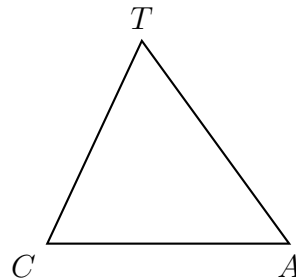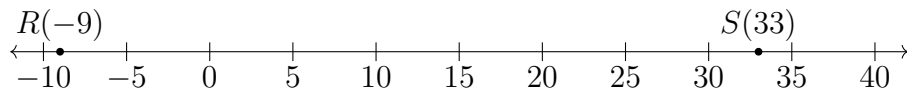## 1.12 Test: Length and area

Show units if given. Show calculation as an equation, starting with a capitalized variable.

Line segments, length, number lines
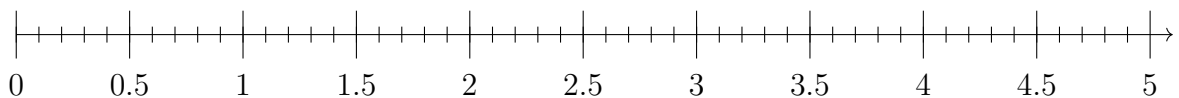
1. Given isosceles $\triangle CAT$ with $\overline{CA} \cong \overline{AT}$. On the diagram mark the congruent line segments with tick marks.
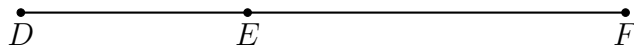
T

C $\qquad$ A

2. Points $R = -9$ and $S = 33$ are shown below. Find RS.

$R(-9)$ $\qquad\qquad\qquad\qquad\qquad\qquad$ $S(33)$

$-10 \quad -5 \quad 0 \quad 5 \quad 10 \quad 15 \quad 20 \quad 25 \quad 30 \quad 35 \quad 40$

3. Mark and label irrational number $\pi = 3.14159265358...$ on the number line below.

$0 \qquad 0.5 \qquad 1 \qquad 1.5 \qquad 2 \qquad 2.5 \qquad 3 \qquad 3.5 \qquad 4 \qquad 4.5 \qquad 5$

4. Given $\overline{DEF}$, $DE = 5\frac{3}{4}$, and $EF = 8\frac{1}{2}$. Find DF as a mixed fraction.
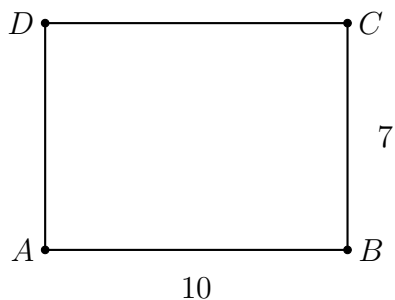
$D \qquad\qquad E \qquad\qquad\qquad\qquad F$

5. Measure and mark the lengths of the sides of the rectangle in centimeters. Find its perimeter.
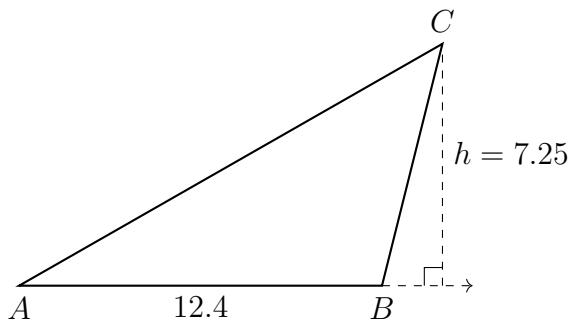
Perimeter and area

6. The rectangle $ABCD$ with dimensions $AB = 10$ inches, $BC = 7$ in.

(a) Find the area of the rectangle.

(b) Find its perimeter.

7. The side $\overline{AB}$ of triangle ABC is extended and an altitude to the vertex C is drawn, as shown below. The triangle's height is $h = 7.25$ and its base measures $AB = 12.4$. Find the area of the triangle.

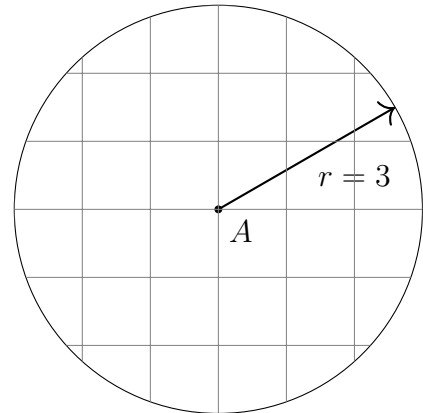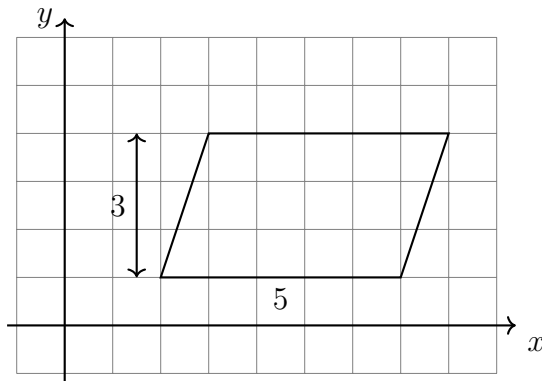8. Find the area of the compound rectangular shape. Use area formulas for full credit.
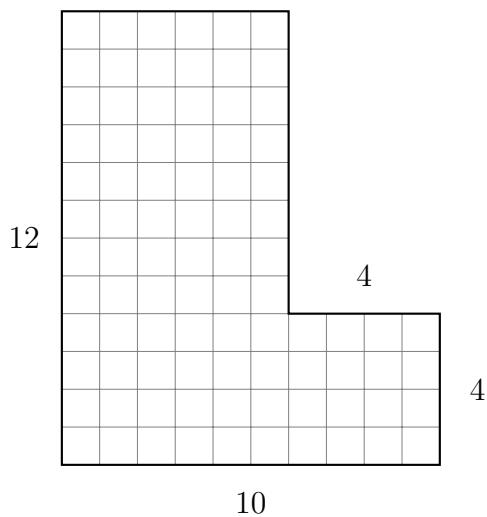
9. Given the circle A with radius $r = 3$. Leave exact answers, in terms of π.
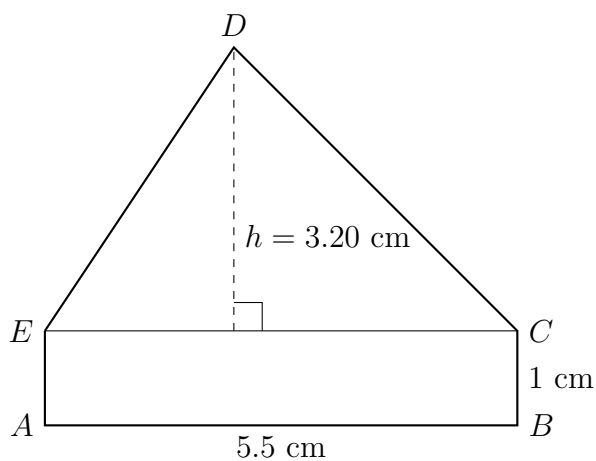
    (a) Find the circumference of circle A.

    (b) Find the area of the circle.

10. Find the area of the parallelogram shown with a base $b = 5$ and height $h = 3$.

11. Find the area of shape $ABCDE$ below, a triangle on a rectangle. The altitude h of the triangle is 3.20 centimeters and the base $EC = 5.5$ cm. The rectangle is 1 cm tall. (diagram not to scale)

Precision, percent error

12. Round each value to the *nearest hundredth.*

    (a) $\frac{2}{3}$ (b) $\sqrt{5}$

13. Round each value to the nearest thousand.

    (a) 7,917.5 miles   (b) 2,159.1 miles

        (diameter of the earth)   (diameter of the moon)

14. Convert each measure, showing the conversion factor and units.

    (a) Find the length in miles of a 10K race (10 kilometers).

    (b) Find the height in inches of a person 1.8 meters tall.

15. Find the number of minutes in a day.

16. Find the percent error for each approximation.

    (a) $7.753 \approx 8$ billion   (b) $4.571 \approx 4\frac{1}{2}$ billion years
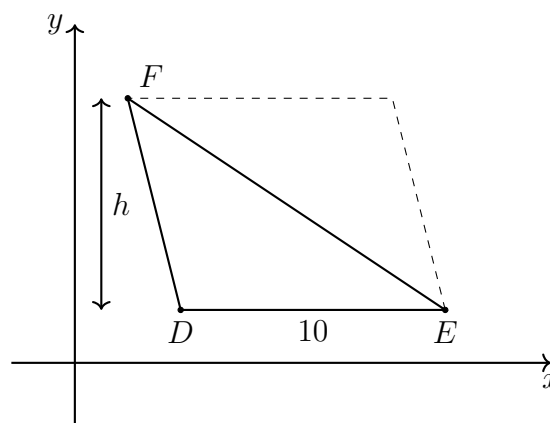
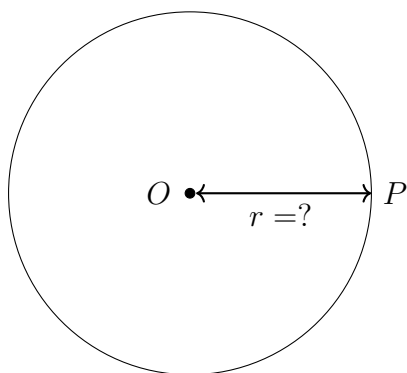   (population of the world)   (age of the solar system, NASA)

Modeling situations and solving with algebra

17. The $\triangle DEF$ has an area $A = 30$ and base $DE = 10$. Find its height h.

Start with $A = \dfrac{1}{2}bh = 30$

18. Given circle O with area $A = 121\pi$ square centimeters. Find the radius, OP.
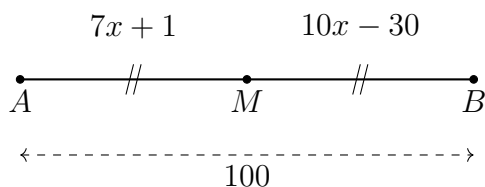
Start with the formula

$$A = \pi r^2 = 121\pi$$

19. A rectangle has an area of 44 square inches. Its width is 4 inches. Find its length.

20. Given that point M bisects $\overline{PQ}$, $PM = 7x + 1$, $MQ = 10x - 30$, $PQ = 100$. Circle True or False for each equation.

(a) T   F $7x + 1 = 100$

(b) T   F $7x + 1 = 10x - 30$

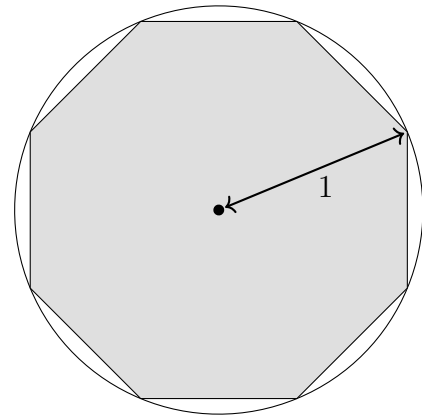(c) T   F $(7x + 1) + (10x - 30) = 100$

(d) T   F $2(10x - 30) = 100$

21. The perimeter of a square classroom is approximately 80 feet. Find its area.

22. Below an octagon is inscribed in a circle, the Archimedes used to approximate π. The area of the octagon is $A_{octagon} \approx 2.8284$.

    (a) Find the area of the circle with $r = 1$.

    (b) Find the percent error of Archimede's approximation using a hexagon.

23. The total area of the figure shown is $A = 55$ square centimeters. The triangle with a base of 2 cm is adjacent to a rectangle with a 10 cm base. Find the height.
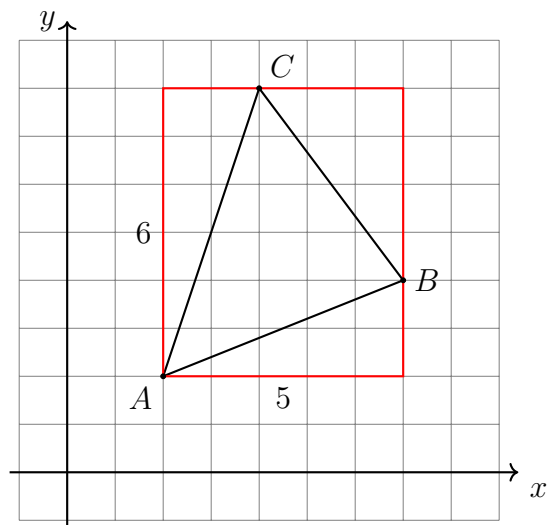

$h = ?$

2   10
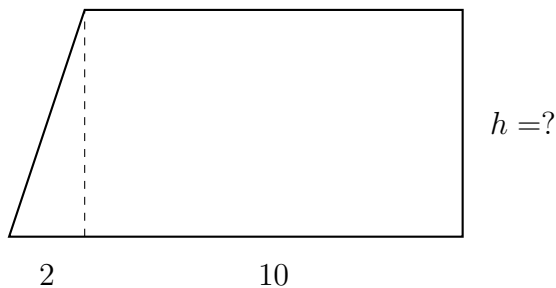
24. Spicy: Find the area of the $\triangle ABC$, shown below, with $A(2, 2)$, $B(7, 4)$, and $C(4, 8)$.

   (a) First find the area of the red rectangle
       with sides $b = 5$, $h = 6$.

   (b) Find the area of the three triangles
       surrounding $\triangle ABC$ in the rectangle.

   (c) Subtract their areas from the rectan-
   gle to find $A_{\triangle ABC}$

Extra problems

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

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

27. 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.
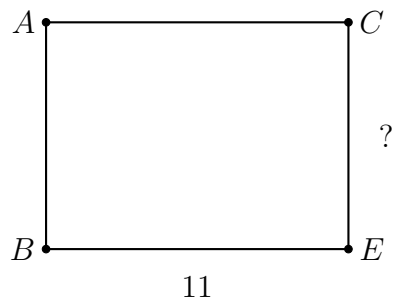
28. Find the area and perimeter of the shape shown below. Mark the missing side lengths
    first. All angles are 90°.   *(not drawn to scale)*

11

7

5

6
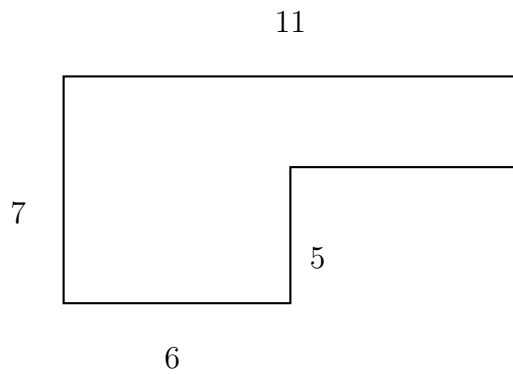
29. Find the area and perimeter of the shape shown below. Mark the missing side lengths first. All angles are 90°. *(not drawn to scale)*

3

4

10

13
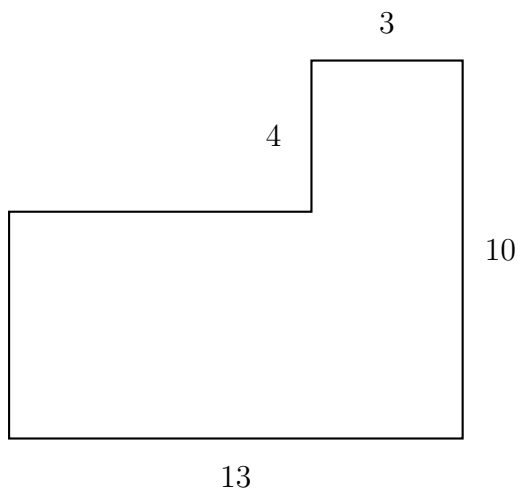
30. Find the area of $\triangle ABC$ shown below (not actual size) with $m\angle C = 90°$ and the lengths of the triangle's sides as $a = 3$, $b = 4$, and $c = 5$.

B

$c = 5$

$a = 3$

A

$b = 4$

C
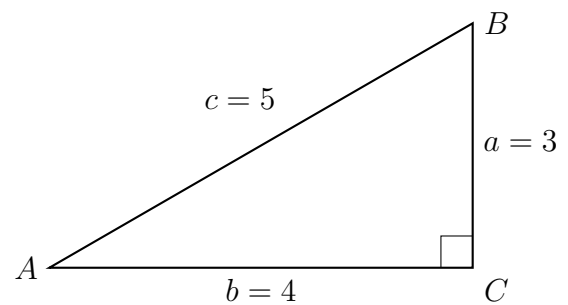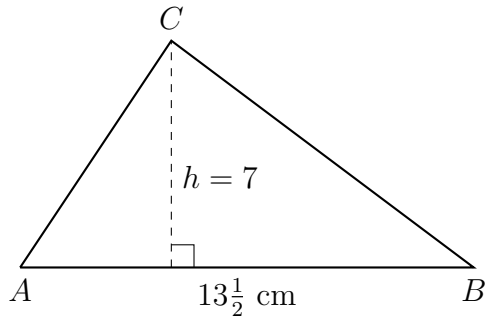
31. Find the area of $\triangle ABC$. The altitude h of the triangle is 7 centimeters and the base

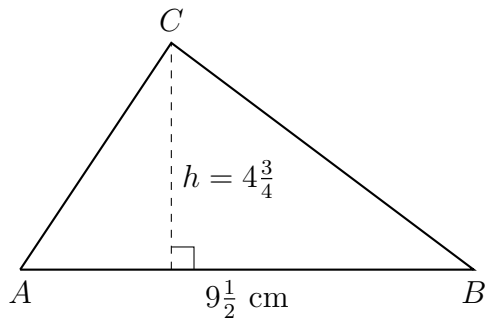$AB = 13\frac{1}{2}$ cm. (diagram not to scale)

C

$h = 7$
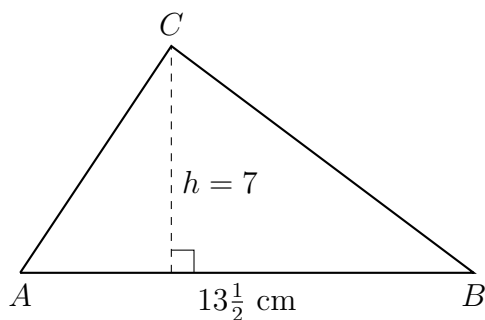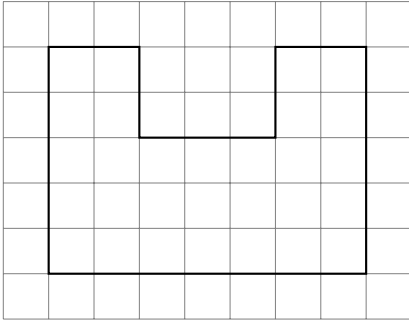
A $13\frac{1}{2}$ cm   B

32. 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)

C

$h = 4\frac{3}{4}$

A $9\frac{1}{2}$ cm   B

33. Find the area of $\triangle ABC$. The altitude h of the triangle is 7 centimeters and the base $AB = 13\frac{1}{2}$ cm. (diagram not to scale)

C

$h = 7$

A $13\frac{1}{2}$ cm   B

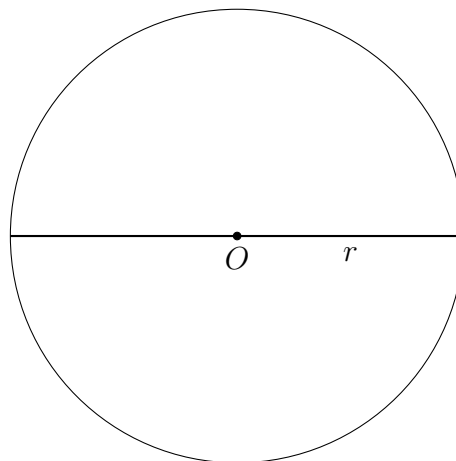34. Find the area A of the shape shown below in terms of unit squares.

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

    (a) Write down the radius.

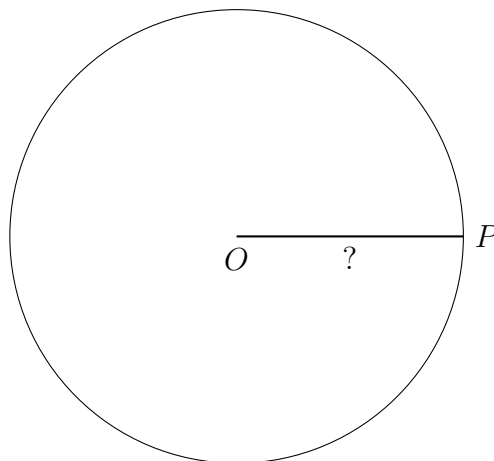   (b) State the circumference in terms of π

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

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

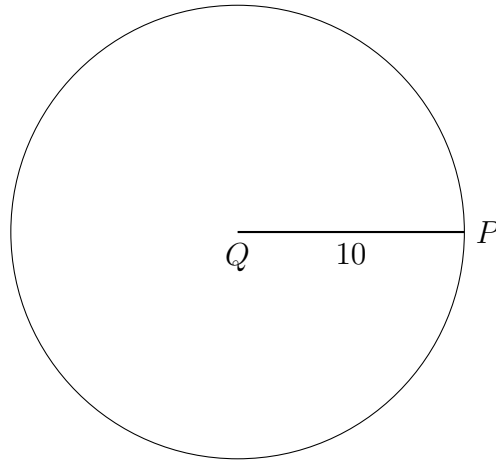   Find the radius of circle, OP. Start with the formula

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

37. Find the area of the given circle Q with radius $r = 10$ centimeters.

Start with the formula

$A = \pi r^2$

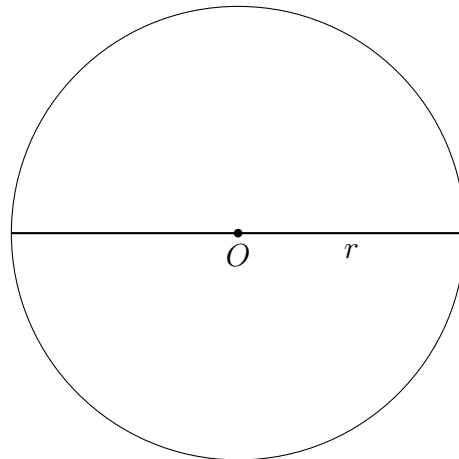(a) State the area in terms of π

(b) Now round to the nearest hundredth

38. Find the radius and circumference of circle O with diameter $D = 14$ centimeters.

(a) Write down the radius.
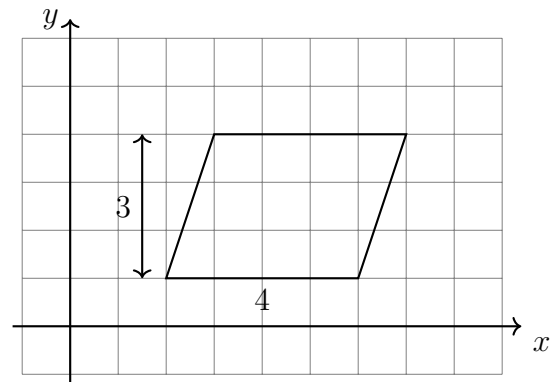
(b) State the circumference in terms of π

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

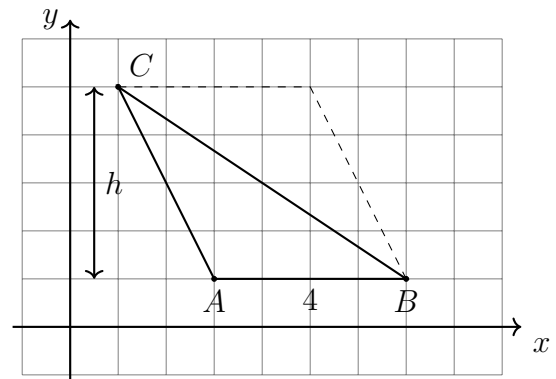39. A parallelogram is shown on the x-y plane having a base $b = 4$ and height $h = 3$.

    Find its area, showing the calculation.

40. 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 $AB = 4$.
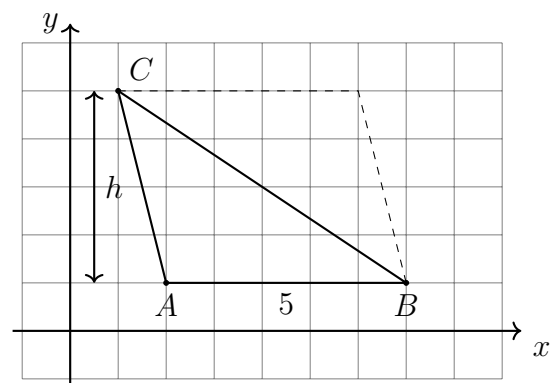
    (a) Find the height h.

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

41. 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 $AB = 5$.
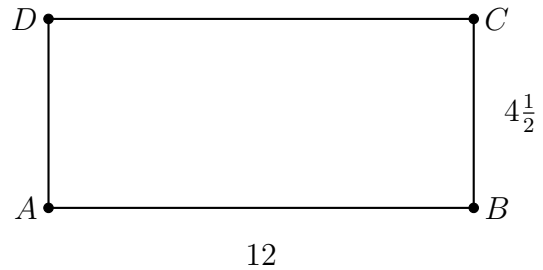
    (a) Find the height h.

    (b) Find its area, showing the calculation.

42. 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

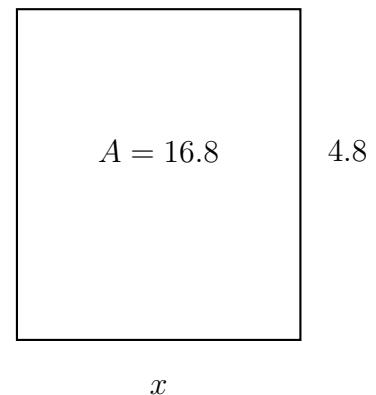$4\frac{1}{2}$

A ●————————————● B

12

43. 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
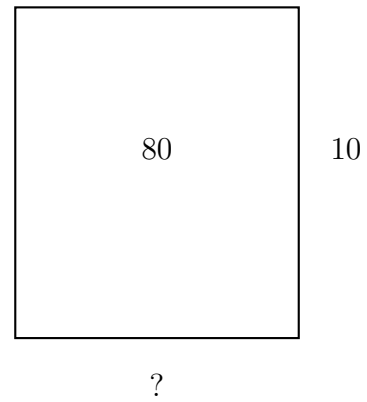
$A = 15$?

A ●————————————● B

6
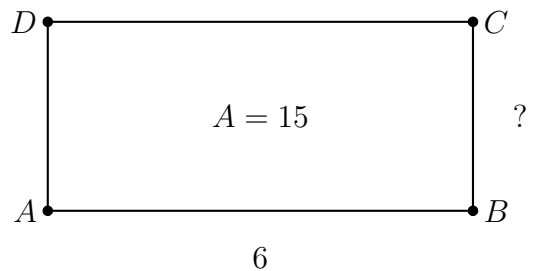
44. Find the base of a rectangle with area $A = 16.8$ and height $h = 4.8$, expressed as a decimal. First write an equation substituting the given values in the area formula.
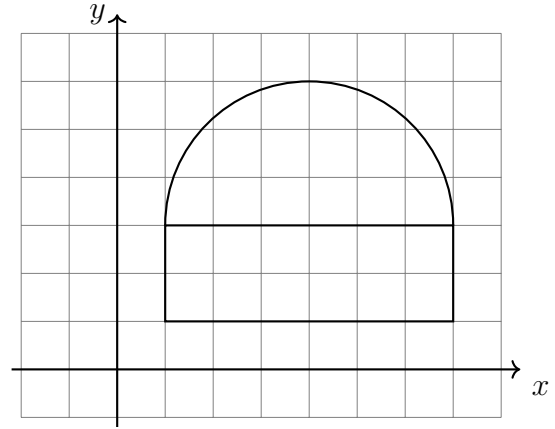
$A = 16.8$ 4.8

x

45. 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):
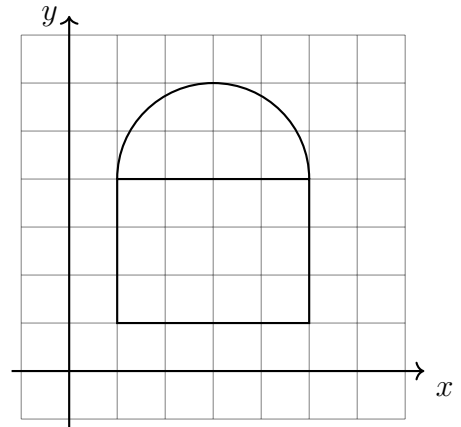
$A = b \times h = 80$

80   10

?

46. 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.

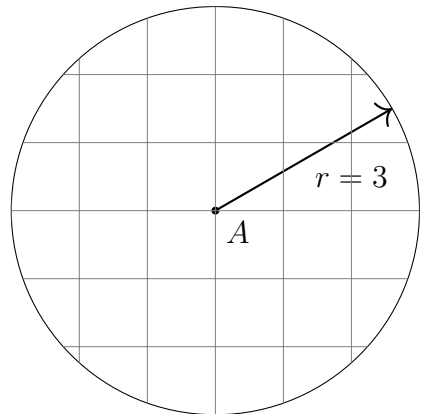

47. Find the *perimeter* of the shape shown below composed of a rectangle and circular cap. Leave your answer as an exact value in terms of π.

48. 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.
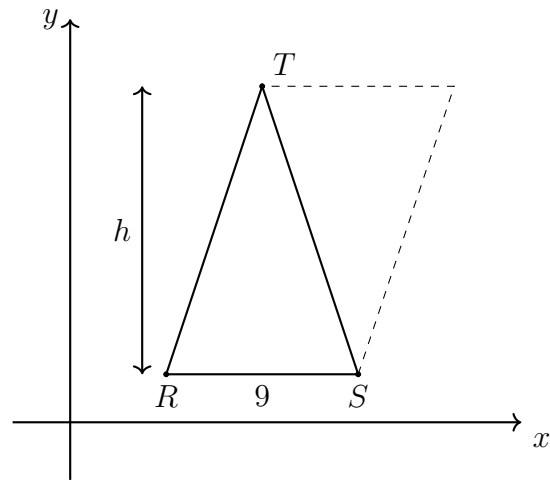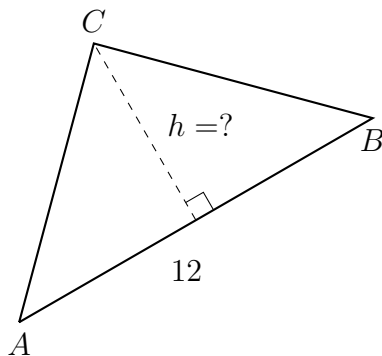
49. Find the height of the $\triangle RST$, having an area of $A = 117$ and base $RS = 9$.
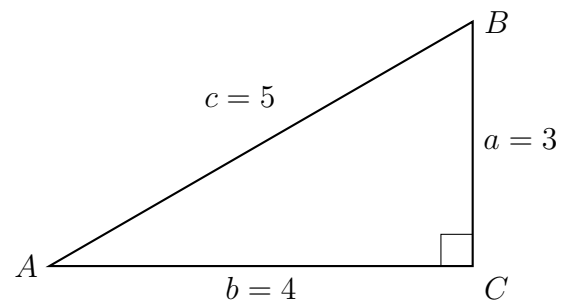
Start by substituting values in the area formula:

$$A = \frac{1}{2}bh = 117$$

50. 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 $\overline{AB}$.

51. 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 $c = 5$.

52. 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 $a = 50$, $b = 87$, and $c = 100$.

B

$c = 100$
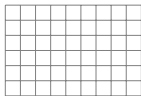
$a = 50$

A

$b = 87$

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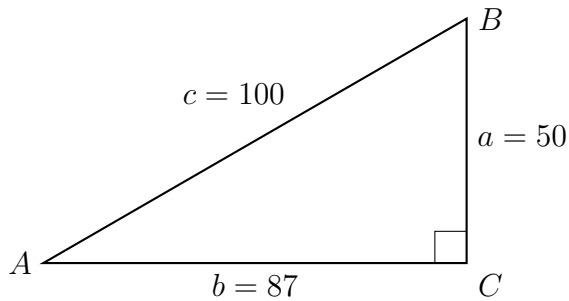
53. On the grid below, accurately draw and label two adjacent squares, one with a side length of 4 cm, the other with a side length of 3 cm. The grid is in centimeters.

Find the area A and perimeter P of combined shape.

54. 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.

y

10
9
8
7
6
5
4
3
2
1

1 2 3 4 5 6 7 8 9 10 x
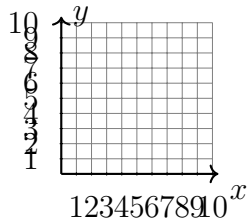
55. Draw and label a triangle $\triangle ABC$ with base $\overline{AB}$ 8 centimeters long and altitude of 5 centimeters. (show the altitude as a dotted line, and make sure it is perpendicular to the base)
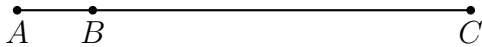
56. A square is partitioned into two rectangles. The sum of the perimeters of the two rectangles is 36. Find the area of the square.
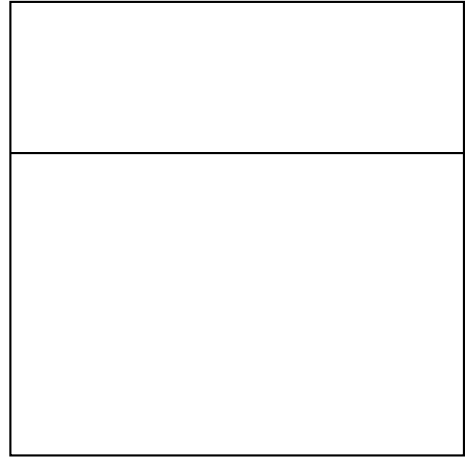
57. Given $\overline{ABC}$, $AB = \frac{2}{3}$, and $AC = 3\frac{1}{3}$.

    Find BC.

58. 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.
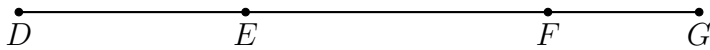
59. Given $\overline{FGHI}$, $FG = 8\frac{1}{6}$, $GH = 12\frac{1}{3}$, and $HI = 5\frac{1}{2}$. (diagram not to scale)

    Find FI.

60. Given $\overleftrightarrow{JK}$ as shown on the number line.

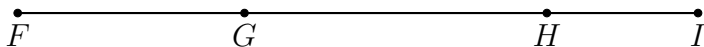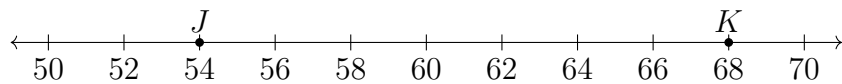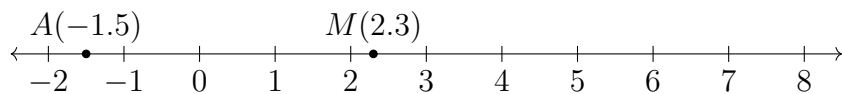$$\overset{J}{\underset{\substack{| \quad | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \\ 50 \quad 52 \quad 54 \quad 56 \quad 58 \quad 60 \quad 62 \quad 64 \quad 66 \quad 68 \quad 70}}{\bullet}} \qquad \overset{K}{\bullet}$$
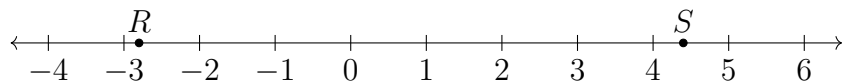
What is the midpoint between the points J and K?

61. The point $M(2.3)$ is the midpoint of segment $\overline{AB}$. Given $A(-1.5)$, find the value of B. Mark and label it below.

$$A(-1.5) \qquad\qquad M(2.3)$$
$$\underset{-2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8}{| \quad \bullet \quad | \quad | \quad | \quad \bullet \quad | \quad | \quad | \quad | \quad | \quad |}$$

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

$$\overset{R}{\bullet} \qquad\qquad\qquad \overset{S}{\bullet}$$
$$\underset{-4 \quad -3 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6}{| \quad | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \quad | \quad |}$$

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

63. Given $\overline{PQR}$, with $PQ = \frac{1}{2}x + 4$, $QR = x + 3$, and $PR = 2x + 5$. Find PR.