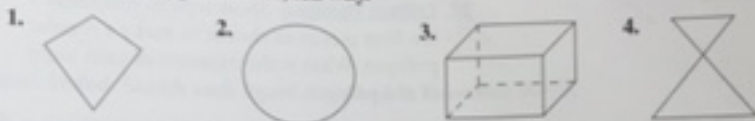


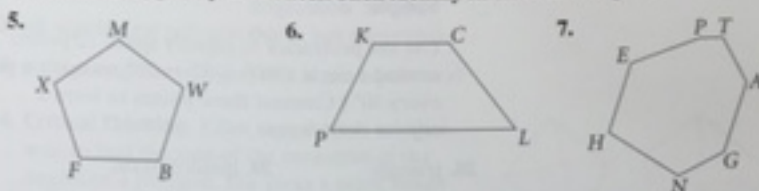
Work by Example

Example 1
(page 143)

Is the figure a polygon? If not, tell why.



Name each polygon by its vertices. Then identify its sides and angles.



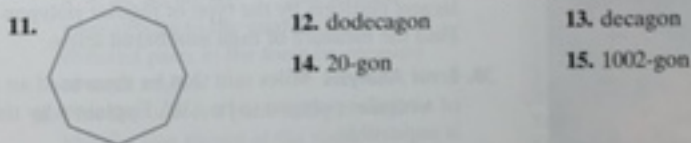
Example 2
(page 144)

Find a polygon in each photograph. Classify the polygon by its number of sides. Tell whether the polygon is convex or concave.



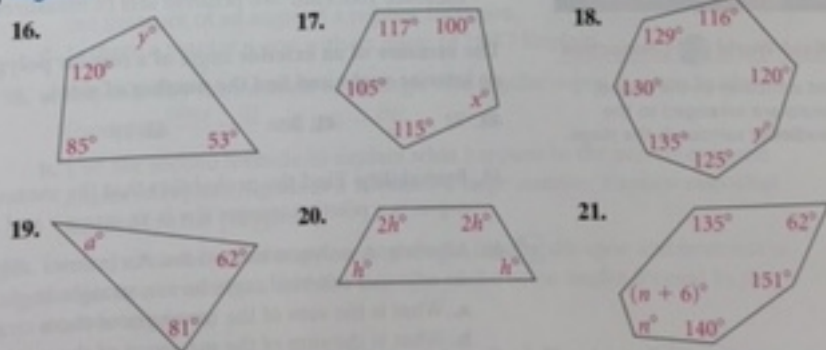
Example 3
(page 145)

Find the sum of the measures of the angles of each polygon.



Example 4 **Algebra**

Find the missing angle measures.



Example 5
(page 146)

Find the measures of an interior angle and an exterior angle of each regular polygon.

22. pentagon 23. dodecagon 24. 18-gon 25. 100-gon

Packaging The nut container at the right has the shape of a regular octagon. It fits in a square box. A cheese wedge fills each corner of the box.



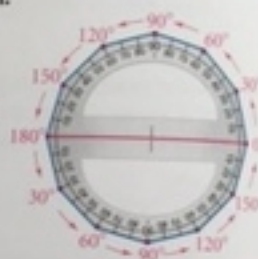
26. Find the measure of each angle of a cheese wedge.
27. **Critical Thinking** Show how to rearrange the four pieces of cheese to make a regular polygon. What is the measure of each angle of the polygon?

Apply Your Skills

Use a protractor. Sketch each type of regular polygon.

Sample: dodecagon

Use the protractor to equally space 12 points around a circle. ($360^\circ \div 12 = 30^\circ$, so mark a point every 30° .) Connect these points to form a regular dodecagon.

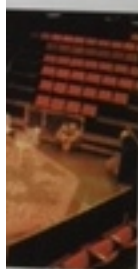


28. triangle 29. quadrilateral
30. hexagon 31. octagon

The sum of the measures of the angles of a polygon with n sides is given. Find n .

32. 180 33. 1080 34. 1980 35. 2880

36. To name each figure below, use as many of the letters A, B, C, \dots as you need, in order, starting with A . For each figure, how many letters do you need? With this labeling, how many different ways can you name the figure?
a. a triangle b. a quadrilateral c. a pentagon



37. **Stage Design** The diagram at the right shows platforms constructed for a theater-in-the-round stage. Describe the largest platform by the type of regular polygon it suggests. Find the measure of each numbered angle.



38. **Error Analysis** Miles said that he measured an angle of a regular polygon to be 130° . Explain why this result is impossible.
39. **Critical Thinking** A triangle has two congruent angles and an exterior angle with measure 100. Find two possible sets of measures for the angles of the triangle.

Connection

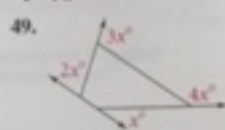
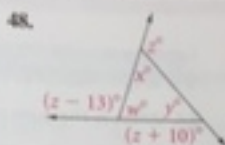
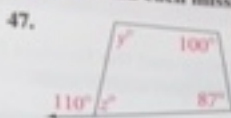
the-round, igned so the unds the stage.

The measure of an exterior angle of a regular polygon is given. Find the measure of an interior angle, and find the number of sides.

40. 72 41. 36 42. 18 43. 30 44. x

45. **Probability** Find the probability that the measure of an angle of a regular n -gon is a positive integer if n is an integer and $3 \leq n \leq 12$.
46. **Algebra** A polygon has n sides. An interior angle of the polygon and an adjacent exterior angle form a straight angle.
- What is the sum of the measures of the n straight angles?
 - What is the sum of the measures of the n interior angles?
 - Using your answers above, what is the sum of the measures of the n exterior angles?
 - What theorem do the steps above lead to?

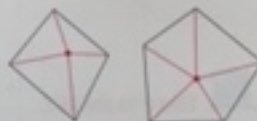
Algebra Find each missing angle measure. Then name the polygon.



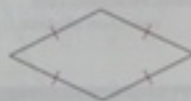
Open-Ended Sketch each figure described in Exercises 50–53.

50. a quadrilateral that is not equiangular
51. an equiangular quadrilateral that is not regular
52. an equilateral polygon that is not equiangular
53. an equiangular polygon that is not equilateral

54. **Critical Thinking** Ellen says she has another way to find the sum of the measures of the angles of a polygon. She picks a point inside the polygon, draws a segment to each vertex, counts the number of triangles, multiplies by 180, and then subtracts 360. Does her method work? Explain.



55. **Writing** Tell what you know about the figure at the right.



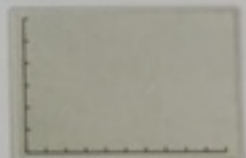
56. The measure of an interior angle of a regular polygon is three times the measure of an exterior angle of the same polygon. What is the name of the polygon?

Challenge

57. a. **Graphing Calculator** Find the measure of an angle of a regular n -gon for $n = 20, 40, 60, 80, \dots, 200$. Record your results to the nearest tenth as ordered pairs in the form $(n, \text{measure of each angle})$.

b. Plot the ordered pairs using a window like the one shown at the right.

- c. **Data Analysis** Based on the graph from part (b), make a statement about the measure of an angle of a regular 1000-gon.
- d. Is there a regular n -gon with an angle of 180° ? Explain.



Xmin = 0 Ymin = 160
Xmax = 200 Ymax = 184
Xscl = 20 Yscl = 4

58. a. Explain why the measure of an angle of a regular n -gon is given by the formulas $\frac{180(n-2)}{n}$ and $180 - \frac{360}{n}$.

b. Use the second formula to explain what happens to the measures in the angles of regular n -gons as n becomes a large number. Explain also what happens to the polygons.

59. Two rays bisect two consecutive angles of a regular decagon and intersect in the decagon's interior. Find the measure of the acute angles formed by the intersecting rays.

Draw, if possible, the concave quadrilateral described. If not possible, explain.

60. with two pairs of congruent adjacent sides
62. with three congruent sides

61. with two pairs of congruent opposite sides
63. with four congruent sides

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calculator
line at
iol.com
afe-2120

A Practice by ExampleExamples 1, 2
(pages 152, 153)**Algebra** Graph each line.

1. $y = x + 2$ 2. $y = 3x + 4$ 3. $y = \frac{1}{2}x - 1$ 4. $y = -\frac{3}{2}x + 2$

Algebra Graph each line using intercepts.

5. $2x + 6y = 12$ 6. $3x + y = 15$ 7. $5x - 2y = 20$
8. $6x - y = 3$ 9. $10x + 5y = 40$ 10. $1.2x + 2.4y = 2.4$

Example 3
(page 153)**Algebra** Write each equation in slope-intercept form and graph the line.

11. $y = 2x + 1$ 12. $y - 1 = x$ 13. $y + 2x = 4$
14. $8x + 4y = 16$ 15. $2x + 6y = 6$ 16. $\frac{3}{4}x - \frac{1}{2}y = \frac{1}{8}$

Example 4
(page 154)**Algebra** Write an equation in point-slope form of the line that contains the given points and has the given slope.

17. $P(2, 3)$, slope 2 18. $X(4, -1)$, slope 3 19. $R(-3, 5)$, slope -1
20. $A(-2, -6)$, slope -4 21. $V(6, 1)$, slope $\frac{1}{2}$ 22. $C(0, 4)$, slope 1

Example 5
(page 154)

Write an equation in point-slope form of the line that contains the given points.

23. $D(0, 5)$, $E(5, 8)$ 24. $F(6, 2)$, $G(2, 4)$ 25. $H(2, 6)$, $K(-1, 3)$
26. $A(-4, 4)$, $B(2, 10)$ 27. $L(-1, 0)$, $M(-3, -1)$ 28. $P(8, 10)$, $Q(-4, 2)$

Example 6
(page 154)

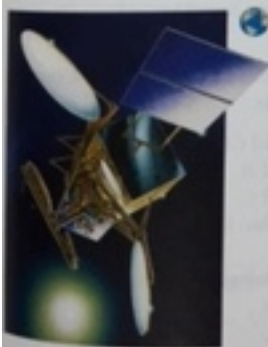
Write equations for (a) the horizontal line and (b) the vertical line that contain the given point.

29. $A(4, 7)$ 30. $Y(3, -2)$ 31. $N(0, -1)$ 32. $E(6, 4)$

B Apply Your Skills

Graph each line.

33. $x = 3$ 34. $y = -2$ 35. $x = 9$ 36. $y = 4$ 37. $y = 6$

**Real-World Connection**

ISAT's Advanced Communications Technology Satellite has a capacity for 200,000 phone calls.

38. Telephone Rates The equation $C = \$0.05m + \4.95 represents the cost (C) of a long distance telephone call of m minutes.

- What is the slope of the line?
- What does the slope represent in this situation?
- What is the y -intercept (C -intercept)?
- What does the y -intercept represent in this situation?

39. Error Analysis A classmate claims that having no slope and having a slope of 0 are the same. Is your classmate correct? Explain.

- What is the slope of the x -axis? Explain.
- Write an equation for the x -axis.
- What is the slope of the y -axis? Explain.
- Write an equation for the y -axis.

Identify the form of each equation. To graph the line, would you use the given form or change to another form? Explain.

42. $-5x - y = 2$ 43. $y = \frac{1}{4}x - \frac{2}{3}$ 44. $y + 2 = -(x - 4)$

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with.

Critical Thinking Graph three different lines having the given property. Describe how the equations of these lines are alike and how they are different.

45. The lines have slope 2.

46. The lines have y-intercept 2.

- Graphing Calculator** Graphing calculators use slope-intercept form (rather than standard form or point-slope form) to graph lines. Choose either Exercise 45 or Exercise 46 and write three equations for the lines you graphed. Use the **Y=** window of your graphing calculator to enter your equations. Press **GRAPH**. Do the graphs on the screen confirm the description you wrote previously?

Graph each pair of lines. Then find their point of intersection.

48. $y = -4, x = 6$ 49. $x = 0, y = 0$ 50. $x = -1, y = 3$ 51. $y = 5, x = 4$

- Building Access** By law, the maximum slope of a ramp in new construction is $\frac{1}{12}$. The plan for the new library shows a 3-ft height from the ground to the main entrance. The distance from the sidewalk to the building is 10 ft. Can you design a ramp for the library that complies with the law? Explain.

Connection

of $\frac{1}{12}$.
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- Writing** Describe the similarities of and the differences between the graphs of the equations $y = 5x - 2$ and $y = -5x - 2$.
- Open-Ended** Write equations for three different lines that contain the point $(5, 6)$.
- Critical Thinking** The x-intercept of a line is 2 and the y-intercept is 4. Use this information to write an equation for the line.
- The vertices of a triangle are $A(0, 0)$, $B(2, 5)$, and $C(4, 0)$.
- Write an equation for the line through A and B .
 - Write an equation for the line through B and C .
 - Compare the slopes and y-intercepts of the two lines.

Challenge

Do the three points lie on one line? Justify your answer.

57. $A(5, 6), B(3, 2), C(6, 8)$

58. $D(-2, -2), E(4, -4), F(0, 0)$

59. $G(5, -4), H(2, 3), I(-1, 10)$

60. $J(-2, 9), K(1, -1), L(4, -11)$

A line passes through the given points. Write an equation for the line in point-slope form. Then, rewrite the equation in standard form with integer coefficients.

61. $R(-2, 2), S(0, 8)$

62. $T(5, 5), W(7, 6)$

63. $X(2, 6), Y(5, 8)$