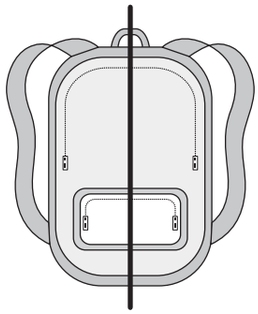
CHAPTER 7

1 Constructing Symmetrical Shapes

Goal **Construct 2-D shapes with one line of symmetry.**

1.



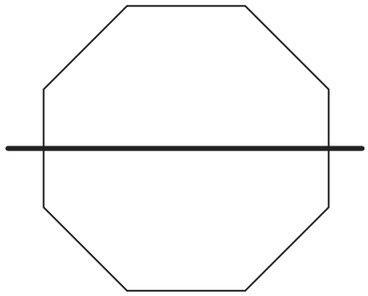
a) Use symmetry to complete the picture.

b) Describe the method you used. Check for symmetry.

Suggested answer: I used a grid to draw a congruent half on the other side of the line of symmetry.

I checked for congruence with a transparent mirror.

2.



a) Use a different method from Question 1 to complete the picture.

b) Describe the method you used. Check for symmetry and describe your method.

Suggested answer: I chose several points on the given half. For each point, I measured the distance to the line of symmetry, making sure distance was at right angles to the line of symmetry. I measured the same distance from the line of symmetry to the other side and marked a point. I repeated this for all other points. Then I joined the new points to complete the picture. I folded the picture to check for symmetry.

At-Home Help

A line of symmetry may be horizontal or vertical.

To complete a picture that has a line of symmetry, use one of these two ways.

- Use a grid to draw a congruent half on the other side of the line of symmetry.
- Find matching points by measuring the distance from several points on the given half to the line of symmetry. Make sure distance is at right angles to line of symmetry. Then join all new points to make a congruent half.

Check for symmetry by using one of these two ways.

- Fold the completed picture along the line of symmetry to see if both halves match exactly.
- Use a transparent mirror to check for congruence of both halves.

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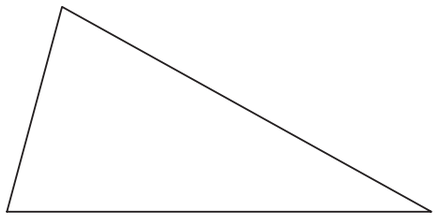
CHAPTER 7

2 Constructing Triangles

Goal **Draw triangles with given side lengths and angle measures.**

You will need a ruler and a protractor.

1. Draw a triangle with side lengths of 3 cm and 6 cm. The angle between these two sides is 75°.



At-Home Help

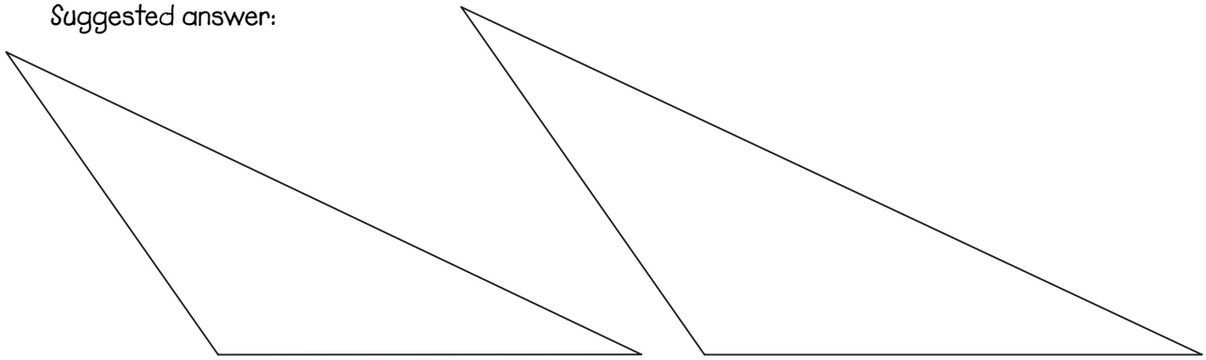
You can draw a triangle if you know the measure of

- only one angle and one side
- two angles and one side without specifying where the side is
- two sides and one angle without specifying where the angle is

There is only one solution if two side lengths and one angle are given, and the angle location is known.

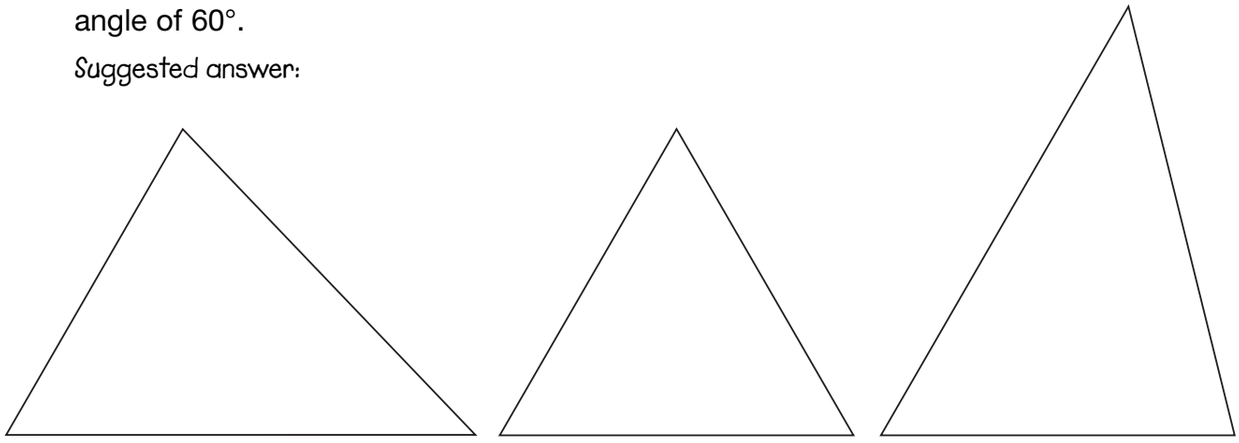
2. Draw two different triangles that each have one side length of 6 cm and angles of 125° and 25°.

Suggested answer:



3. Draw three different triangles that each have one side length of 5 cm and an angle of 60°.

Suggested answer:



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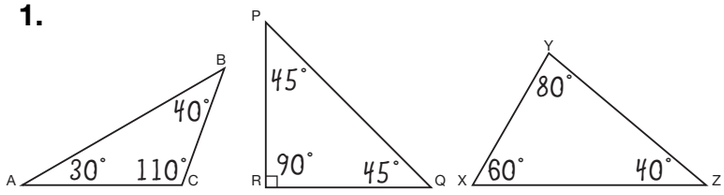
CHAPTER 7
3

Classifying Triangles by Angles

Goal **Investigate angle measures in triangles.**

You will need a protractor.

1.



a) Measure and label all the angles in the triangles.

b) Classify the triangles. Give reasons for your answers.

Triangle ABC is obtuse-angled.

Reason: One angle is obtuse.

Triangle PQR is right-angled.

Reason: One angle is 90°.

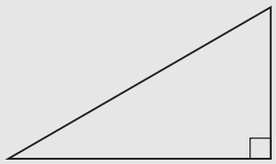
Triangle XYZ is acute-angled.

Reason: All angles are acute.

At-Home Help

A **right-angled triangle** has one right angle.

A **right angle** measures 90°.

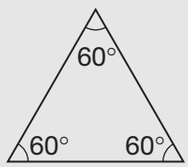


An **obtuse-angled triangle** has one obtuse angle.

An **obtuse angle** measures greater than 90°.

An **acute-angled triangle** has only acute angles.

An **acute angle** measures less than 90°.



2. a) What type of triangle has an angle that measures 100° and an angle that measures 50°? Give your reasons.

obtuse-angled triangle

100° is an obtuse angle.

b) What type of triangle has an angle that measures 60° and an angle that measures 90°? Give your reasons.

right-angled triangle

90° is a right angle.

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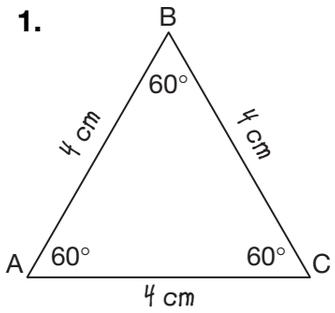
CHAPTER 7

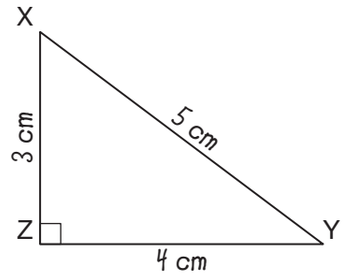
4 Classifying Triangles by Side Lengths

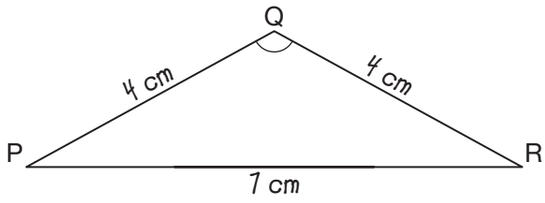
Goal **Investigate side lengths of triangles.**

You will need a ruler.

1.







a) Measure and label all the side lengths of the triangles.

b) Classify the triangles according to their side lengths. Give your reasons.

Triangle ABC is equilateral.

Reason: All side lengths are equal.

Triangle PQR is isosceles.

Reason: Two side lengths are equal.

Triangle XYZ is scalene.

Reason: All side lengths are different.

2. Classify the triangles according to their angle measures and side lengths. Example: Triangle KLM is an obtuse-angled scalene triangle.

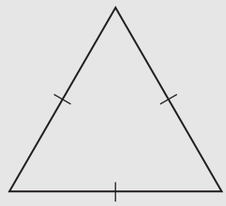
a) Triangle ABC is an acute-angled equilateral triangle.

b) Triangle PQR is an obtuse-angled isosceles triangle.

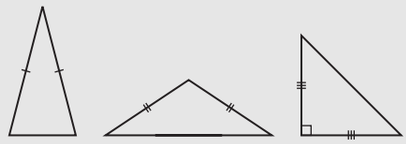
c) Triangle XYZ is a right-angled scalene triangle.

At-Home Help

An **equilateral triangle** has all sides of equal length.



An **isosceles triangle** has two sides of equal length.



A **scalene triangle** has all sides of different length.

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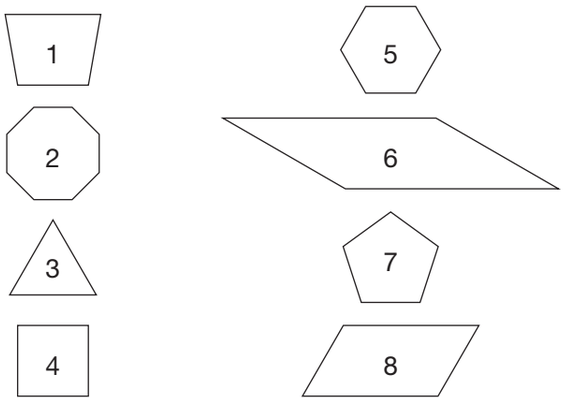
CHAPTER 7
5

Measuring Angles in Polygons

Goal **Identify and classify regular polygons by their angle measures.**

1. Match these shapes with the angle clues below. Name each shape.



a) 100°, 100°, 80°, 80° trapezoid (shape 1)

b) 120°, 120°, 60°, 60° parallelogram (shape 8)

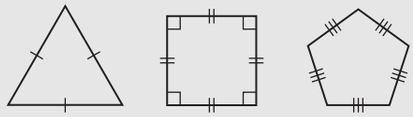
c) 60°, 60°, 60° equilateral triangle (shape 3)

d) 90°, 90°, 90°, 90° square (shape 4)

e) 30°, 30°, 150°, 150° parallelogram (shape 6)

At-Home Help

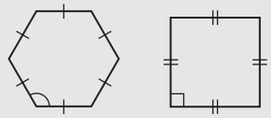
A **regular polygon** is a polygon with equal angle measures and equal side lengths.



Regular polygons are identified by the number of sides.

The angle measure in a regular polygon increases as the number of sides increases.

For example: Each angle in a regular hexagon is greater than each angle in a square, because a hexagon has 6 sides while a square has only 4 sides.



2. Write angle clues for the remaining polygons. Match the shapes with your angle clues. Name each shape.

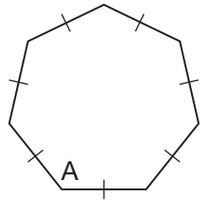
Angle clue: 108°, 108°, 108°, 108°, 108° Shape: pentagon (shape 7)

Angle clue: 120°, 120°, 120°, 120°, 120°, 120° Shape: hexagon (shape 5)

Angle clue: 135°, 135°, 135°, 135°, 135°, 135°, 135°, 135° Shape: octagon (shape 2)

3. Without measuring, predict the size of angle A. Use what you know about the relationship between the number of sides and angle measures in a regular polygon.

Angle A will be less than 135° but greater than 120°.



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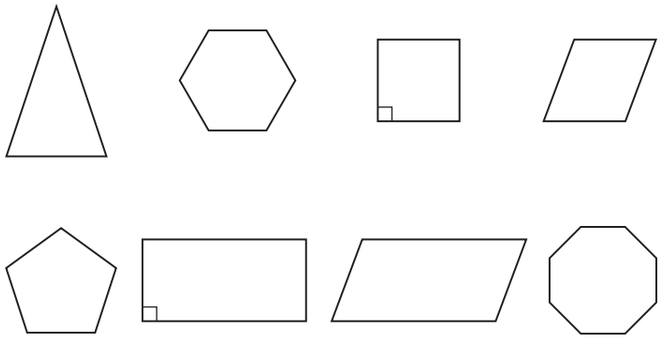
CHAPTER 7

6 Properties of Polygons

Goal **Investigate properties of geometric shapes.**

1. Match the polygons with the property riddles below.



At-Home Help

The **properties** of a shape are the features that describe it.

For example:

The properties of a regular hexagon are 6 equal sides, 6 equal angles (all obtuse), 3 pairs of parallel sides, and 6 lines of symmetry.

Because no other shape shares all the same properties, a shape can be identified by its properties.

a) I have no parallel sides.
All my sides are equal in length.
All my angles are equal.
I have 5 lines of symmetry.
Who am I?

pentagon

b) I have 3 pairs of parallel sides.
All my sides are equal in length.
All my angles are obtuse.
I have 6 lines of symmetry.
Who am I?

hexagon

c) I have 2 pairs of parallel sides.
All my sides are equal in length.
I have 2 pairs of equal angles.
I have 2 lines of symmetry.
Who am I?

rhombus

d) I have 2 pairs of parallel sides.
My opposite sides are equal in length.
All my angles are equal in size.
I have 2 lines of symmetry.
Who am I?

rectangle

2. Write property riddles for two of the remaining polygons. Write about parallel sides, side lengths, angle measures, and lines of symmetry. Name each polygon.

a)

Suggested answer:

I have 4 pairs of parallel sides.

All my sides are equal in length.

All my angles are equal.

I have 8 lines of symmetry.

Who am I? octagon

b)

Suggested answer:

I have no parallel sides.

I have 2 sides that are equal in length.

Two of my angles are equal.

I have 1 line of symmetry.

Who am I? isosceles triangle

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CHAPTER 7

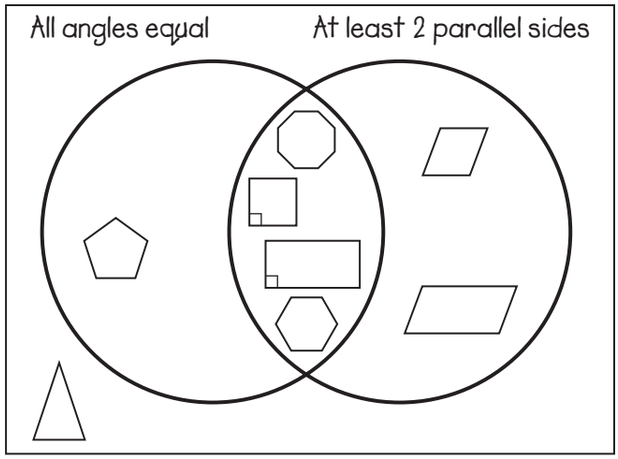
7 Sorting Polygons

Goal **Sort and classify polygons by sides, angles, and vertices.**

1. Use a Venn diagram to sort these shapes using two of the properties below.

- number of sides
- number of angles
- number of vertices
- number of lines of symmetry
- parallel sides
- equal side lengths
- equal angles
- kinds of angles

Suggested answer:



At-Home Help

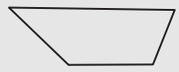
Polygons can be sorted based on

- number of sides
- number of angles
- number of vertices
- number of lines of symmetry
- parallel sides
- equal side lengths
- equal angles
- kinds of angles

In a polygon, the number of angles and the number of vertices are equal to the number of sides.

An **irregular polygon** is a polygon with different angle measures and different side lengths.

For example:



A **Venn diagram** is a drawing with overlapping circles inside a rectangle. This type of diagram is helpful when sorting shapes or numbers.

2. Are there any shapes inside both circles? If so, what properties do these shapes have in common?

(using suggested answer given) octagon, hexagon, square, and rectangle

All these shapes have all angles equal and at least 2 parallel sides.

3. Are there any shapes outside both circles? If so, why are they placed there?

(using suggested answer given) isosceles triangle

This shape has neither all angles equal nor at least 2 parallel sides.

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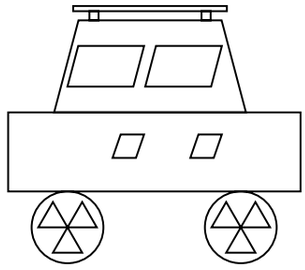
CHAPTER 7

8 Communicate About Shapes

Goal **Use math language to describe geometric ideas.**

1.



a) Write directions for a friend to draw the picture shown.

Suggested answer:

The body of the car is made up of a trapezoid at the top.

The bottom part of the body of the car is a rectangle.

There are 2 windows in the top part of the car. They are shaped like parallelograms.

There is 1 door handle below each window in the rectangular body of the car.

The door handles are rhombuses.

There is a roof rack shaped like a thin rectangle. The rectangle rests on two small squares, which are on top of the body of the car.

There are 2 wheels, which are circles.

There are 3 triangles inside each wheel.

b) Use the Communication Checklist to identify the strengths of your directions. List them.

Suggested answer: I used math language for all the polygons.

I included all the details, but did not include unnecessary information such as colours, and exact measurements of lengths and angles.

2. If possible, test your directions by having a Grade 6 student use them to draw the picture.

At-Home Help

To describe how to draw a picture made of polygons, remember to use the Communication Checklist.

The true test of whether or not your directions are clear is if someone else can reproduce the picture exactly.

Communication Checklist

- ☑ Did you show the right amount of detail?
- ☑ Did you use math language?
- ☑ Did you include only necessary information?

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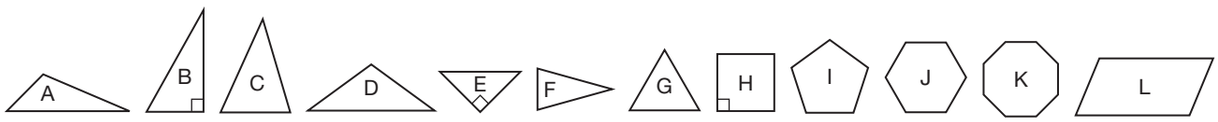
CHAPTER 7

Test Yourself

Circle the correct answer.



1. Which triangle has no lines of symmetry?

A. shape A **B.** shape D **C.** shape F **D.** shape G

2. Which shape is a regular polygon?

A. shape B **B.** shape C **C.** shape K **D.** shape E

3. Which shape has no parallel sides?

A. shape J **B.** shape L **C.** shape H **D.** shape I

4. Which shape has 2 pairs of equal angles?

A. shape L **B.** shape D **C.** shape H **D.** shape K

5. Which shape has no obtuse angles?

A. shape A **B.** shape K **C.** shape L **D.** shape E

6. Which shape is a right-angled isosceles triangle?

A. shape B **B.** shape F **C.** shape E **D.** shape D

7. Which shape has only acute angles?

A. shape L **B.** shape H **C.** shape C **D.** shape K

8. Which shape is a scalene triangle?

A. shape G **B.** shape A **C.** shape D **D.** shape F

9. Which shape is an irregular polygon?

A. shape L **B.** shape H **C.** shape J **D.** shape I

10. Which shape is symmetrical?

A. shape B **B.** shape L **C.** shape C **D.** shape D

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