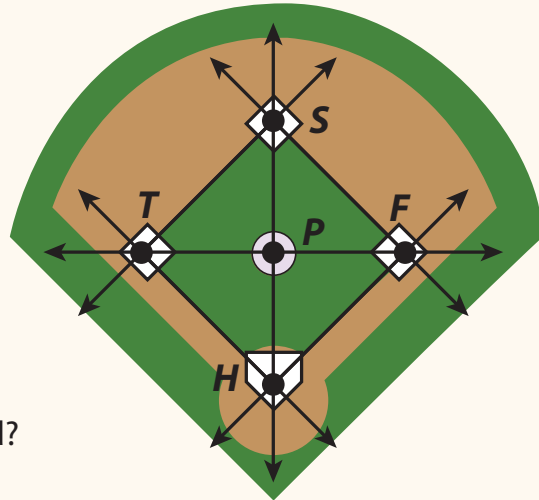
Colby draws parallel and perpendicular lines to place the bases and pitcher's mound on a drawing of a baseball field.

$\overleftrightarrow{SF}$  and  $\overleftrightarrow{TH}$  are parallel lines.

$\overleftrightarrow{ST}$  and  $\overleftrightarrow{FH}$  are parallel lines.

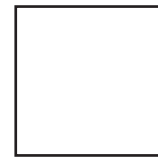
The pitcher's mound is one place where perpendicular lines cross. At what point do perpendicular lines cross at the pitcher's mound?

They cross at point  $P$ , where  $\overleftrightarrow{TF}$  crosses  $\overleftrightarrow{SH}$ .



For problems 1 and 2, use the shape at the right.

- 1 How many pairs of parallel sides does the square have? .....
- 2 Put Xs on the square where each pair of perpendicular line segments meet.
- 3 Look at the drawing of a window at the right. Circle 3 parallel line segments in the drawing.



- 4 Look at the line segments in the letters on the tiles at the right. Fill in the table with each letter to identify parallel line segments. The first one is done for you.

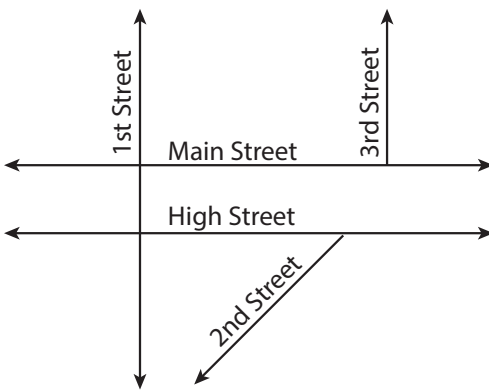


No parallel line segments	Only 1 pair of parallel line segments	More than 1 pair of parallel line segments
L		

- 5 Look at the line segments in the letters on the tiles again. Fill in the table to identify perpendicular line segments.

Only 1 pair of perpendicular line segments	Only 2 pairs of perpendicular line segments	3 pairs of perpendicular line segments

- 6 Tell whether each statement that describes the streets shown on the map below is *True* or *False*.



	True	False
1st and 3rd Street are perpendicular.	(A)	(B)
Main and High Street are parallel.	(C)	(D)
2nd Street is perpendicular to Main St.	(E)	(F)
1st Street is perpendicular to High St.	(G)	(H)

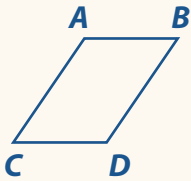


# Refine Points, Lines, Rays, and Angles

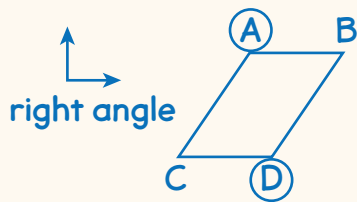
Complete the Example below. Then solve problems 1–9.

## EXAMPLE

In the shape below, list each pair of parallel sides and circle the letter marking each obtuse angle.



Look at how you could show your work.



**Solution** .....

.....

Even if the sides of the shape went on forever, the opposite sides would never cross each other.

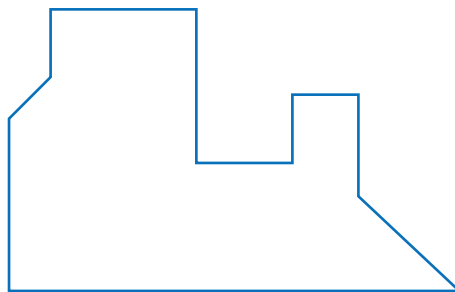


### PAIR/SHARE

What kind of angles are  $\angle B$  and  $\angle C$ ? How do you know?

## APPLY IT

- Put an X where each pair of perpendicular line segments meet in the shape below.

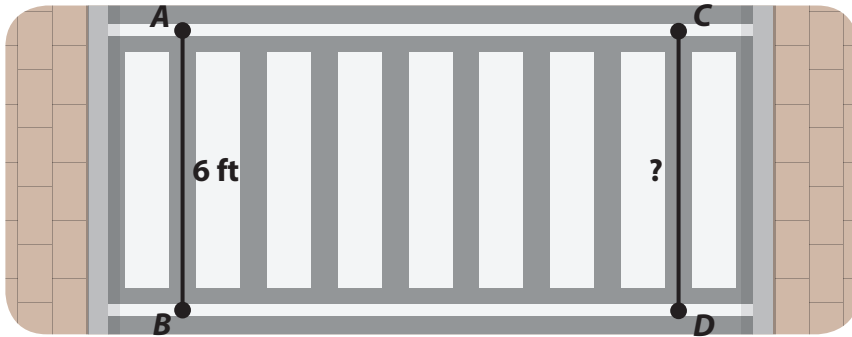


Perpendicular line segments meet to form right angles.

### PAIR/SHARE

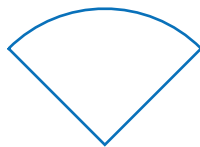
Describe the angles that are NOT marked with an X.

- 2 A crosswalk is marked with a pair of parallel line segments that extend from one side of the street to the other. The distance between the two line segments from point  $A$  to point  $B$  is 6 feet. What is the distance from point  $C$  to point  $D$ ?



**Solution**

- 3 Toshi cuts one fourth of a circle out of paper. How many angles does this shape have?



- (A) 0
- (B) 1
- (C) 2
- (D) 3

Esme chose (D) as the correct answer. How did she get that answer?

What facts do I know about parallel lines?



**PAIR/SHARE**

Can the lines still be parallel if the distance from  $C$  to  $D$  is 3 feet?

I know that it takes two rays to make an angle.

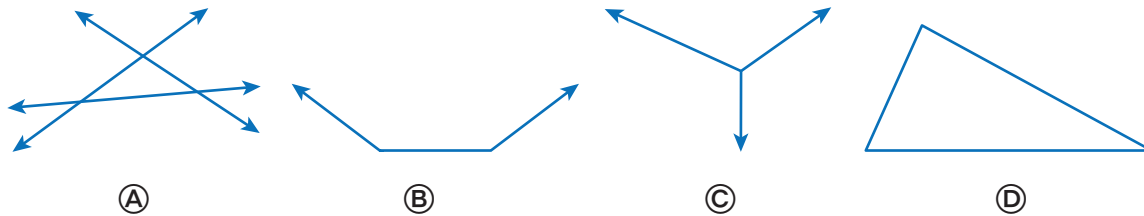
**PAIR/SHARE**

Does Esme's answer make sense?

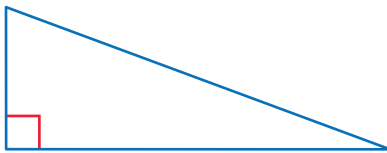
4 Think about a real-world example of where a wall meets the floor and where the same wall meets the ceiling. Which term best describes what it looks like where these surfaces meet?

- (A) parallel line segments
- (B) perpendicular line segments
- (C) right angle
- (D) acute angle

5 Which drawing shows 3 lines?



6 Look at the shape below. For which terms is an example shown in the shape?

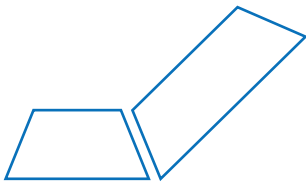


- (A) parallel line segments
- (B) perpendicular line segments
- (C) right angle
- (D) acute angle
- (E) obtuse angle

- 7 Tell whether each sentence is *True* or *False*.

	True	False
A ray goes on forever in two directions.	(A)	(B)
A line segment has exactly two endpoints.	(C)	(D)
An obtuse angle has a wider opening than a right angle.	(E)	(F)
Parallel lines meet to form an acute angle.	(G)	(H)

- 8 Liz draws the two shapes below. Use words you have learned in this lesson to describe what the shapes have in common. How are they different?



## 9 MATH JOURNAL

A triangle can have one pair of perpendicular sides. Can a triangle have one pair of parallel sides? Use drawings and words to explain your answer.



**SELF CHECK** Go back to the Unit 5 Opener and see what you can check off.