Week 4

Geometry-Perimeter, Circumference, and Area

MA123: Mathematical Reasoning & Modeling
(Spring 2021)

Instructor: Emmanuel Thompson

Geometry-Perimeter, Circumference, and Area

Polygon

- Is a closed geometric figure with three or more sides.

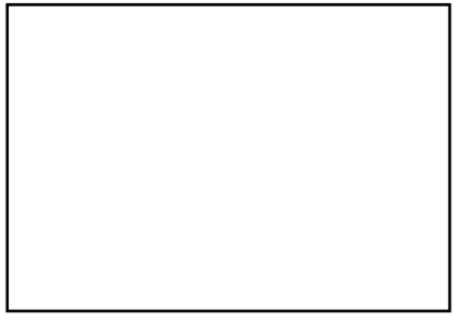
Perimeter

- The perimeter of a polygon is the distance around it, or the sum of the lengths of its sides.
- The perimeter of a square is : $P = s + s + s + s$

$= 4s$

s = side

The perimeter of a rectangle is: $P = 2w + 2l$



$w = 18,\ l = 26$

$P = 2w + 2l$

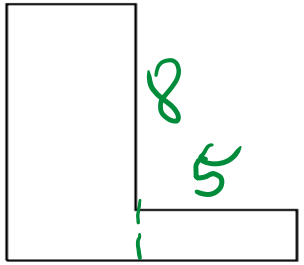
$P = 2(18) + 2(26)$

$= 36 + 52$

$= 88$

Find the perimeter of the rectangle pictured above.

Find the perimeter of the figure pictured below.



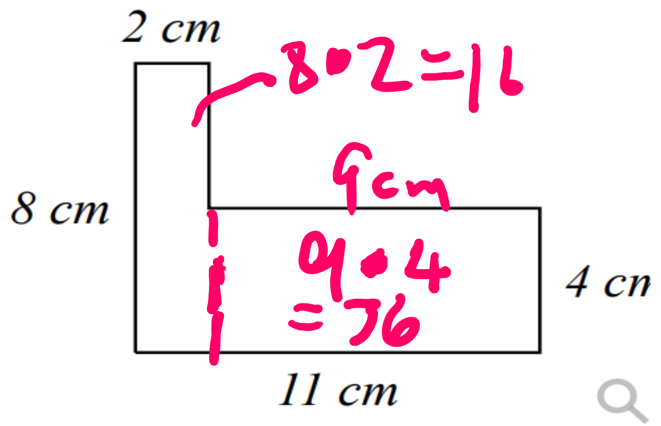
$10 + 4 + 8 + 5 + 2 + 9$

$= 38$

Geometry-Perimeter, Circumference, and Area

Find the area of the figure pictured below.

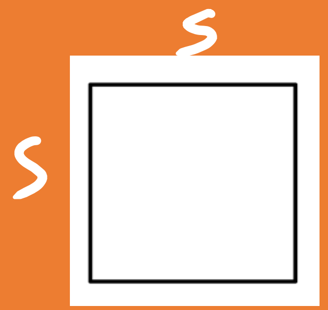
$A = (8 \cdot 2) + (9 \cdot 4)$
$= 16 + 36 = 52 cm^2$



Geometry-Perimeter, Circumference, and Area

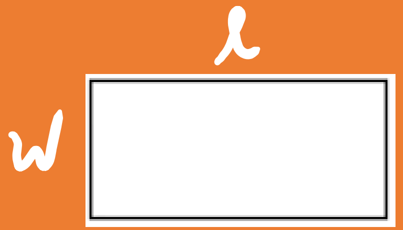
Area of a Square and a Rectangle

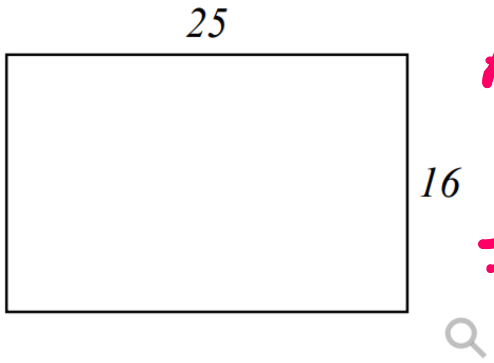
- The area of a square is: $A = s \cdot s = s^2$



- The area of rectangle is the product of the length and the width:

$A = l \cdot w$





$A = l \cdot w$
$= 25 \cdot 16$
$= 400 \text{ units}^2$

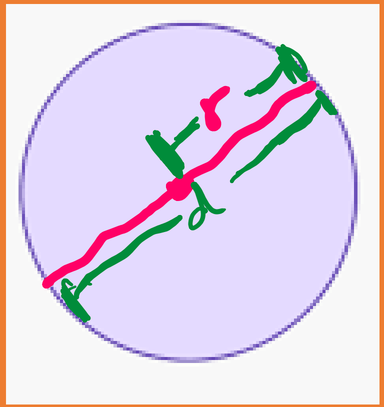
Find the area of the rectangle pictured above.

Geometry-Perimeter, Circumference, and Area

Circle

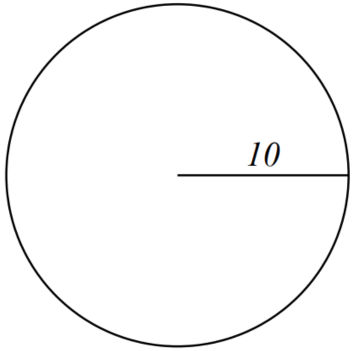
- The perimeter of a circle is called the circumference of the circle.
- The perimeter of a circle C of diameter d is:

$$C = \pi \cdot d$$
$$= 2\pi r$$



$$\pi = \frac{22}{7}$$
or
$$\pi = 3.14$$

- The area of a circle is: $A = \pi r^2$

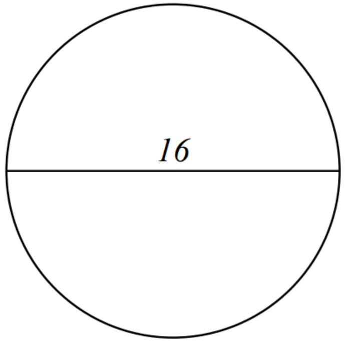


$$C = 2\pi r$$
$$= 2 \cdot 3.14 \cdot 10$$
$$= 62.8$$

Find the circumference of the circle pictured above.

Round your answer to the nearest hundredth.

$$r = \frac{16}{2} = 8$$



$$C = 2 * 3.14 * 8$$
$$= 50.2$$

Find the circumference of the circle pictured above.

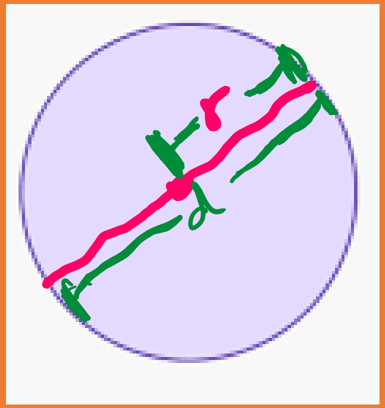
Round your answer to the nearest tenth

Geometry-Perimeter, Circumference, and Area

Circle

- The perimeter of a circle is called the circumference of the circle.
- The perimeter of a circle C of diameter d is:

$$C = \pi \cdot d$$
$$= 2\pi r$$



$\pi = \frac{22}{7}$ or $\pi = 3.14$

- The area of a circle is: $A = \pi r^2$

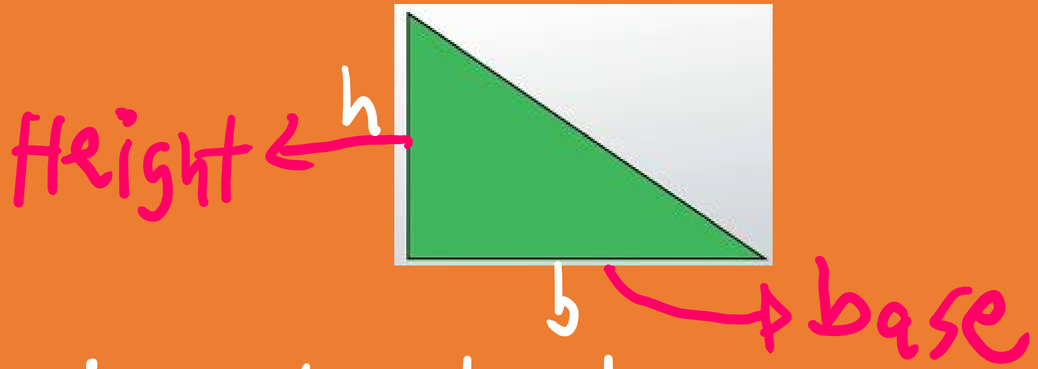
Find the are of a circle with radius 5ft

$$A = \pi r^2$$
$$= 3.14 \cdot (5)^2$$
$$= 3.14 \cdot 25$$
$$= 78.5 ft^2$$

Geometry-Perimeter, Circumference, and Area

Right-Triangle

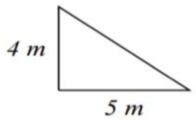
- The area of a right-triangle is half the length of the base times the height:



$$A = \frac{1}{2} \cdot b \cdot h$$

Find the area of the triangle pictured below, where the measurements are given in meters (m)

$$A = \frac{1}{2} \cdot b \cdot h$$
$$= \frac{1}{2} \cdot 4 \cdot 5 = 10 m^2$$

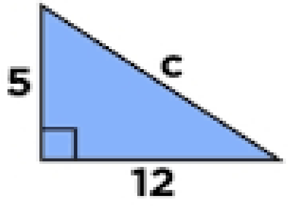


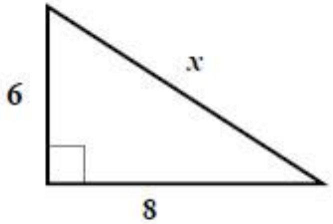
Pythagoras Theorem

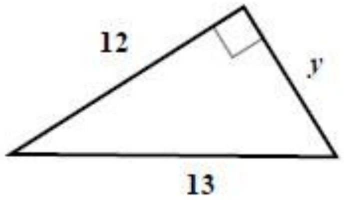
The Pythagorean Theorem

given two sides we can calculate the third

$$a^2 + b^2 = c^2$$







$$6^2 + 8^2 = x^2$$
$$36 + 64 = x^2$$
$$100 = x^2$$
$$\sqrt{100} = \sqrt{x^2}$$
$$\boxed{x = 10}$$

$$12^2 + y^2 = 13^2$$
$$144 + y^2 = 169$$
$$y^2 = 25$$
$$\sqrt{y^2} = \sqrt{25}$$
$$\boxed{y = 5}$$

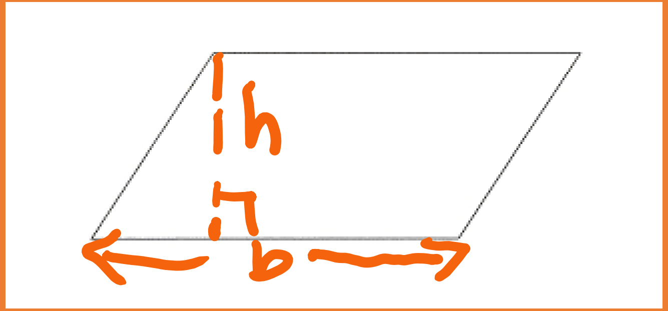
Geometry-Perimeter, Circumference, and Area

Area of a Parallelogram

- The area of a parallelogram is the product of the length of the base and the height, that is

$$A = b \cdot h$$

$h = 6m;\ b = 12m$

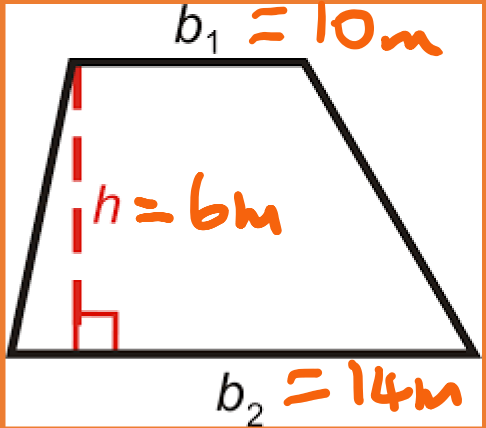


$$A = 12 \cdot 6$$
$$= 72m^2$$

Area of a Trapezium

- The area of a trapezoid is the half product of the height and the sum of the lengths of the parallel sides or the product of the height and the average length of the bases.

$$A = \frac{1}{2} \cdot h(b_1 + b_2)$$



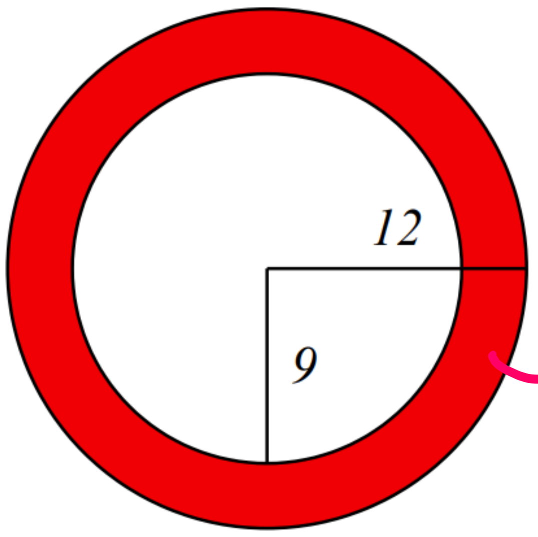
Let $b_1 = 10m;\ b_2 = 14m,\ h = 6m$

$$A = \frac{1}{2} \cdot 6(10+14) = 3(24) = 72m^2$$

Geometry-Perimeter, Circumference, and Area

Try This

$r_1 = 9 ; r_2 = 12$



197.82

Find the area of the shaded region.

Round your answer to the nearest tenth

$$A_1 = \pi \cdot r_1^2$$
$$= 3.14 \cdot (9)^2$$
$$= 3.14 \cdot 81 = 254.34$$

$$A_2 = \pi \cdot r_2^2$$
$$= 3.14 \cdot (12)^2$$
$$= 3.14 \cdot 144 = 452.16$$

Area of shaded region is
$452.16 - 254.34 = 197.82$

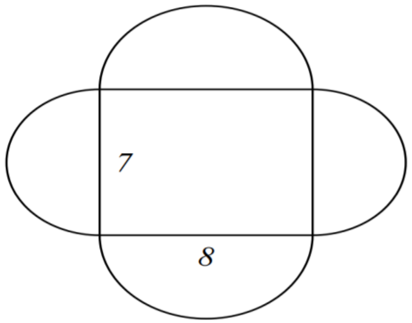
Geometry-Perimeter, Circumference, and Area

Try This

The shape below contains a rectangle and four semi-circles.

$r_1 = \frac{7}{2}$

$r_2 = \frac{8}{2}$



Round your responses to two decimal places.

What is the perimeter of the shape above?

47.1

What is the area of the shape above?

144.71

Perimeter: Two circles:

$$2\pi r_1 + 2\pi r_2$$

$$\cancel{2}\cdot 3.14 \cdot \frac{7}{\cancel{2}} + \cancel{2}\cdot 3.14 \cdot \frac{8}{\cancel{2}}$$

$$3.14 \cdot 7 + 3.14 \cdot 8$$

$$3.14(7+8) = 3.14 \cdot 15$$

$$= 47.1$$

Area: Two circles, 1 rectangle

$$\pi r_1^2 + \pi r_2^2 + l \cdot w$$

$$3.14\left(\frac{7}{2}\right)^2 + 3.14\left(\frac{8}{2}\right)^2 + 8 \cdot 7$$

$$= 144.71$$

Geometry-Perimeter, Circumference, and Area

Try This

The shape below contains a triangle and a semi-circle.

$a = 6;\ b = 11,\ c = ?$

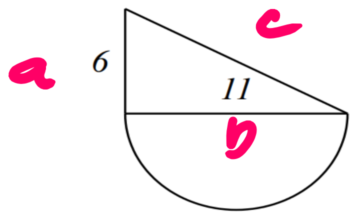
$c^2 = a^2 + b^2$ Pythagoras Theorem

$c^2 = 6^2 + 11^2$

$= 36 + 121$

$= 157$

$c = \sqrt{157} = 12{,}53$



Round your responses to two decimal places.

What is the perimeter of the shape above?

____

What is the area of the shape above?

____

Perimeter:

$6 + 12.53 + \frac{1}{\cancel{2}} \cdot \cancel{2} \cdot 3.14 \cdot \frac{11}{2}$

$6 + 12.53 + 17{,}25 = 35{,}8$

Area:

$\frac{1}{2} \cdot b \cdot h + \frac{1}{2}\pi r^2$

$\frac{1}{\cancel{2}} \cdot 11 \cdot \cancel{6}^{3} + \frac{1}{2} \cdot 3{,}14 \left(\frac{11}{2}\right)^2$

$33 + 47.49$

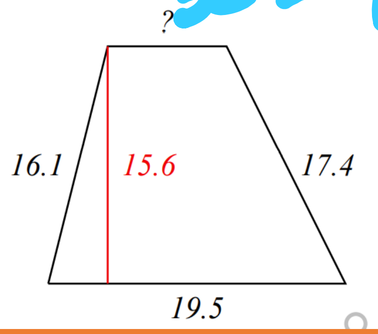
$= 80{,}49$

Geometry-Perimeter, Circumference, and Area

Try This

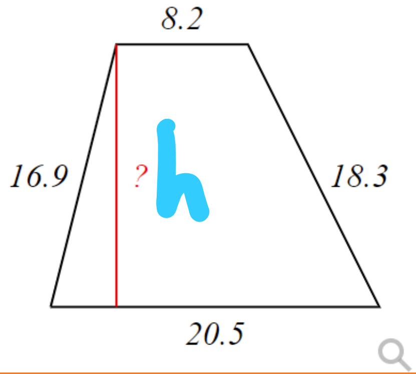
Find the missing length of the trapezoid shown below, if the perimeter is 60.8.

$x = 7.8$



$$60.8 = 16.1 + x + 17.4 + 19.5$$
$$= 53 + x$$
$$x = 60.8 - 53$$
$$= 7.8$$

Find the height of the trapezoid shown below, if the area is 235.34.



$$235.34 = \frac{1}{2} \cdot h \, (8.2 + 20.5)$$
$$h = \frac{235.34 \cdot 2}{28.7} = 16.4$$