8.1 Classifying Polygons

Goal

Describe polygons.

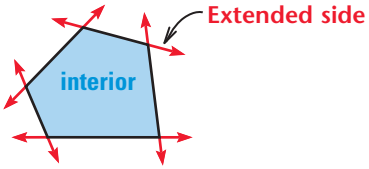
Key Words

- convex
- concave
- equilateral
- equiangular
- regular

The Iranian tile pattern at the right shows several polygons. These polygons can be classified as *convex* or *concave*.

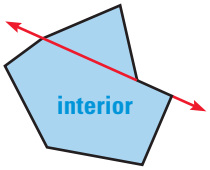
A polygon is **convex** if no line that contains a side of the polygon passes through the interior of the polygon. A polygon that is not convex is called **concave**.

Convex polygon



None of the extended sides pass through the interior.

Concave polygon

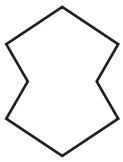


At least one extended side passes through the interior.

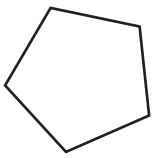
EXAMPLE 1 Identify Convex and Concave Polygons

Decide whether the polygon is *convex* or *concave*.

a.

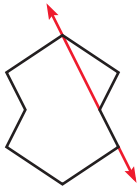


b.

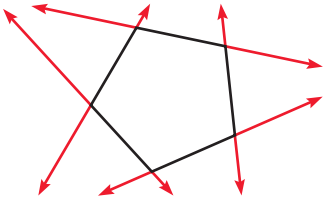


Solution

a. At least one extended side passes through the interior. So, the polygon is concave.

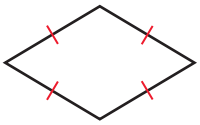


b. None of the extended sides pass through the interior. So, the polygon is convex.



A polygon is **equilateral** if all of its sides are congruent. A polygon is **equiangular** if all of its interior angles are congruent. A polygon is **regular** if it is both equilateral and equiangular.

Equilateral

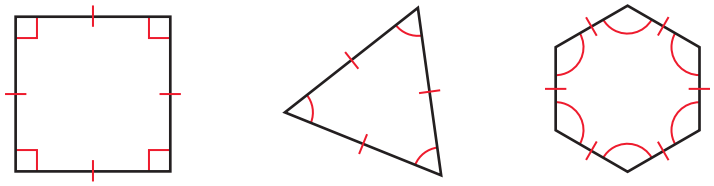


All sides are congruent.

Equiangular

All angles are congruent.

Regular Polygons



All sides are congruent and all angles are congruent.

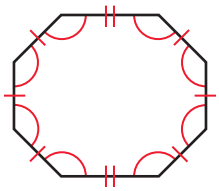
Student Help
CLASSZONE.COM

MORE EXAMPLES
More examples at classzone.com

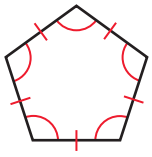
EXAMPLE 2 Identify Regular Polygons

Decide whether the polygon is regular. Explain your answer.

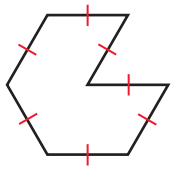
a.



b.



c.



Solution

a. Although the polygon is equiangular, it is not equilateral. So, the polygon is not regular.

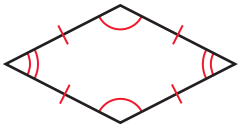
b. Because the polygon is both equilateral and equiangular, it is regular.

c. Although the polygon is equilateral, it is not equiangular. So, the polygon is not regular.

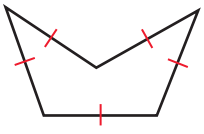
Checkpoint Describe Polygons

Decide whether the polygon is *convex* or *concave*. Then decide whether the polygon is regular. Explain your answer.

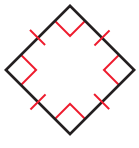
1.



2.



3.



8.1 Exercises

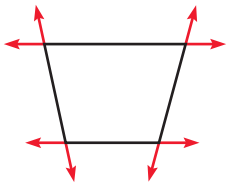
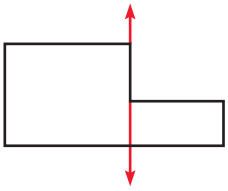
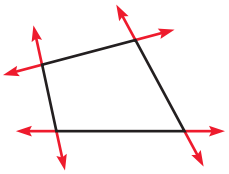
Guided Practice

Vocabulary Check

1. Sketch a *concave* polygon.
2. Describe the difference between an *equilateral* polygon and an *equiangular* polygon.
3. What is a *regular* polygon?

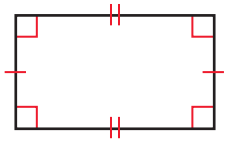
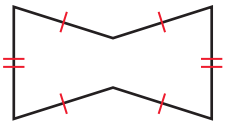
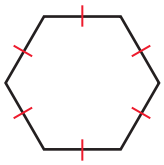
Skill Check

Decide whether the polygon shown in black is *convex* or *concave*.

4. 
5. 
6. 

Match the polygon with the description.

A. concave **B.** equilateral **C.** convex equiangular

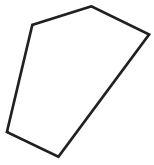
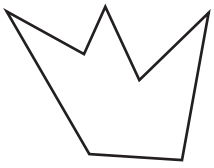
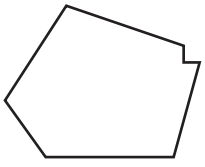
7. 
8. 
9. 

Practice and Applications

Extra Practice

See p. 689.

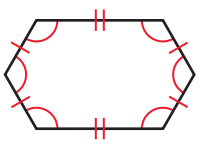
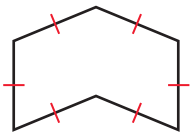
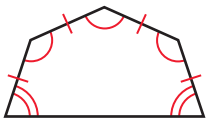
Convex and Concave Polygons **Decide whether the polygon is *convex* or *concave*.**

10. 
11. 
12. 

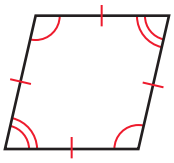
Equilateral and Equiangular Polygons **Decide whether the polygon is *equilateral*, *equiangular*, or *neither*.**

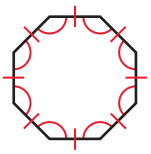
Homework Help

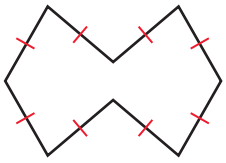
Example 1: Exs. 10–12
Example 2: Exs. 13–21

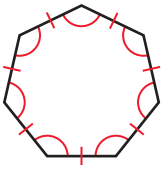
13. 
14. 
15. 

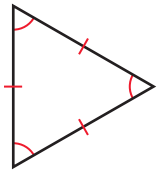
Regular Polygons **Decide whether the polygon is regular. Explain your answer.**

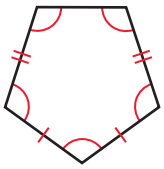
16. 

17. 

18. 

19. 

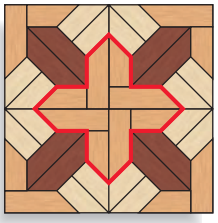
20. 

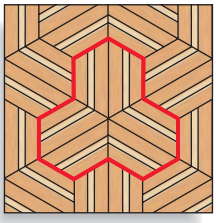
21. 

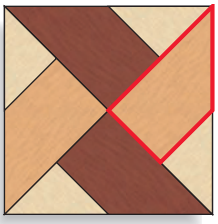
Link to Careers

FLOORING INSTALLERS are hired by flooring contractors to install, repair, or replace floor coverings such as carpet and hardwood.

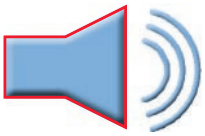
Flooring **Decide whether the polygon outlined in red in the floor pattern is *convex* or *concave*.**

22. 

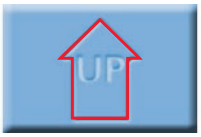
23. 

24. 

Web site Icons **Use the polygons outlined on the website icons shown below.**



A



B

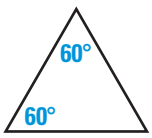
C

25. Which polygons are convex? Which polygons are concave?

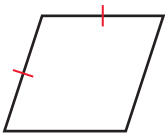
26. Do any of the polygons appear to be regular? Explain.

Logical Reasoning **Answer the question about the polygon.**

27. Is the triangle equiangular? Explain.



28. Is the parallelogram equilateral? Explain.



Student Help

LOOK BACK
To review the names given to polygons, see p. 304. For example, a *pentagon* has five sides.

Visualize It! **Decide whether it is possible to sketch a polygon that fits the description. If so, sketch it.**

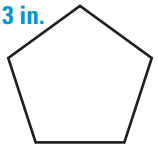
29. A concave pentagon

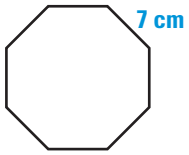
30. A convex quadrilateral

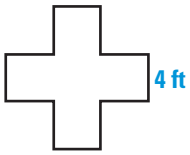
31. A polygon that is equilateral but not equiangular

32. A polygon that is equiangular but not equilateral

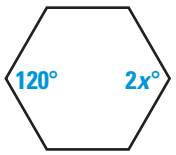
Finding Perimeters **In Exercises 33–35, the polygons are equilateral. Find the perimeter of the polygon.**

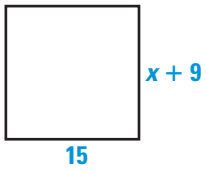
33. 

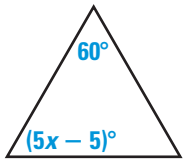
34. 

35. 

Using Algebra **In Exercises 36–38, the polygons are regular. Find the value of *x*.**

36. 

37. 

38. 

Standardized Test Practice

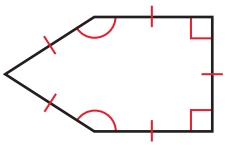
Multiple Choice **In Exercises 39 and 40, use the terms below.**

I. Equilateral **II.** Equiangular **III.** Convex **IV.** Concave

39. Which of the terms best describe the polygon below?

Ⓐ I and III Ⓑ III only

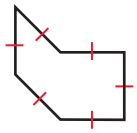
Ⓒ I and IV Ⓓ I, II, and III



40. Which of the terms best describe the polygon below?

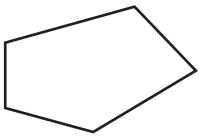
Ⓕ I and III Ⓖ I, II, and IV

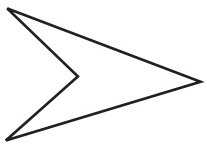
Ⓗ I and IV Ⓙ IV only

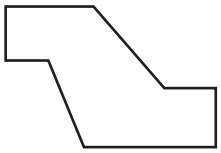


Mixed Review

Classifying Polygons **Decide whether the figure is a polygon. If so, tell what type.** *(Lesson 6.1)*

41. 

42. 

43. 

Algebra Skills

Evaluating Powers **Evaluate the expression.** *(Skills Review, p. 668)*

44. 5^2 **45.** $(-4)^2$ **46.** 6^3 **47.** 2^5

Evaluating Radicals **Evaluate. Give the exact value if possible. If not, approximate to the nearest tenth.** *(Skills Review, p. 668)*

48. $\sqrt{36}$ **49.** $\sqrt{1}$ **50.** $\sqrt{169}$ **51.** $\sqrt{5}$