1.13 Extra problems

1. Draw the ray $\overrightarrow{WV}$ with a straight edge (or ruler). Measure VW in centimeters.

$\overset{\bullet}{V}$
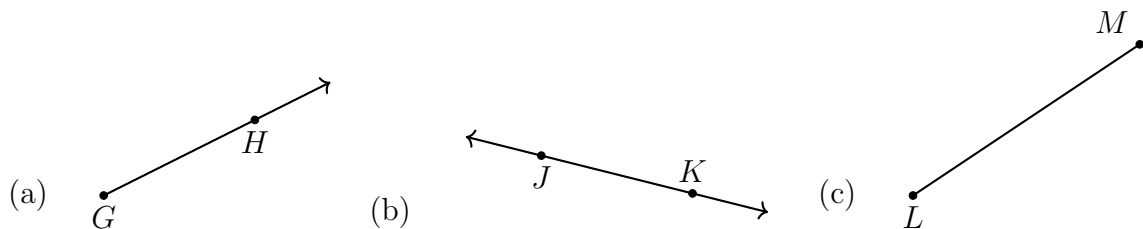
$\overset{\bullet}{W}$

2. Draw the ray $\overrightarrow{ST}$ with a straight edge (or ruler). Measure ST in centimeters.

$\overset{\bullet}{S}$

$\overset{\bullet}{T}$

3. A flat surface is a(n) _____.

4. Two line segments or angles of equal measure are _____.

5. Use conventional notation to write the names of the ray, line, and segment shown.
    .

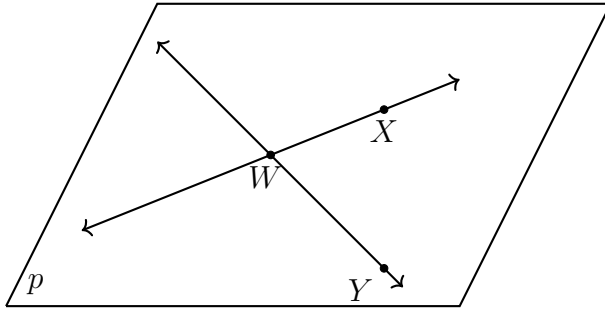(a) G ... H

(b) J ... K

(c) L ... M

6. Points that are all located on the same plane are _____.

7. Two rays with a common vertex compose a(n) _____.

8. Points that are all located on the same line are _____.

9. Use conventional notation to write the names of the ray, line, and segment shown.
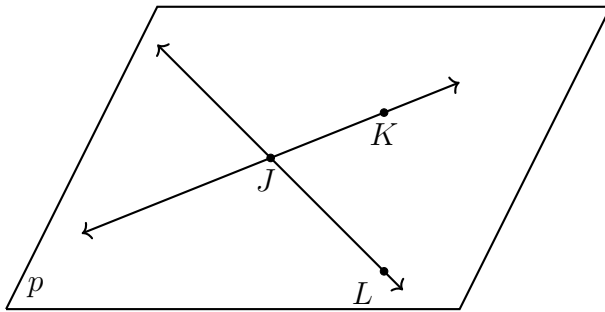   .

(a) A ... B

(b) P ... Q

(c) S ... T
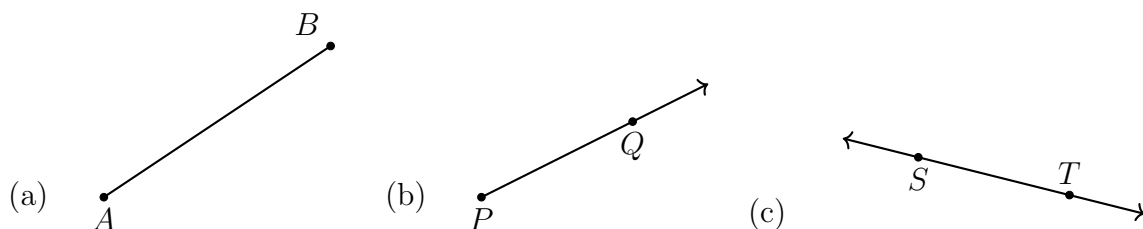
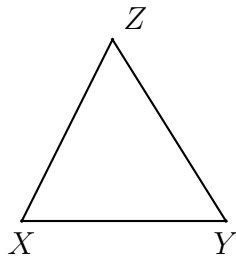10. Two line segments or angles of equal measure are _____ .

11. Identify three points in the given plane.

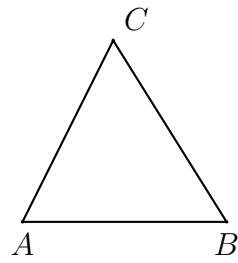12. Identify two line segments in the given plane.

13. Given isosceles $\triangle XYZ$ with $\overline{XY} \cong \overline{XZ}$. On the diagram mark the congruent line segments with tick marks.
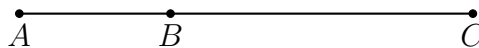

14. Given isosceles $\triangle ABC$ with $\overline{AB} \cong \overline{AC}$. On the diagram mark the congruent line segments with tick marks.
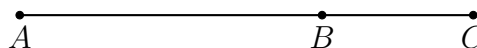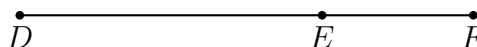
$$\triangle ABC$$

15. Given $\overline{ABC}$, $AB = 29$, and $BC = 63$. Find AC.

A   B   C
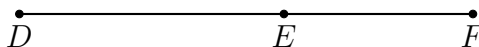
16. Given $\overline{ABC}$, $AB = 84$, and $AC = 116$. Find BC.

A   B   C

17. Given $\overline{DEF}$, $DE = 7\frac{1}{3}$, and $EF = 3\frac{1}{6}$. Find DF.

D   E   F

18. Given $\overline{DEF}$, $DE = 5\frac{1}{14}$, and $DF = 9\frac{4}{7}$. Find EF. State as a fraction.

D   E   F

19. Find the distance between M and N.

$M(-4)$ $N(3)$

$-5 \quad -4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4$

20. Given $\overline{DEFG}$, $DE = 3\frac{1}{4}$, $EF = 6\frac{1}{4}$, and $FG = 1\frac{3}{4}$. (diagram not to scale)

Find DG, expressed as a fraction, not a decimal.

D   E   F   G

21. Given $\overleftrightarrow{RS}$ as shown on the number line, with $R = -2.8$ and $S = 4.4$.

R S

$-4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6$

The points T and U trisect $\overline{RS}$. Find their values, and mark and label them on the number line.

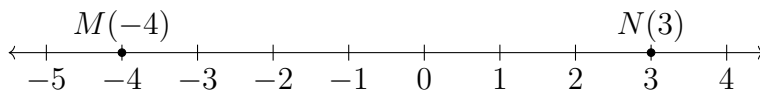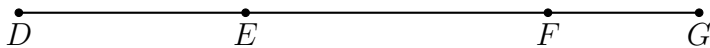22. Given $\overline{ABC}$, $AB = 84$, $AC = 116$.

    Find BC.

23. Given $\overline{DEF}$, $DE = 3\frac{1}{3}$, and $EF = 4\frac{1}{6}$.
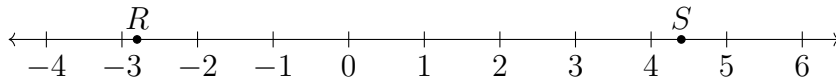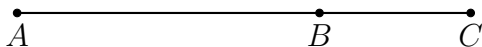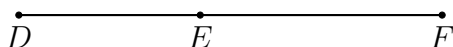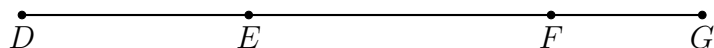
    Find DF.

24. Given $\overline{DEFG}$, $DE = 3\frac{1}{4}$, $EF = 6\frac{1}{4}$, and $FG = 1\frac{3}{4}$. (diagram not to scale)

    Find DG, expressed as a fraction, not a decimal.
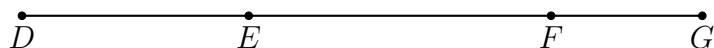

25. Given $\overline{DEFG}$, $DE = 3\frac{1}{4}$, $EF = 6\frac{1}{4}$, and $FG = 1\frac{3}{4}$. (diagram not to scale)

    Find DG, expressed as a fraction, not a decimal.

26. Given $P(-2.4)$ and $Q(1.8)$, as shown on the number line.

    Find the length of the line segment $\overline{PQ}$. State an equation for full credit.

27. Given $P(-2.4)$ and $Q(1.8)$, as shown on the number line.

    Find the length of the line segment $\overline{PQ}$. State an equation for full credit.

28. Given $\overleftrightarrow{PQ}$ as shown on the number line. Find PQ.

$$\begin{array}{c} \quad P \qquad\qquad\qquad\qquad Q \\ \leftarrow \!\!\! \underset{-4}{|} \ \underset{-3}{|} \ \underset{-2}{\bullet} \ \underset{-1}{|} \ \underset{0}{|} \ \underset{1}{|} \ \underset{2}{|} \ \underset{3}{|} \ \underset{4}{\bullet} \ \underset{5}{|} \ \underset{6}{|} \!\!\! \rightarrow \end{array}$$

29. Given $\overleftrightarrow{RS}$, with $R = 0.7$ and $S = 5.3$. Find RS, showing the formula.

$$\begin{array}{c} \qquad\qquad\qquad\qquad R \qquad\qquad\qquad S \\ \leftarrow \!\!\! \underset{-4}{|} \ \underset{-3}{|} \ \underset{-2}{|} \ \underset{-1}{|} \ \underset{0}{|} \ \underset{1}{\bullet} \ \underset{2}{|} \ \underset{3}{|} \ \underset{4}{|} \ \underset{5}{\bullet} \ \underset{6}{|} \!\!\! \rightarrow \end{array}$$

30. Given $\overline{DEFG}$, $DE = 3\frac{1}{4}$, $EF = 6\frac{1}{4}$, and $FG = 1\frac{3}{4}$. (diagram not to scale)
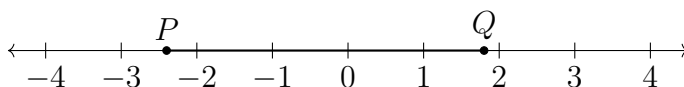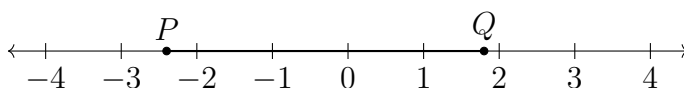
    Find DG, expressed as a fraction, not a decimal.

$$\bullet\!\!-\!\!\!\!\underset{D}{}\!\!\!\!-\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{E}{}\!\!\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{F}{}\!\!\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{G}{}$$
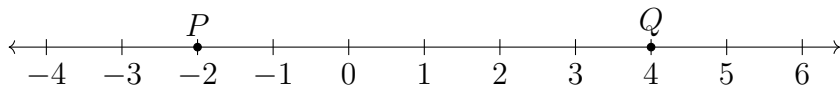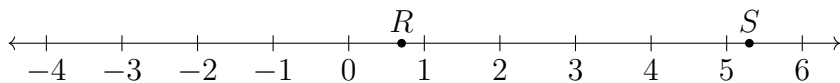
31. Given $P(-2.4)$ and $Q(1.8)$, as shown on the number line.

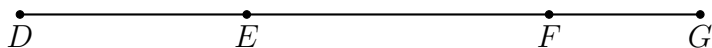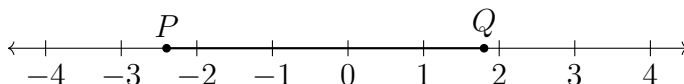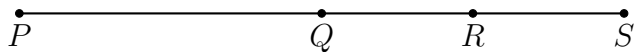   Find the length of the line segment $\overline{PQ}$. State an equation for full credit.
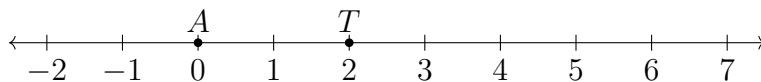
$$\begin{array}{c} \qquad\qquad P \qquad\qquad\qquad\qquad Q \\ \leftarrow \!\!\! \underset{-4}{|} \ \underset{-3}{|} \ \underset{-2}{\bullet} \ \underset{-1}{|} \ \underset{0}{|} \ \underset{1}{|} \ \underset{2}{\bullet} \ \underset{3}{|} \ \underset{4}{|} \!\!\! \rightarrow \end{array}$$

32. Given $\overline{PQRS}$. Q is the midpoint of $\overline{PS}$, and R bisects $\overline{QS}$.

    If $PR = 4\frac{1}{2}$ find PS. Justify your answer.

$$\bullet\!\!\!\!\underset{P}{}\!\!\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{Q}{}\!\!\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{R}{}\!\!\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{S}{}$$
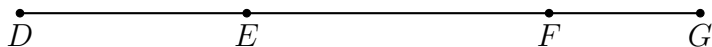
33. Given $A(0)$ and $T(2)$, as shown on the number line. T is one of the points that trisects $\overline{AB}$.

    Find B. For full credit, find both solutions.

$$\begin{array}{c} \qquad\qquad\qquad A \qquad\quad T \\ \leftarrow \!\!\! \underset{-2}{|} \ \underset{-1}{|} \ \underset{0}{\bullet} \ \underset{1}{|} \ \underset{2}{\bullet} \ \underset{3}{|} \ \underset{4}{|} \ \underset{5}{|} \ \underset{6}{|} \ \underset{7}{|} \!\!\! \rightarrow \end{array}$$
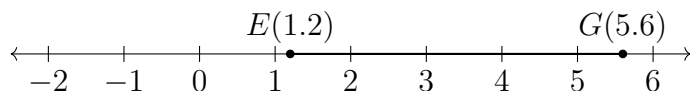
34. Given $\overline{DEFG}$, $DE = 1\frac{2}{5}$, $EF = 2\frac{3}{10}$, and $FG = \frac{4}{5}$. (diagram not to scale)

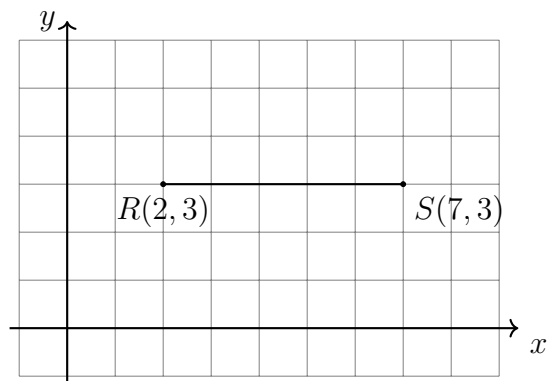   Find DG, expressed as a fraction, not a decimal.

$$\bullet\!\!\!\!\underset{D}{}\!\!\!\!-\!\!-\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{E}{}\!\!\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{F}{}\!\!\!\!-\!\!-\!\!\bullet\!\!\!\!\underset{G}{}$$

35. Given points on the number line $E(1.2)$ and $G(5.6)$ as shown. Find the midpoint F of $\overline{EG}$. Mark it on the number line and label it as an ordered pair.

$$E(1.2) \qquad\qquad G(5.6)$$

```
←—+——+——+——+——+——+——+——+——+→
  −2  −1   0   1   2   3   4   5   6
```

36. The horizontal line segment $\overline{RS}$ is plotted on the coordinate plane with $R(2,3)$ and $S(7,3)$.

    Find length RS, showing the calculation.

37. The vertical line segment $\overline{PQ}$ is plotted on the coordinate plane with $P(3,5)$ and $Q(3,1)$.

    Find the length PQ.

   Show the calculation, including the absolute value bars.
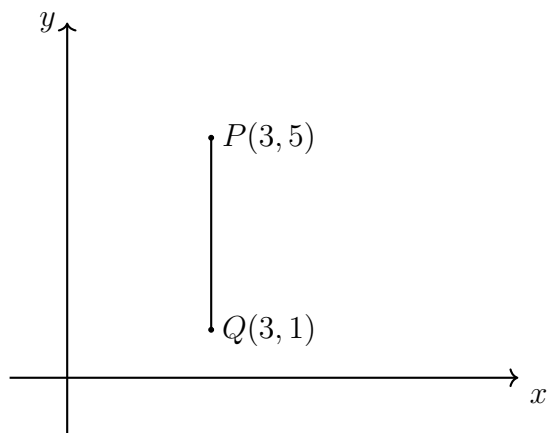
Do Not Solve! Draw and label the situation on the right, model with an equation to the left, and circle where it states what to find.

38. Given $\overline{ABC}$, with $AB = 2x - 7$, $BC = 3x - 3$, and $AC = 15$. Find AB.

39. Given that K bisects $\overline{JL}$. $JK = 3x + 8$, $KL = 17$. Find x.

40. The point M is the midpoint of $\overline{UV}$, $UM = x + 7$, and $MV = 2x + 1$. Find UV.

41. The points P, Q, and R are collinear, with $PQ = 6x + 16$ and $PR = 42$. $\overline{QR}$ is half the length of $\overline{PQ}$. Find x.

42. A triangle has an area of 68 square centimeters. Its height is 16 centimeters. Find the length of its base.

43. A triangle has an area of 75 square centimeters. Its height is 12 centimeters. Find the length of its base.

44. The rectangle $BECA$ has an area of 77, with length $BE = 11$.

   (a) Write an equation with the unknown w as the width of the rectangle.

    (b) Solve.

    A ●————————————● C

    | ?

    B ●————————————● E
              11
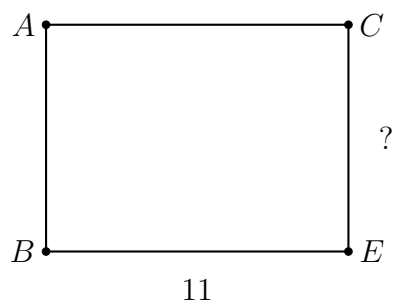
45. Find the area of rectangle $ABCD$ having length $l = 12$ and width $w = 4\frac{1}{2}$. Start with a formula of this form, substituting the given values:

    $A = l \times w$

    D ————————— C
    | | $4\frac{1}{2}$
    A —————————— B
          12
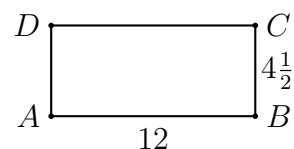
46. Rectangle $ABCD$ has area $A = 15$ and base $b = 6$ but unknown height. Write an equation then solve. Start with this form (for the unknown, use h, x, or BC) and state your answer as a fraction:

    $A = b \times h = 15$

    D ————————— C
    | A = 15 | ?
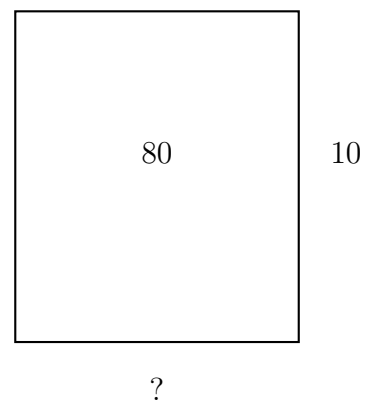   A —————————— B
          6
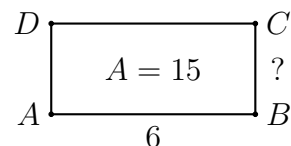
47. Find the base of a rectangle with area $A = 16.8$ and height $h = 4.8$, expressed as a decimal. First write an equation substituting the given values in the area formula.
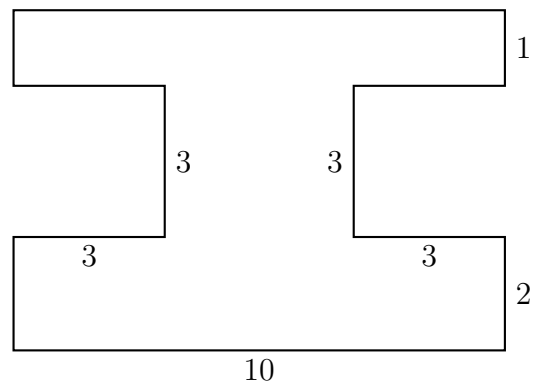
$A = 16.8$ | 4.8

x
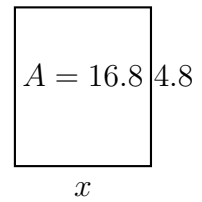
48. Find the length of the base of a rectangle with area $A = 80$ and height $h = 10$. Start with the form (use b or x):
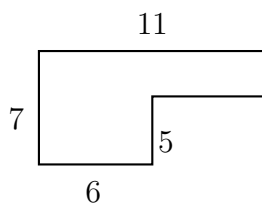
$A = b \times h = 80$

80 | 10

?

49. The shape shown below is composed of straight lines and right angles, with some lengths as marked. Find the perimeter of the figure. Show your work.
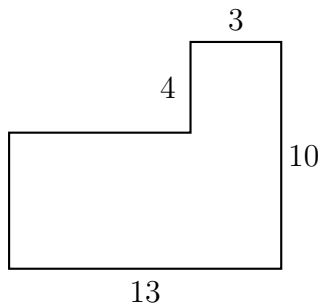
1

3   3

3   3

2

10

50. Find the area and perimeter of the shape shown below. Mark the missing side lengths first. All angles are 90°. *(not drawn to scale)*

11

7

5

6

51. Find the area and perimeter of the shape shown below. Mark the missing side lengths first. All angles are 90°. *(not drawn to scale)*
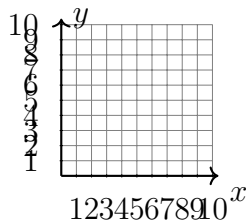

52. On the grid below, accurately draw and label two adjacent squares, one with a side length of 4 cm, the other with a side length of 3 cm. The grid is in centimeters.

Find the area A and perimeter P of combined shape.
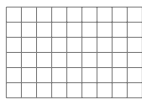
53. On the graph, draw polygon ABCDEF with vertices A(1, 1), B(1, 4), C(3, 4), D(3, 7), E(8, 7), and F(8, 1). Find the perimeter and the area of the polygon.


54. Draw and label a triangle $\triangle ABC$ with base $\overline{AB}$ 8 centimeters long and altitude of 5 centimeters. (show the altitude as a dotted line, and make sure it is perpendicular to the base)
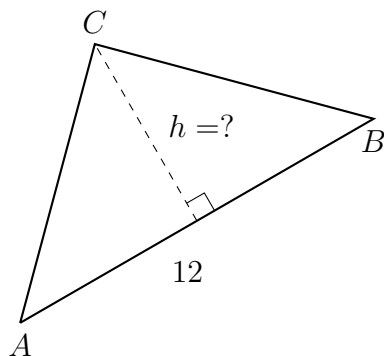
55. Find the area of $\triangle ABC$ shown below (not actual size) with $m\angle C = 90°$ and the lengths of the triangle's sides as $a = 3$, $b = 4$, and $c = 5$.
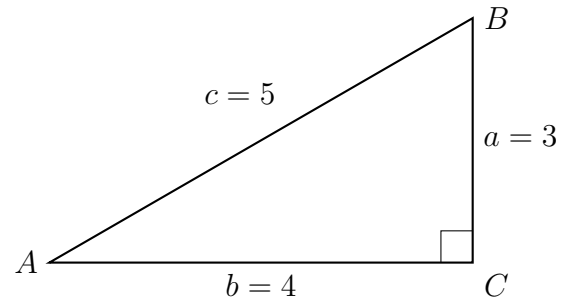
56. Find the area of $\triangle ABC$. The altitude h of the triangle is $4\frac{3}{4}$ centimeters and the base $AB = 9\frac{1}{2}$ cm. (diagram not to scale)
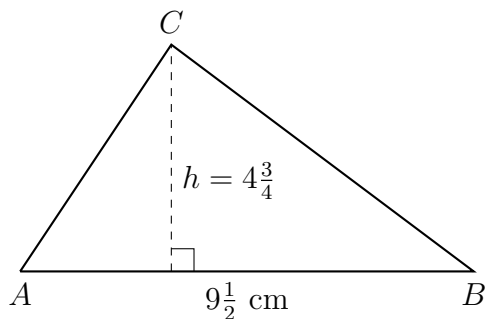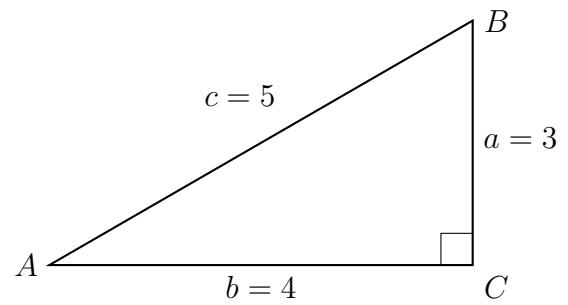

57. One side of the $\triangle ABC$ has a length $AB = 12$. The triangle's area is 60. Find the length of the altitude h of the triangle to vertex C and perpendicular to side $\overline{AB}$.

58. Find the area of $\triangle ABC$ shown below (not actual size) with $m\angle C = 90°$ and the lengths of the triangle's sides as $a = 3$, $b = 4$, and $c = 5$.

$$B$$

$$c = 5$$

$$a = 3$$

$$A$$

$$b = 4$$

$$C$$

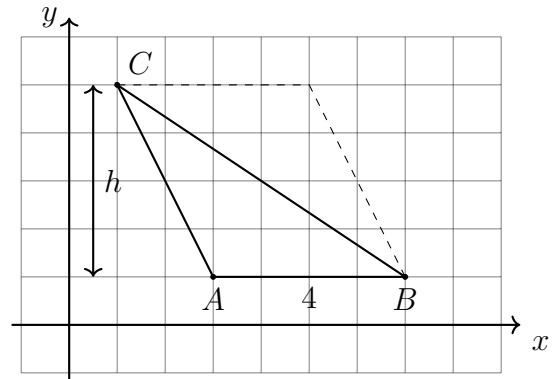59. A parallelogram is shown on the x-y plane having a base $b = 4$ and height $h = 3$.

Find its area, showing the calculation.
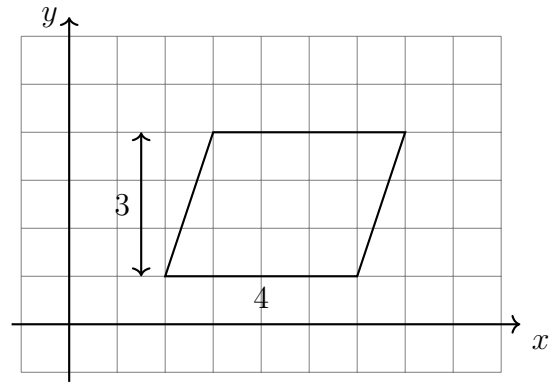
60. The $\triangle ABC$ is shown below with $A(3,1)$, $B(7,1)$, and $C(1,5)$. The length of the base of the triangle is $AB = 4$.
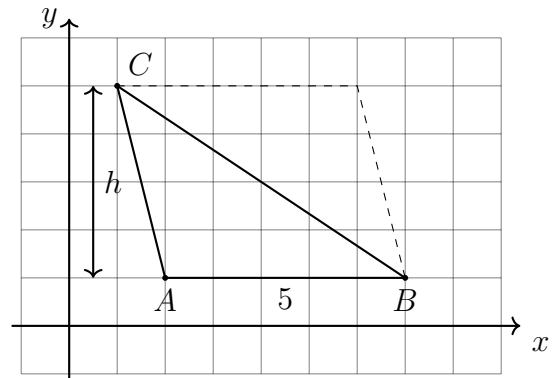
   (a) Find the height h.

   (b) Find the triangle's area, showing the calculation.

61. The $\triangle ABC$ is shown below with $A(2,1)$, $B(7,1)$, and $C(1,5)$. The length of the base of the triangle is $AB = 5$.
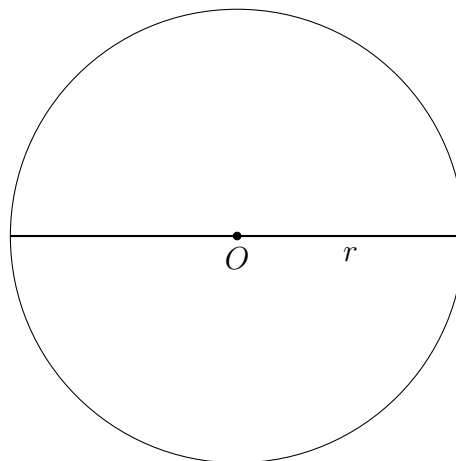
   (a) Find the height h.

   (b) Find its area, showing the calculation.

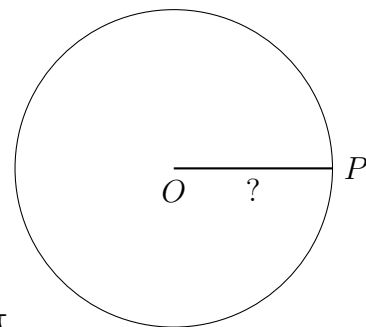62. Find the radius and circumference of circle O with diameter $D = 15$ centimeters.

    (a) Write down the radius.

    (b) State the circumference in terms of π

    (c) Express the circumference as a decimal, rounding to the *nearest hundredth*.

63. Given circle O with area $A = 64\pi$ square centimeters.

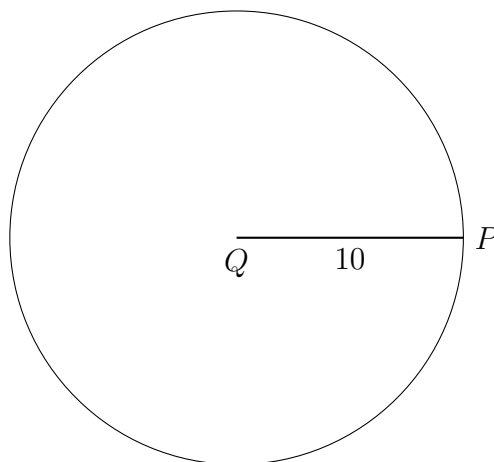   Find the radius of circle, OP. Start with the formula

    $$A = \pi r^2 = 64\pi$$

64. Find the area of the given circle Q with radius $r = 10$ centimeters.
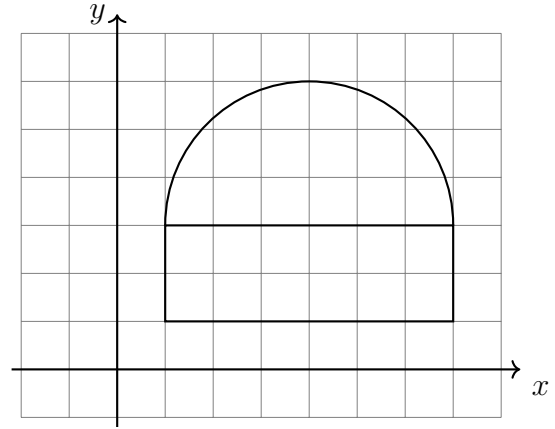
    Start with the formula

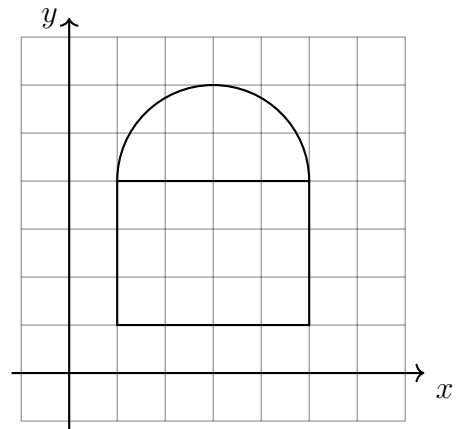 $$A = \pi r^2$$

    (a) State the area in terms of π

    (b) Now round to the nearest hundredth

65. Find the area of the shape shown below composed of a rectangle and circular cap. Leave your answer as an exact value in terms of π.
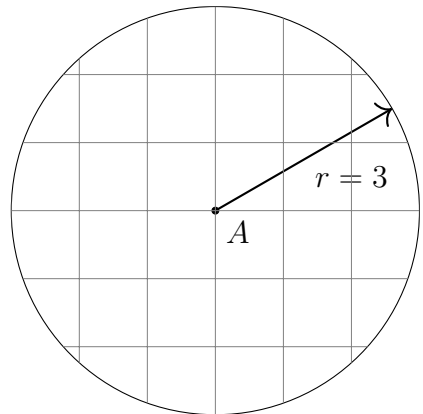

66. Find the *perimeter* of the shape shown below composed of a rectangle and circular cap. Leave your answer as an exact value in terms of π.

67. Given the circle A with radius $r = 3$. Leave exact answers, in terms of π.

   (a) Find the circumference of circle A.

   (b) Find the area of the circle.

Challenge problems

68. A square is partitioned into two rectangles. The sum of the perimeters of the two rectangles is 36. Find the area of the square.