Unit 7

Angles and Properties of Shapes

Essential Questions

- What components can be used to describe all the elements of any geometric drawing?
- How can the sizes of angles be compared?
- What attributes must a parallelogram have, and what other attributes can a parallelogram have?

Unit Story: Captain Bogwart's Treasure

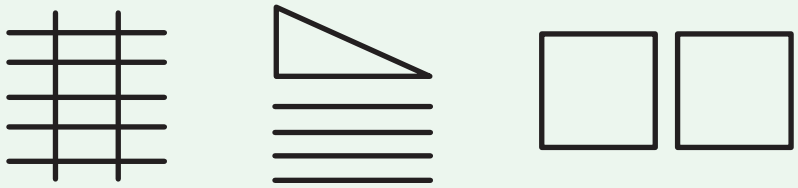
You can read the Unit Story with your student by visiting the Unit Story page on the Caregiver Hub.

Unit Investigation

Lesson 1 is the Unit Investigation. Students draw and describe geometric figures to build curiosity and apply their own knowledge in a variety of ways. Use the **Caregiver Connection** to help students continue to explore the math they will see in the unit.

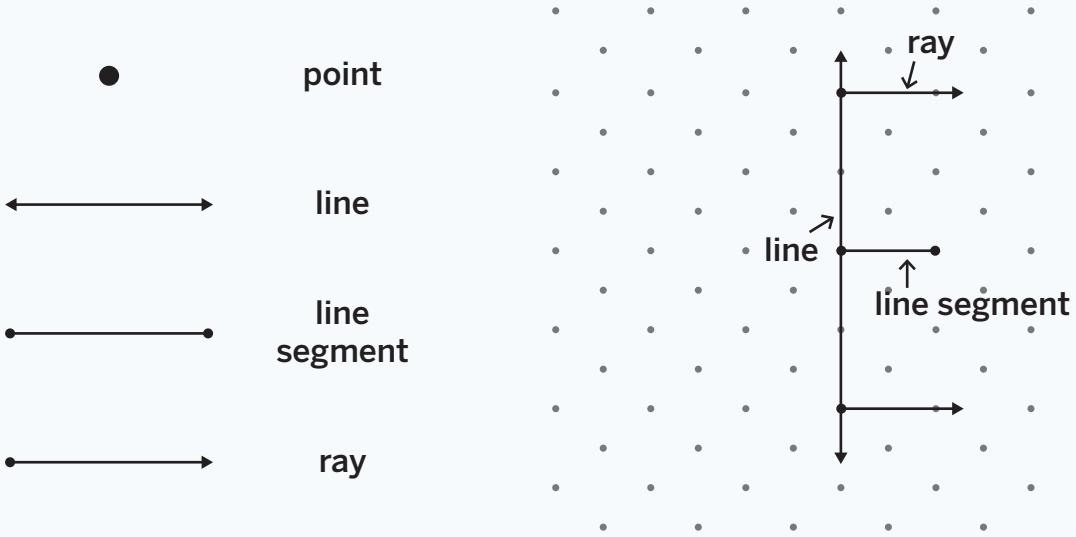
Caregiver Connection

Students may enjoy drawing geometric images, or designs with multiple shapes and lines, at home with a partner. Have students describe their drawing to another person so they could recreate it.



Summary | Lesson 2

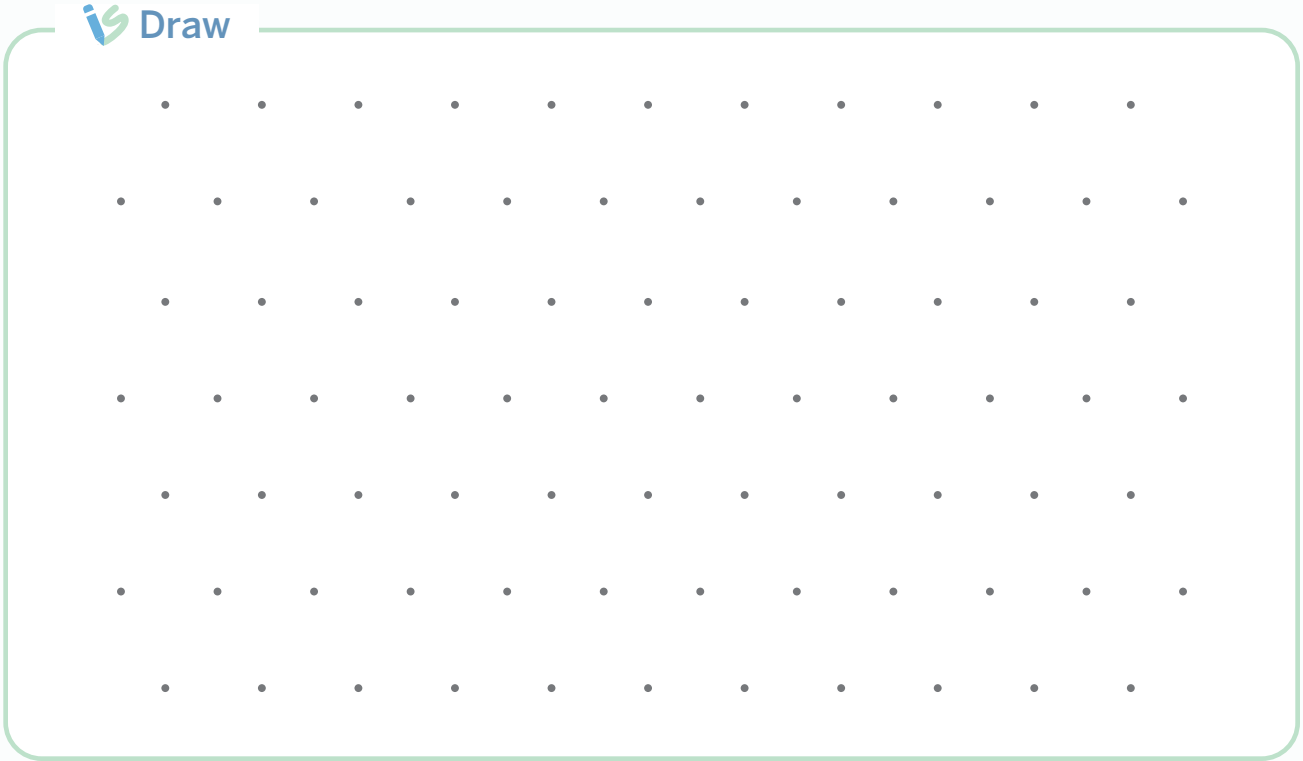
Points, **lines**, **line segments**, and **rays** can be used to create geometric drawings. Arrows and sometimes dots are used in drawings to show the differences between lines, line segments, and rays.



Try This

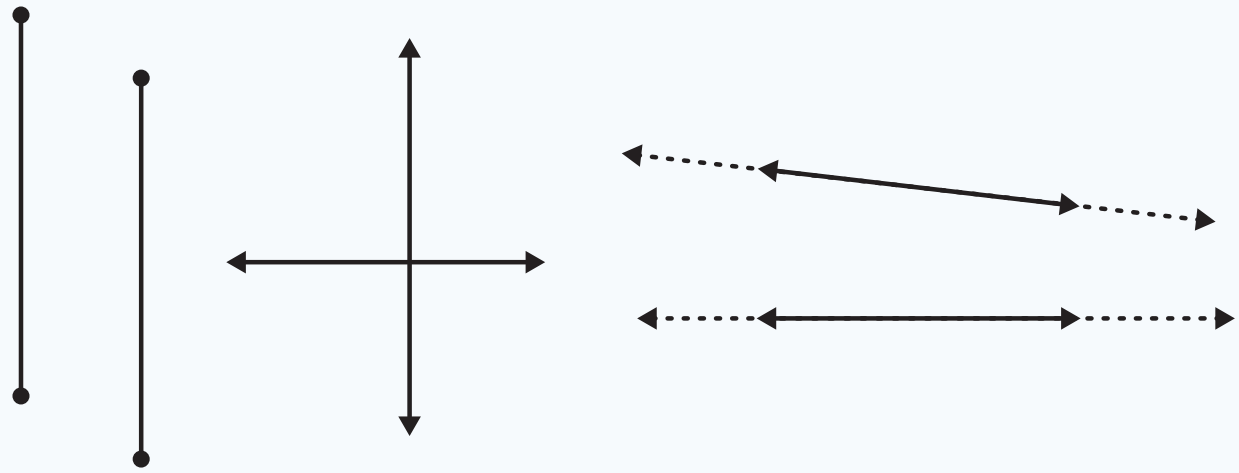
1 Draw 4 points. Connect your points to draw as many line segments as you can.

Draw



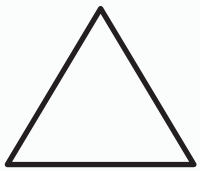
Summary | Lesson 3

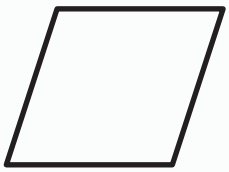
Parallel lines will never cross. **Intersecting lines** cross. **Perpendicular lines** cross and form right angles. Sometimes, lines need to be extended to see if they will intersect.

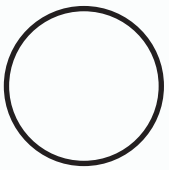


Try This

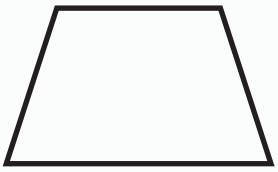
1 Which shape has *at least* 1 pair of parallel sides?

A 

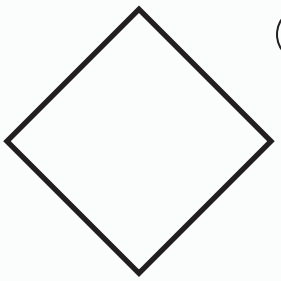
B 

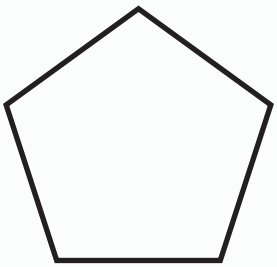
C 

2 Which shape does *not* have any pairs of parallel sides?

A 

B 

C 

D 

Summary | Lesson 4

Geometric figures can be found in the real world.

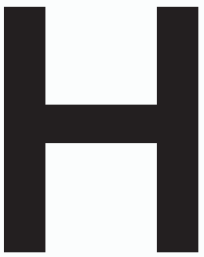



Lou Cannon/Shutterstock.com, Igorsky/Shutterstock.com, Anastasia Samorodova/Shutterstock.com, vectorisland/Shutterstock.com

Try This

1 Circle the 2 line segments in the letter Z that are parallel.

2 Describe how the 3 line segments in the letter H are related.



_____

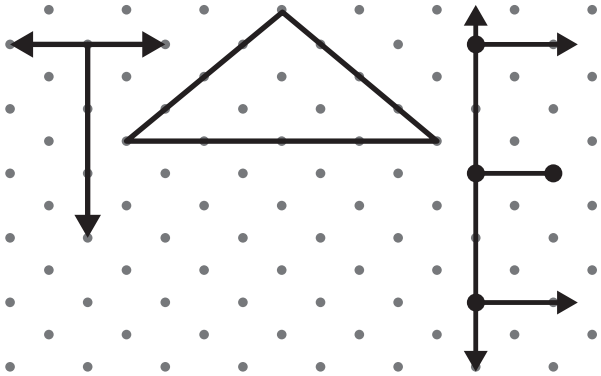
_____

_____

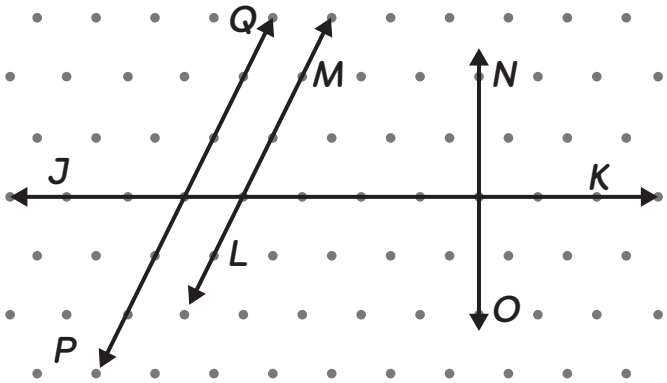
Sub-Unit 1 | Summary

In this sub-unit . . .

- We created shapes and letters with points, lines, line segments, and rays.



- We drew parallel, intersecting, and perpendicular lines.

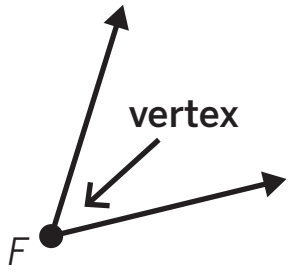
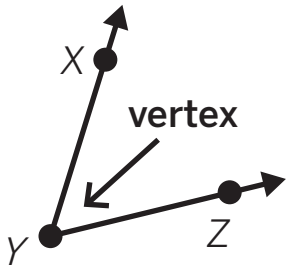


Math tip: If lines do not visibly cross, extend the lines to see if they intersect.

- We saw examples of geometric figures in real-world contexts.

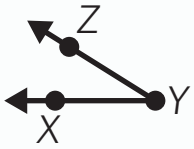
Summary | Lesson 5

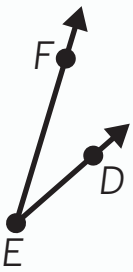
Angles are formed by 2 rays that share an endpoint called a **vertex**. You can name an angle by using the vertex or by using the 3 points, with the vertex listed in the middle.

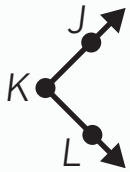
Naming using the vertex	Naming using 3 points
 angle *F*	 angle *XYZ* or angle *ZYX*

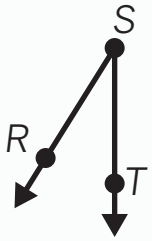
Try This

1 Which angle represents angle *K*?

Ⓐ 

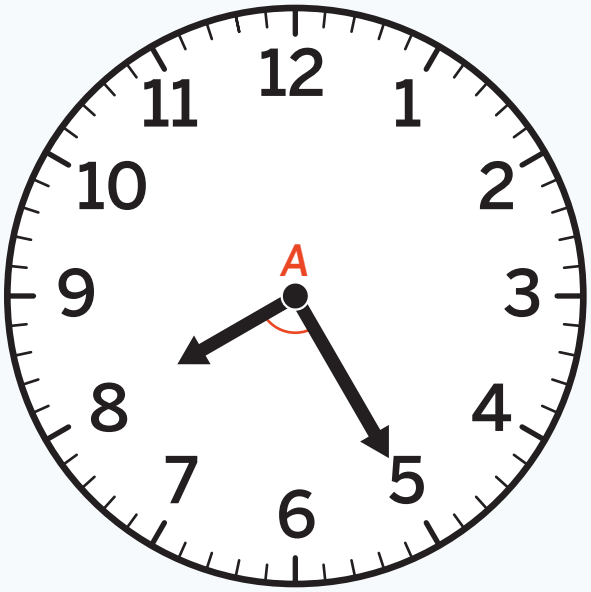
Ⓑ 

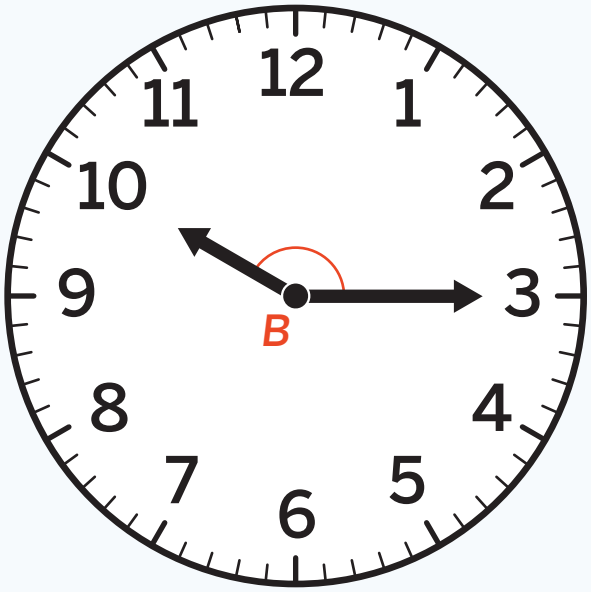
Ⓒ 

Ⓓ 

Summary | Lesson 6

You can use a clock to visualize the turning of rays around an endpoint to create and describe an angle.





Try This

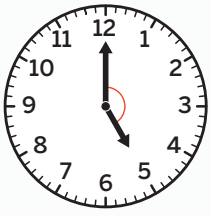
1 Which clock shows the largest angle?

(A)

(B)

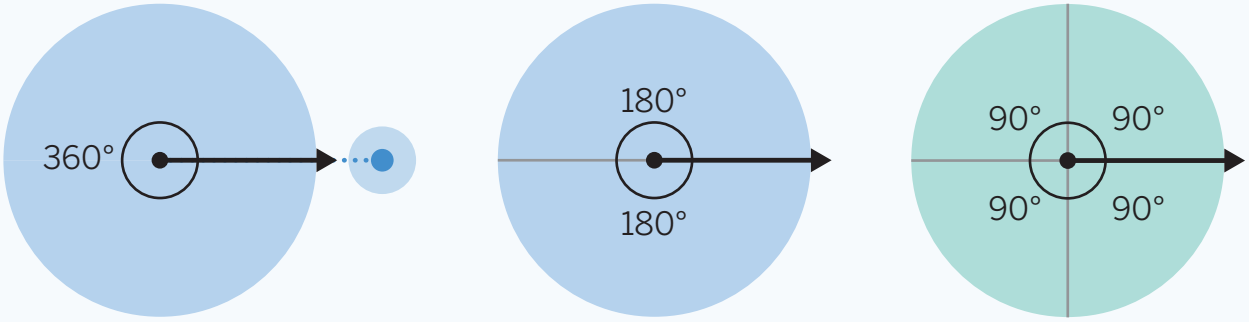
(C)

(D)



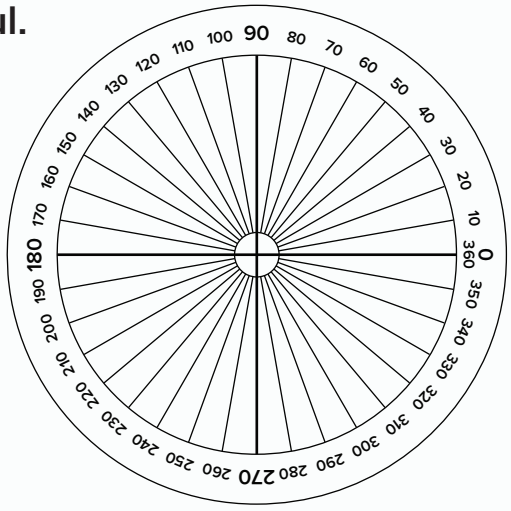
Summary | Lesson 7

Angles are measured in **degrees**. A circle measures 360°, a half circle measures 180°, and a quarter circle measures 90°.



Try This

Use the image for Problems 1–3 if it is helpful.



1. What fraction of a full turn is 40°?

   _____

2. What fraction of a full turn is 90°?

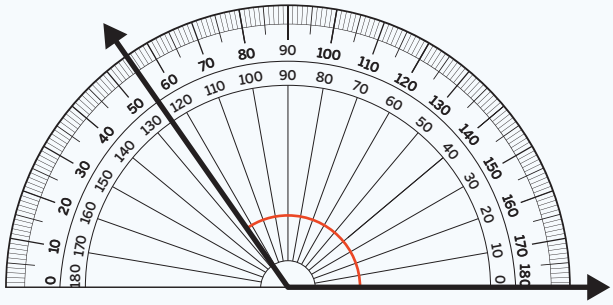
   _____

3. How many 120° angles does it take to make a full turn?

   _____

Summary | Lesson 8

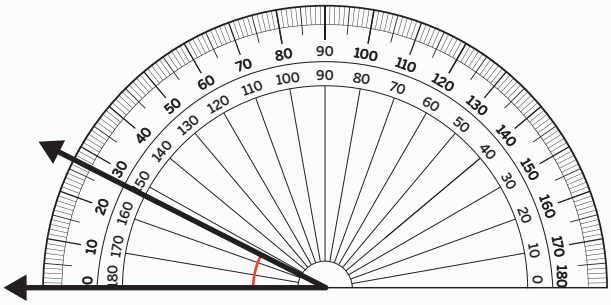
A **protractor** is used to precisely measure the size of an angle. You line up one ray with a 0 and determine the number the other ray passes through, making sure you use the set of numbers counting up from the 0 at the first ray.



The angle is 125°.

Try This

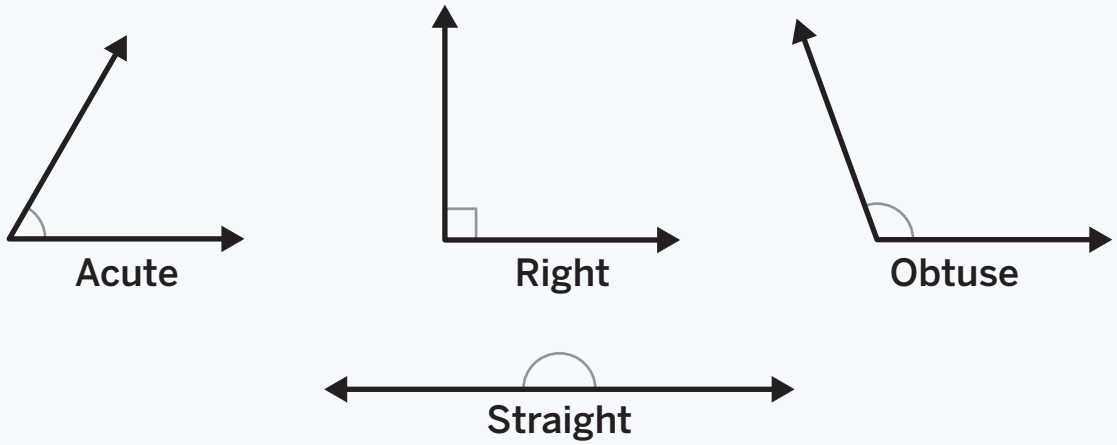
1 What could be the measure of the angle?



(A) 30° (B) 27° (C) 153° (D) 167°

Summary | Lesson 9

Angles are classified by their size into 4 categories — **acute angles**, **right angles**, **obtuse angles**, and **straight angles**.



Try This

1 The angle formed by the wind turbine measures 120°. Name the angle as *acute*, *right*, *obtuse*, or *straight*.

_____

fokke baarssen/Shutterstock.com

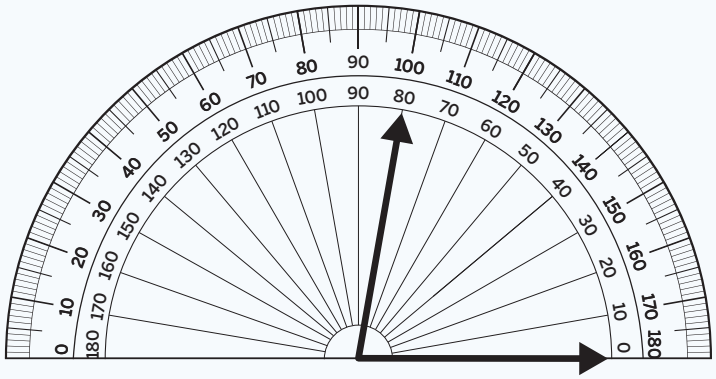
2 An angle measures 38°. Which name describes the angle based on its size?

(A) acute (B) obtuse (C) right (D) straight

Summary | Lesson 10

Protractors can be used to draw specific types of angles or draw angles with specific measurements.

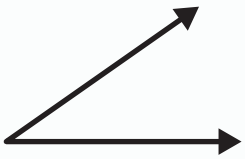
Draw an acute angle.



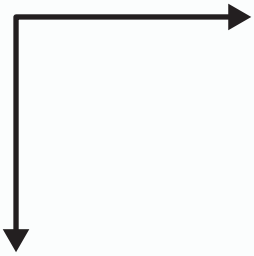
Try This

1 Without measuring, which angle looks like it is about 45°?

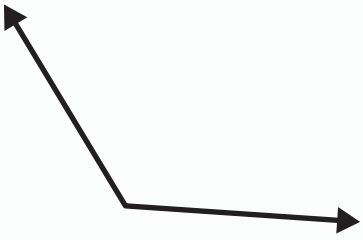
A



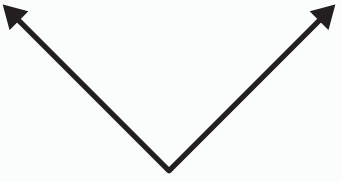
B



C

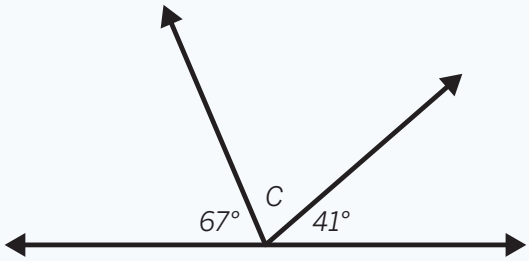


D



Summary | Lesson 11

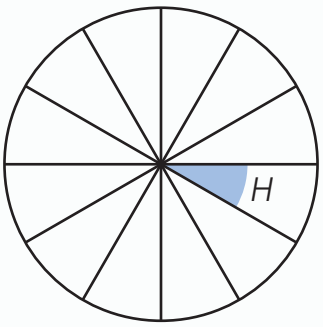
Angles can be composed or decomposed to determine unknown angle measurements.



$$67 + 41 + C = 180$$
$$67 + 41 = 108$$
$$180 - 108 = 72$$
$$C = 72°$$

Try This

1 The circle is divided into 12 equal parts.
What is the measure of angle *H*?
Explain your thinking.

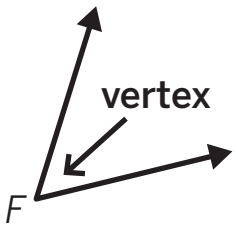
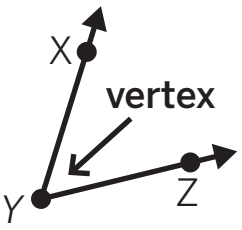


2 How many 20° angles does it take to make a circle?
Explain your thinking.

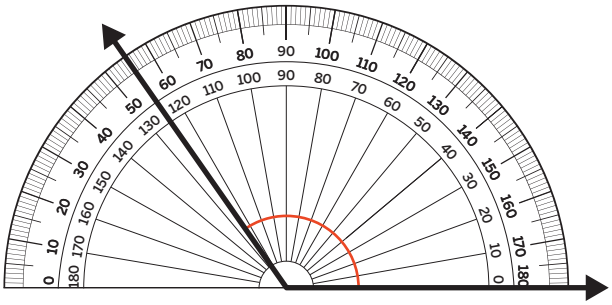
Sub-Unit 2 | Summary

In this sub-unit . . .

- We learned that angles are formed by 2 rays that share an endpoint, called a vertex, and there are different ways to name angles.

Naming using the vertex	Naming using 3 points
 angle *F*	 angle *XYZ* or angle *ZYX*

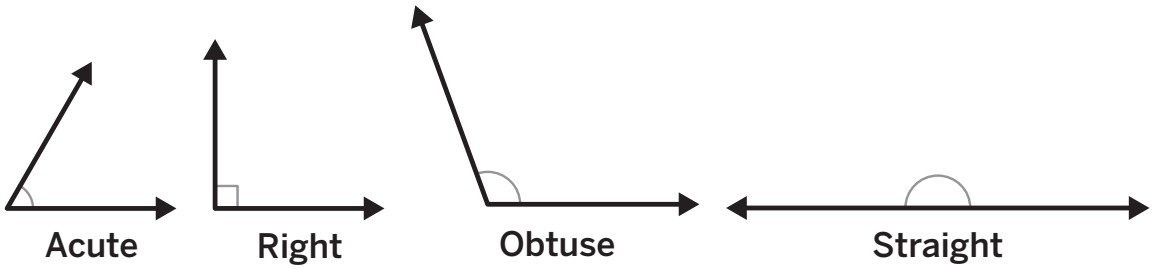
- We used protractors to precisely measure the size of angles.



The angle is 125°.

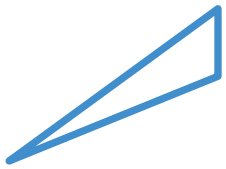
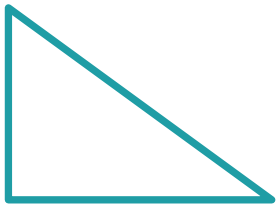
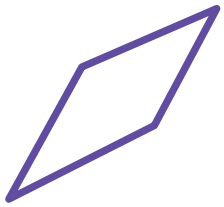
Math tip: Make sure you use the set of numbers counting up from the 0 at the first ray.

- We classified angles by their size.



Summary | Lesson 12

You can sort, compare, and classify shapes based on their attributes by looking at the sides, angle measures, or angle types.

No parallel or perpendicular sides	Perpendicular sides	Parallel sides	Parallel and perpendicular sides
			

Try This

1 What attribute do the shapes have in common?

(A) All 4 shapes have neither parallel nor perpendicular sides.

(B) All 4 shapes have both parallel and perpendicular sides.

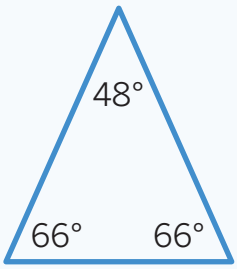
(C) All 4 shapes have at least 1 pair of parallel sides.

(D) All 4 shapes have at least 1 set of perpendicular sides.

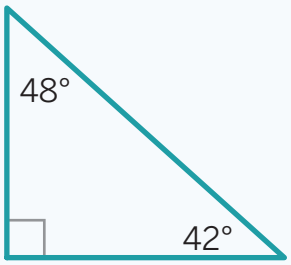
Summary | Lesson 13

You can sort, compare, and classify triangles based on their angles. **Acute triangles** have 3 acute angles, **right triangles** have 1 right angle and 2 acute angles, and **obtuse triangles** have 1 obtuse angle and 2 acute angles.

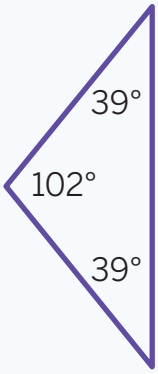
Acute triangle



Right triangle



Obtuse triangle



Try This

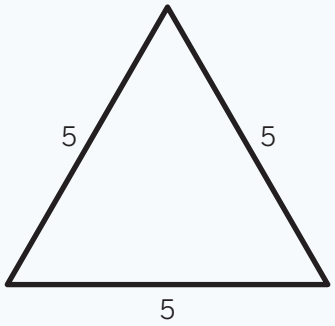
1 Draw a triangle. Label each angle inside the triangle using the letters *A* for acute, *R* for right, and *O* for obtuse.

Draw

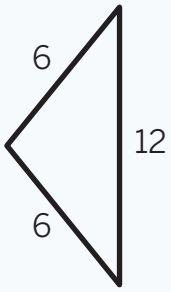
Summary | Lesson 14

You can sort, compare, and classify triangles based on their side lengths. **Equilateral triangles** have 3 equal sides, **isosceles triangles** have 2 equal sides, and **scalene triangles** have no equal sides.

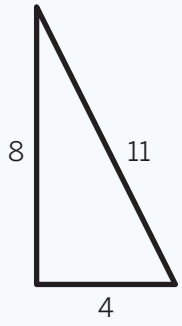
Equilateral triangle



Isosceles triangle



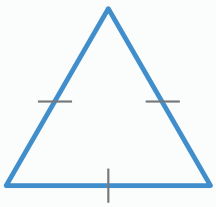
Scalene triangle



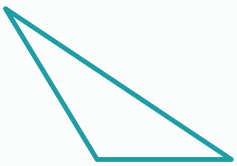
Try This

1 Which triangles are scalene? Select *all* that apply.

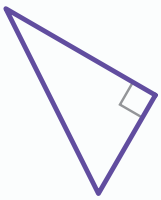
(A)



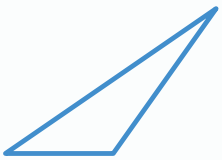
(B)



(C)



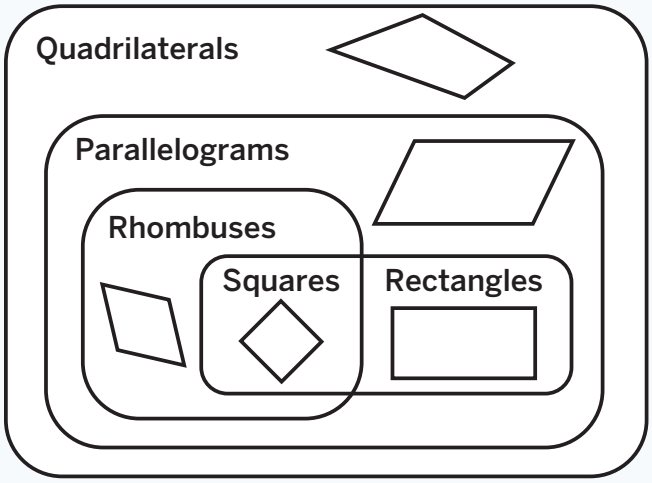
(D)



2 How do you know which triangles from Problem 1 are scalene?

Summary | Lesson 15

Quadrilaterals can be classified and named by angles, side lengths, and whether they have parallel sides. Quadrilaterals with 2 pairs of parallel sides are parallelograms. Some **parallelograms** can also be described as rhombuses, rectangles, and squares.



Try This

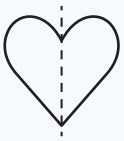
1 For each clue, select which shapes it could be describing. Place a check mark in the correct columns.

	Parallelogram	Rhombus	Rectangle	Square
4 right angles				
2 pairs of parallel sides				
All sides are equal length.				
2 pairs of perpendicular sides				

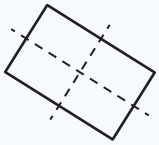
Summary | Lesson 16

A **line of symmetry** divides a figure into 2 parts that are a mirror reflection of one another and would match up exactly when folded along the line. Some figures may have more than 1 line of symmetry, and some may not have a line of symmetry.

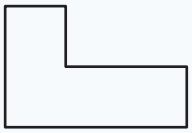
1 line of symmetry



2 lines of symmetry

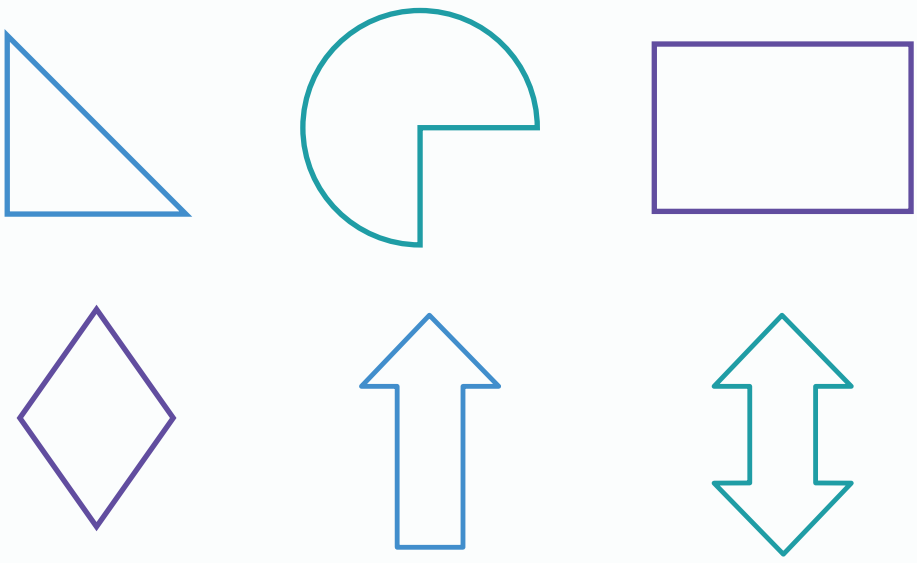


No line of symmetry



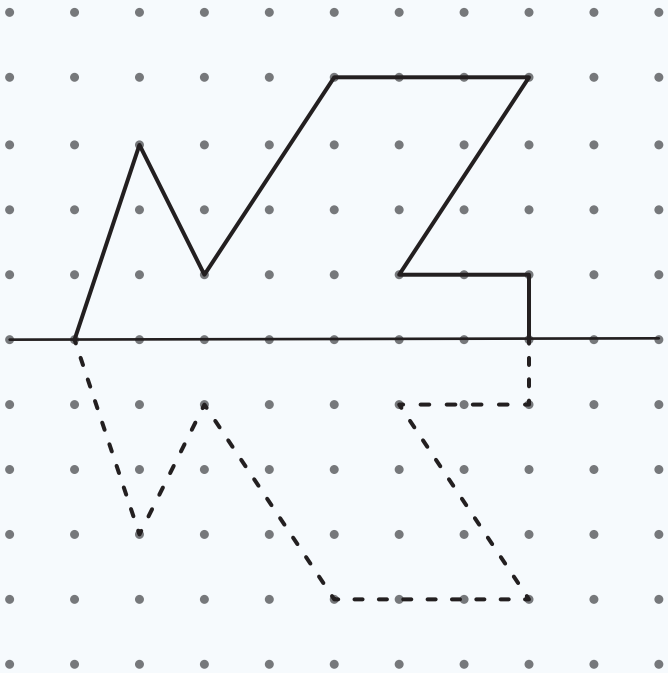
Try This

1 Draw *all* the lines of symmetry for each figure.



Summary | Lesson 17

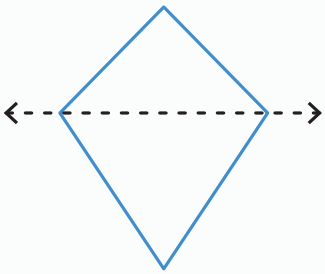
When figures are symmetric, the corresponding points in each half of the figure are the same distance from the line of symmetry.



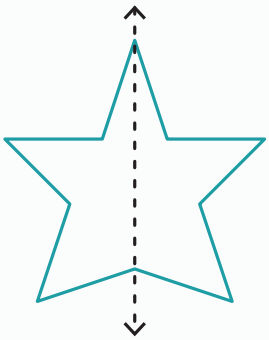
Try This

1 Which image shows a line of symmetry?

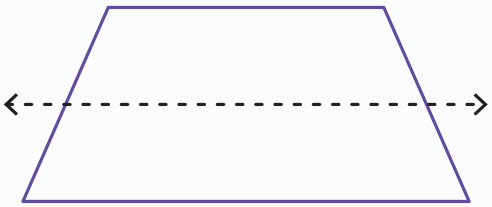
A



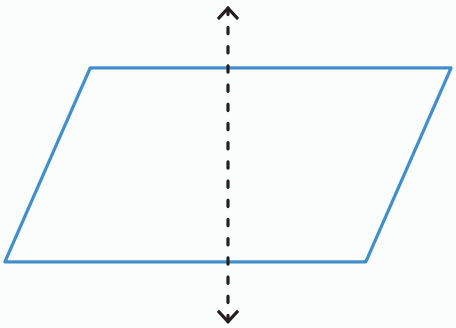
B



C

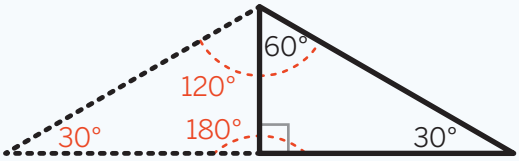


D



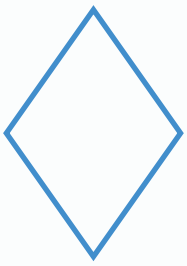
Summary | Lesson 18

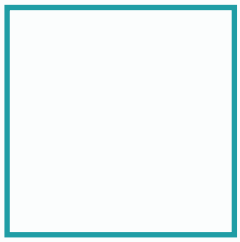
You can use a line of symmetry to determine unknown side lengths and unknown angle measures.

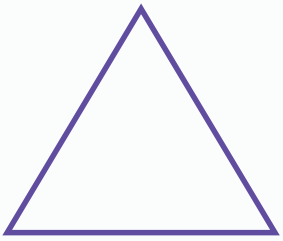


Try This

1 Draw *all* the lines of symmetry in the shapes.



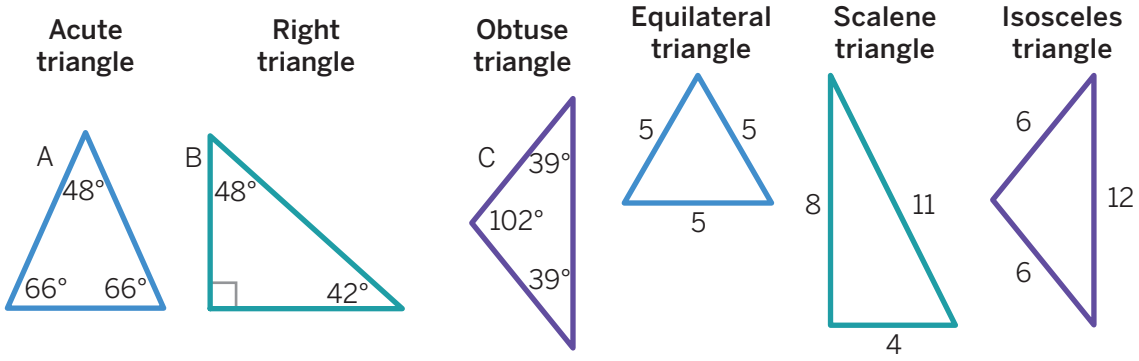




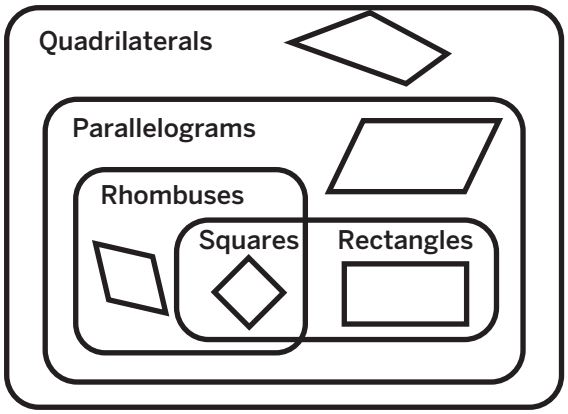
Sub-Unit 3 | Summary

In this sub-unit . . .

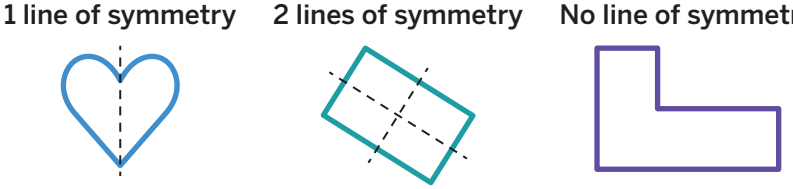
- We sorted, compared, and classified triangles based on their angles or side lengths.



- We classified quadrilaterals by angles, side lengths, and parallel sides.



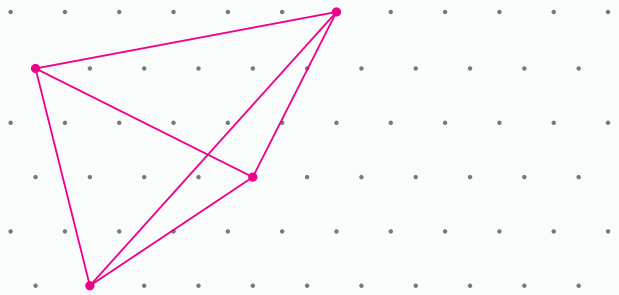
- We learned that a line of symmetry divides a figure into 2 parts that are mirror reflections of one another.



Math tip: You can fold a figure on a line of symmetry or use grid paper to check if a figure is symmetrical.

Lesson 2

1 Sample response shown.



Lesson 3

1 B

2 D

Lesson 4

1 

2 Sample response shown.
H has 2 vertical, parallel line segments and 1 horizontal line segment that intersects those.

Lesson 5

1 C

Lesson 6

1 D

Lesson 7

1 $\frac{40}{360}$ or $\frac{1}{9}$ or equivalent

2 $\frac{90}{360}$ or $\frac{1}{4}$ or equivalent

3 3

Lesson 8

1 B

Lesson 9

1 obtuse

2 A

Lesson 10

1 A

Lesson 11

1 Sample explanation shown.
30°. Each angle is 30° because 12 × 30 = 360, and there are 360° in a circle.

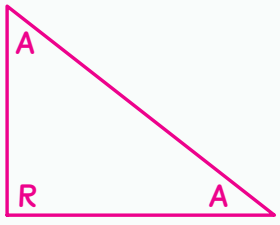
2 Sample explanation shown.
18. It will take eighteen 20° angles because 20 × 18 = 360.

Lesson 12

1 C

Lesson 13

1 Sample response shown.



Lesson 14

1 B, C, and D

2 Sample response shown.
I know that the triangles are scalene because each side is a different length.

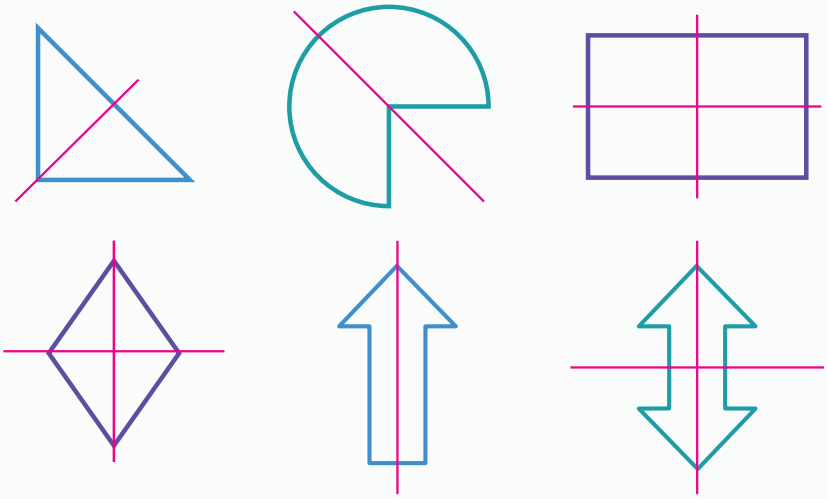
Lesson 15

1

	Parallelogram	Rhombus	Rectangle	Square
4 right angles			✓	✓
2 pairs of parallel sides	✓	✓	✓	✓
All sides are equal length.		✓		✓
2 pairs of perpendicular sides			✓	✓

Lesson 16

1

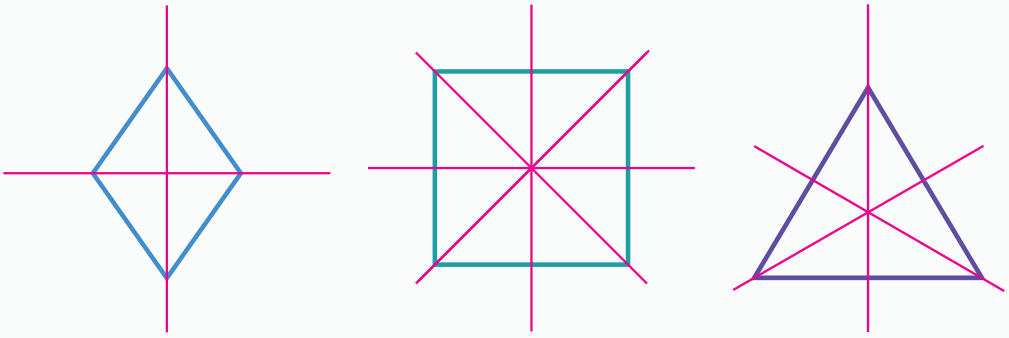


Lesson 17

1 B

Lesson 18

1



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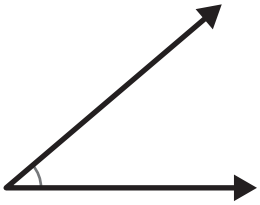
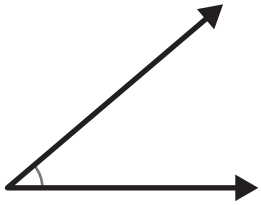
English	Español

A

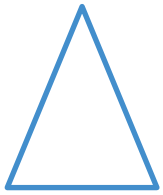
acute angle An angle with a measure of less than 90 degrees.



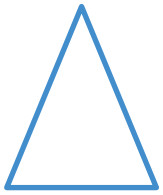
ángulo agudo Un ángulo que mide menos de 90 grados.



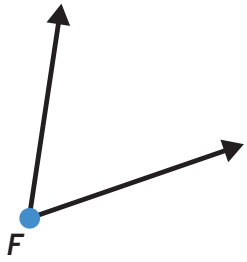
acute triangle A triangle with 3 acute angles.



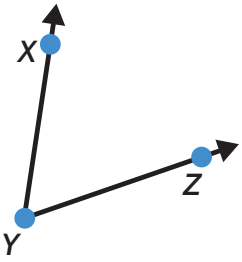
triángulo agudo Un triángulo con 3 ángulos agudos.



angle A geometric figure made up of 2 rays that share the same endpoint.

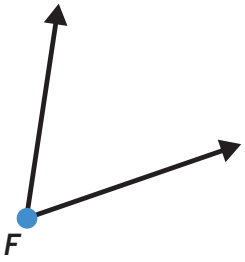


angle F

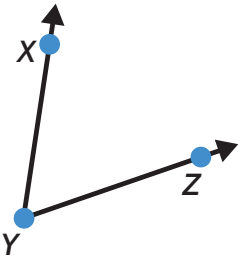


angle XYZ or angle ZYX

ángulo Una figura geométrica formada por 2 semirrectas que comparten el mismo extremo.



ángulo F



ángulo XYZ o ángulo ZYX

D

degree A unit for measuring the size of an angle.

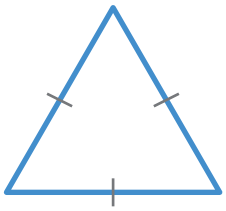
grado Unidad que mide el tamaño de un ángulo.

English

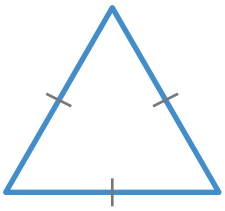
Español

E

equilateral triangle A triangle with 3 equal sides.

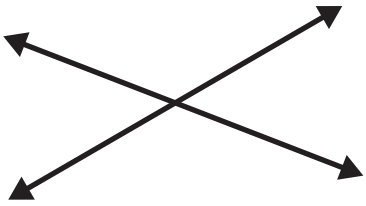


triángulo equilátero Un triángulo con 3 lados iguales.

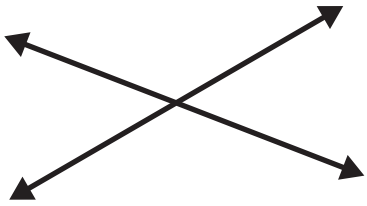


I

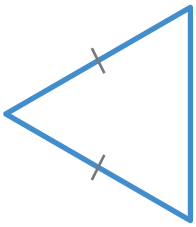
intersecting lines Lines that cross.



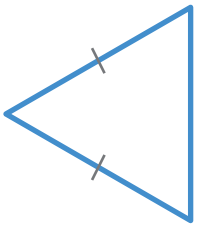
líneas de intersección Líneas que cruzan.



isosceles triangle A triangle with exactly 2 equal sides.



triángulo isósceles Un triángulo con 2 lados iguales.



L

line A set of points that are arranged in a straight way and extend infinitely in both directions.

línea, recta Un conjunto de puntos que están dispuestos de forma recta y que se extienden infinitamente en ambas direcciones.

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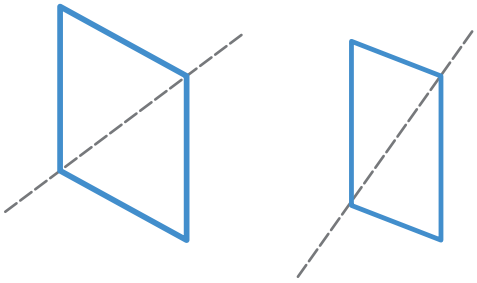
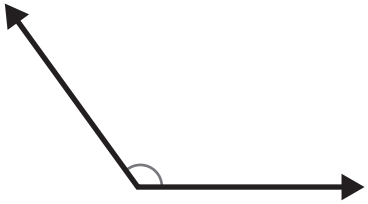
English

line of symmetry A line that splits a figure into 2 matching halves that perfectly mirror each other on both sides of the line.

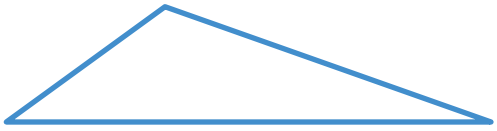


line segment or segment A part of a line with 2 endpoints.

obtuse angle An angle with a measure greater than 90 degrees but less than 180 degrees.

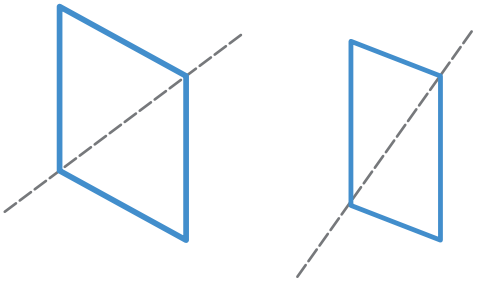


obtuse triangle A triangle with 1 obtuse angle.



Español

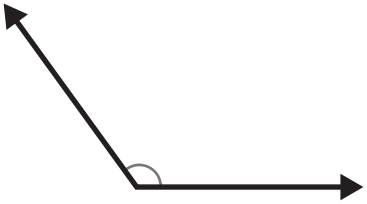
eje de simetría Una línea recta que divide una figura en 2 mitades iguales que se reflejan perfectamente en ambos lados de la línea.



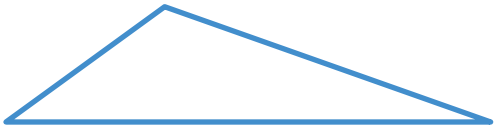
segmento de recta o segmento Una parte de una recta con 2 extremos.

O

ángulo obtuso Un ángulo que mide más de 90 grados, pero menos de 180 grados.



triángulo obtuso Un triángulo con 1 ángulo obtuso.



English

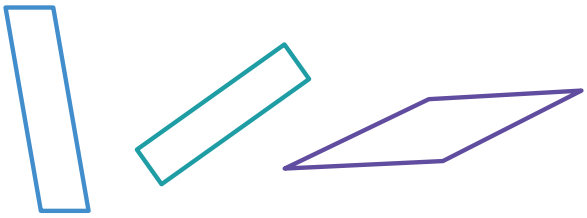
Español

P

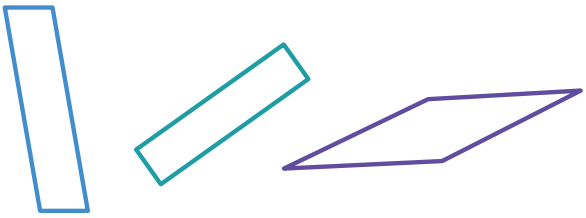
parallel lines Lines that never cross or intersect.

líneas paralelas Rectas que nunca se cruzan o intersecan.

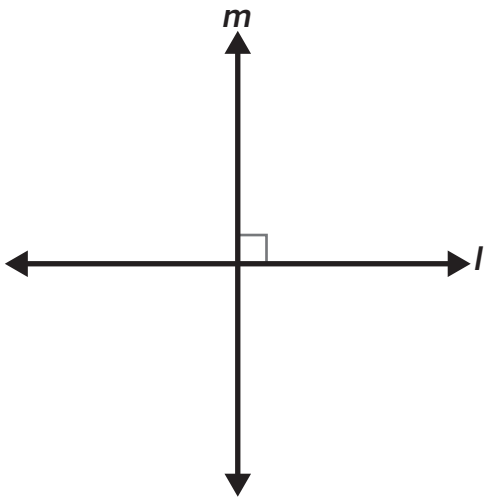
parallelogram A quadrilateral wtih 2 pairs of parallel sides.



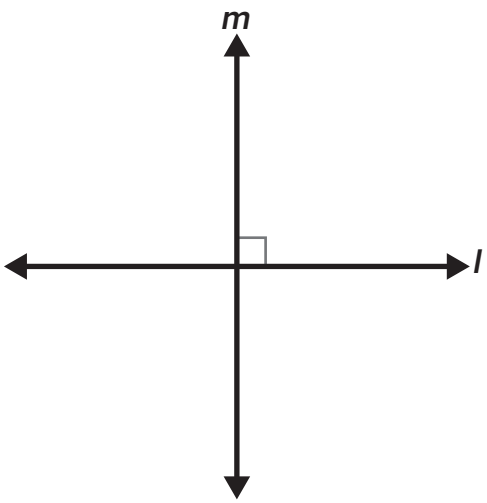
paralelogramo Un cuadrilátero que tiene 2 pares de lados paralelos.



perpendicular lines Lines that intersect to create right angles.



rectas perpendiculares Rectas que se intersecan y forman ángulos rectos.



point A location in space.

punto Una ubicación en el espacio.

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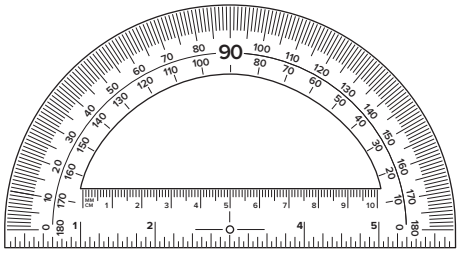
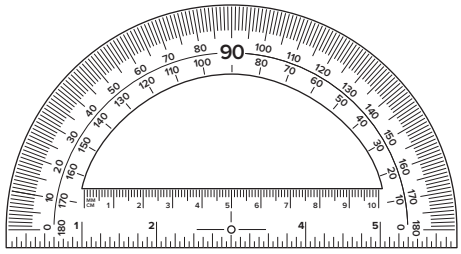
English

protractor A tool for measuring the size of an angle in degrees.



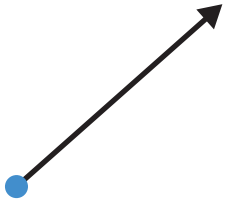
Español

transportador Una herramienta para medir el tamaño de un ángulo en grados.

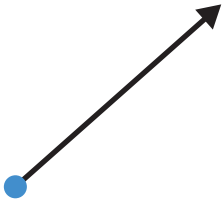


R

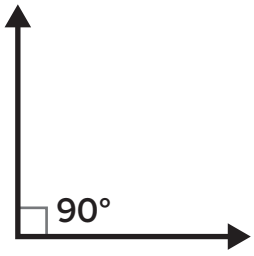
ray A part of a line with 1 endpoint.



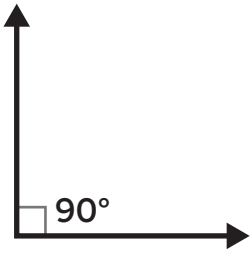
semirrecta Una parte de una recta con 1 extremo.



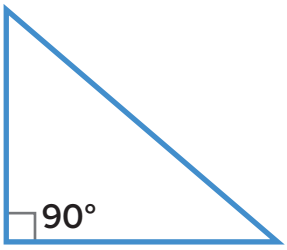
right angle An angle that measures 90 degrees.



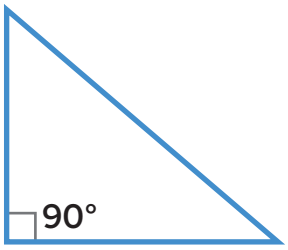
ángulo recto Un ángulo que mide 90 grados.

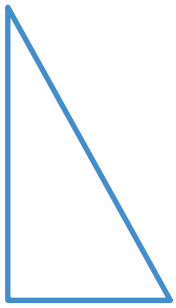
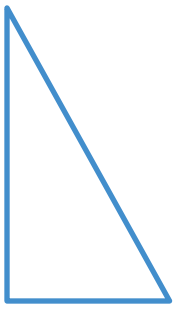
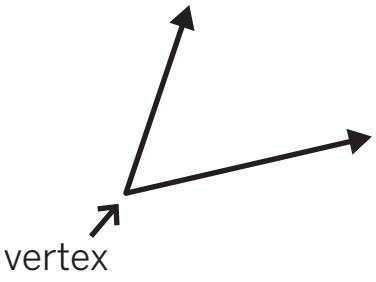


right triangle A triangle with 1 right angle.



triángulo rectángulo Un triángulo con 1 ángulo recto.



English	Español
S	
scalene triangle A triangle with no sides that are equal. 	**triángulo escaleno** Un triángulo en el que ningún lado es igual. 
straight angle An angle that measures 180 degrees. 	**ángulo llano** Un ángulo que mide 180 grados. 
V	
vertex of an angle The shared endpoint where the 2 rays forming an angle intersect. 	**vértice de un ángulo** El extremo compartido donde se intersecan las 2 semirrectas que forman un ángulo.