



Indicator 29 Class Notes by Mrs. Joshi

Area of Trapezoids-(AL 26, 26a)

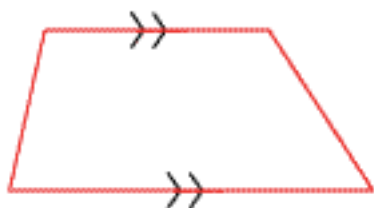
I can find the area or missing measure of a trapezoid.

Source:

https://www.varsitytutors.com/hotmath/hotmath_help/topics/trapezoid
https://www.varsitytutors.com/isee_middle_level_math-help/how-to-find-the-area-of-a-trapezoid

Area of Trapezoids

A trapezoid is a quadrilateral with only one pair of opposite sides that are parallel. We must take the average of the bases and then multiply by the height. That means that we need to add the bases together and divide by 2. Then we will multiply by the height.



a trapezoid

Area of a Trapezoid

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

A trapezoid is a quadrilateral with exactly one pair of parallel sides.

Indicator 29 Class Notes by Mrs. Joshi

The parallel sides are called the **bases** and the non-parallel sides are the **legs** of the trapezoid.

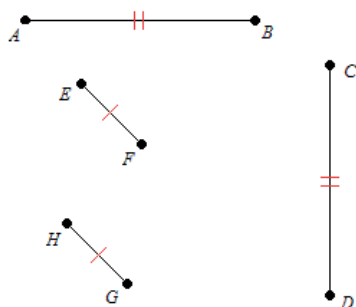
An **isosceles trapezoid** is a trapezoid in which the two non-parallel sides are congruent.

Congruent Segments

Congruent line segments are simply segments with the same measure (length). If segment AB is congruent to segment CD , we write:

$$\overline{AB} \cong \overline{CD}$$

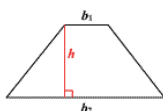
In geometrical figures, two segments are shown to be congruent by marking them with the same number of small perpendicular marks, as shown below.



The **area** A of a trapezoid is given by

$$A = \frac{b_1 + b_2}{2} h$$

where b_1 and b_2 are the lengths of the two parallel sides, and h is the height, as shown in the figure below.



Indicator 29 Class Notes by Mrs. Joshi

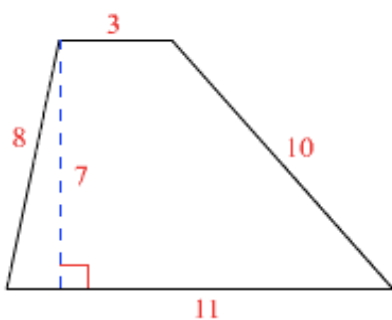
The perimeter of a trapezoid is the sum of the lengths of its four sides.

Perimeter

The **perimeter** of a polygon (or any other closed curve, such as a circle) is the distance around the outside.

Example:

Find the area and perimeter of the trapezoid shown.

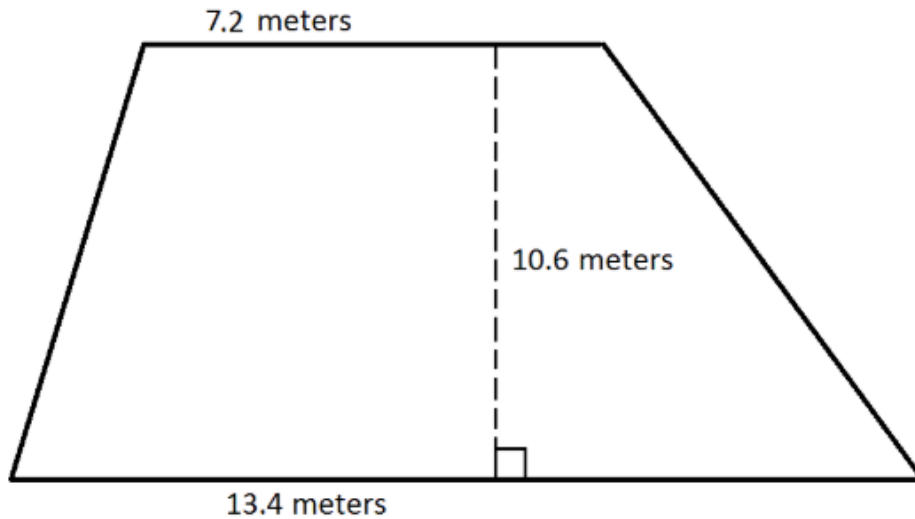


To find the area, apply the formula.

$$\begin{aligned} A &= \frac{b_1 + b_2}{2} h \\ &= \frac{3 + 11}{2} (7) \\ &= 7(7) \\ &= 49 \text{ square units} \end{aligned}$$

To find the perimeter, add the lengths of all four sides.

Indicator 29 Class Notes by Mrs. Joshi



What is the area of the above trapezoid?

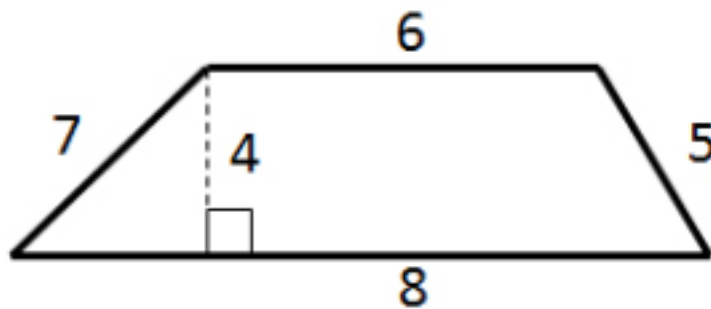
Explanation:

To find the area of a trapezoid, multiply one half (or 0.5, since we are working with decimals) by the sum of the lengths of its bases (the parallel sides) by its height (the perpendicular distance between the bases). This quantity is

$$A=0.5 \cdot (7.2+13.4) \cdot 10.6=0.5 \cdot 20.6 \cdot 10.6=109.18 \text{ m}^2$$

Indicator 29 Class Notes by Mrs. Joshi

Find the area of the trapezoid:



Explanation:

The area of a trapezoid can be determined using the equation $A = \frac{1}{2}(b_1 + b_2)h$.

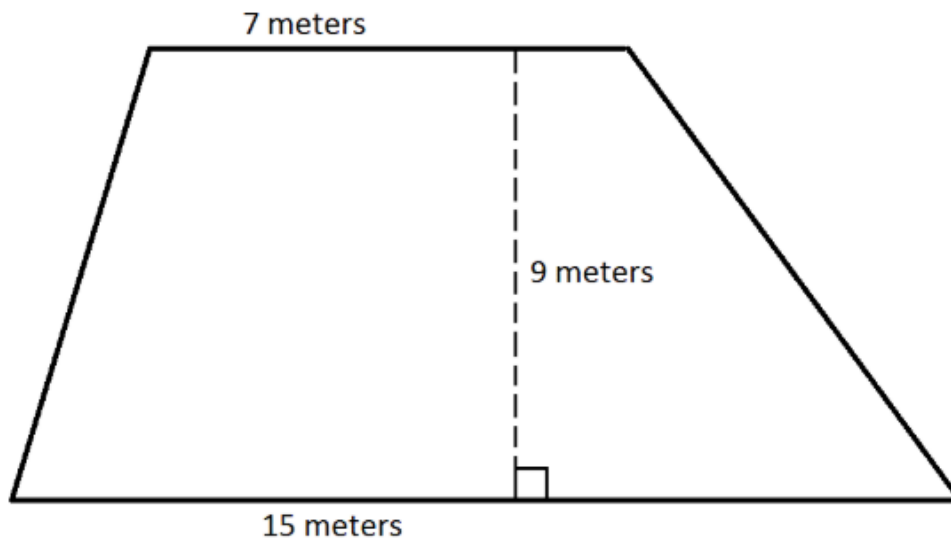
$$A = \frac{1}{2}(6 + 8)(4)$$

$$A = \frac{1}{2}(14)(4)$$

$$A = (7)(4) = 28$$



Indicator 29 Class Notes by Mrs. Joshi



Explanation:

To find the area of a trapezoid, multiply the sum of the bases (the parallel sides) by the height (the perpendicular distance between the bases), and then divide by 2.

$$A = \frac{1}{2} \cdot (7 + 15) \cdot 9 = \frac{1}{2} \cdot 22 \cdot 9 = 99 \text{ m}^2$$



Indicator 29 Class Notes by Mrs. Joshi

A trapezoid has a height of 25 inches and bases measuring 24 inches and 36 inches. What is its area?



Correct answer:

750 in^2

Explanation:

Use the following formula, with $B = 36$, $b = 24$, $h = 25$:

$$A = \frac{1}{2}(B + b)h = \frac{1}{2}(36 + 24) \cdot 25 = 750$$



Indicator 29 Class Notes by Mrs. Joshi

Find the area of a trapezoid with bases equal to 7 and 9 and height is 2.



Correct answer:

16

Explanation:

To solve, simply use the formula for the area of a trapezoid.

$$b_1 = 7, b_2 = 9, h = 2$$

Thus,

$$A = \frac{1}{2}(b_1 + b_2)h = \frac{1}{2}(7 + 9)(2) = 16$$



Indicator 29 Class Notes by Mrs. Joshi

Find the area of a trapezoid with bases of 10 centimeters and 8 centimeters, and a height of 4 centimeters.



Correct answer:

$$36\text{cm}^2$$

Explanation:

The formula for area of a trapezoid is:

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

where

$$b_1 = 10, b_2 = 8, h = 4$$

therefore the area equation becomes,

$$A = \frac{1}{2}(10 + 8) \times 4$$

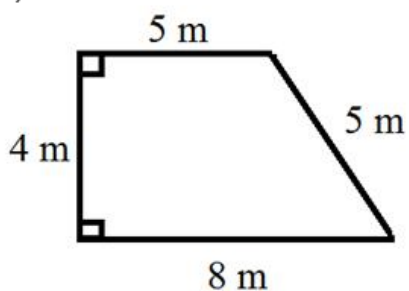
$$A = \frac{1}{2}(72)$$

$$A = 36\text{cm}^2$$

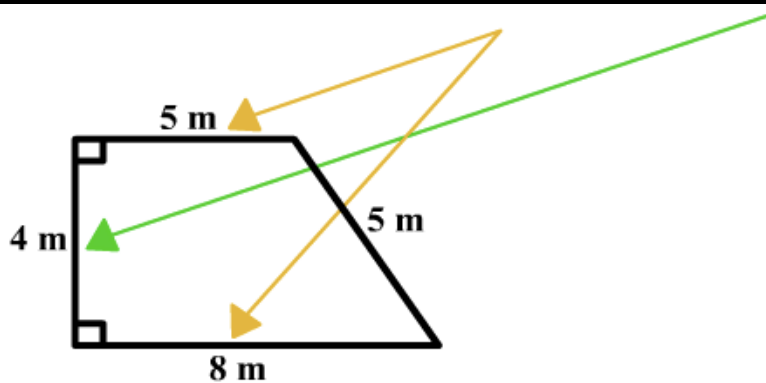
Indicator 29 Class Notes by Mrs. Joshi

Determine the area of the following trapezoids.

1.)



Be sure to use the parallel sides as the bases and the height is the piece that makes a right angle with the parallel sides.



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

$$A = \frac{(5 + 8)4}{2}$$

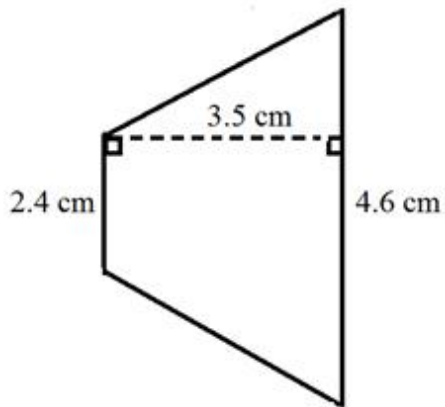
$$A = \frac{(13)4}{2}$$

$$A = \frac{52}{2}$$

$$A = 26 \text{ m}^2$$

Indicator 29 Class Notes by Mrs. Joshi

2.)



This trapezoid is on its side. The height connects the two bases.

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

$$A = \frac{(2.4 + 4.6)3.5}{2}$$

$$A = \frac{(7)3.5}{2}$$

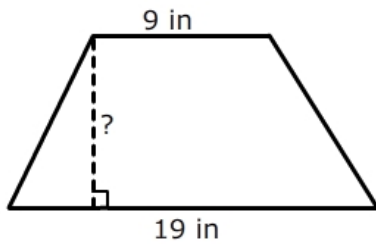
$$A = \frac{24.5}{2}$$

$$A = 12.25 \text{ cm}^2$$



Indicator 29 Class Notes by Mrs. Joshi

3. The area of the trapezoid is 168 in^2 . Determine the **height**.



In this example, the area has been given, so we will work backwards to determine the height.

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

$$168 = \frac{(9 + 19)h}{2}$$

$$168 = \frac{(28)h}{2}$$

$$168 = 14h$$

$$\frac{168}{14} = \frac{14h}{14}$$

$$h = 12 \text{ in.}$$

Notice that in this example, the height is labeled in inches and not inches squared. The height is one dimensional, whereas the area is two dimensional. Therefore, the height is labeled inches where the area is labeled square inches.
