Find the Dimensions and Area of Quadrilaterals

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7.5 Find the Dimensions and Area of Quadrilaterals

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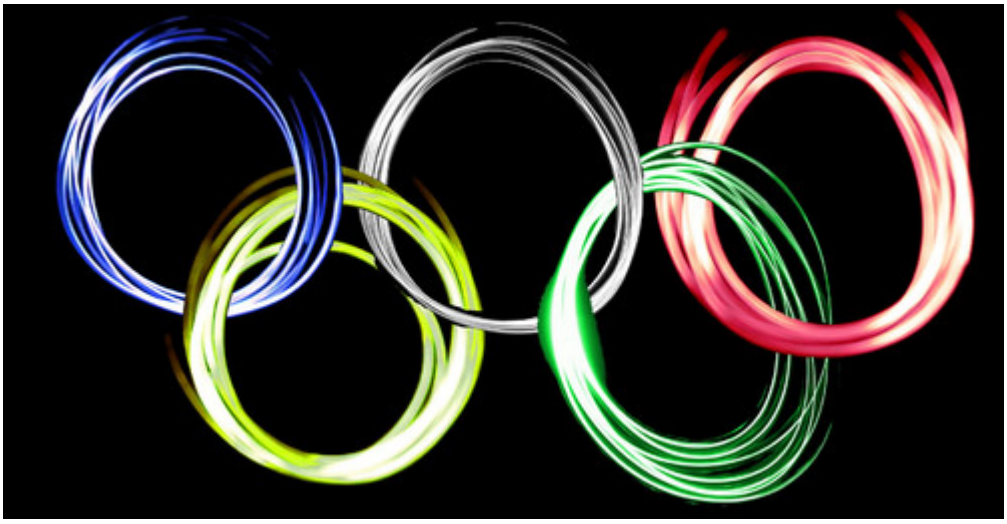


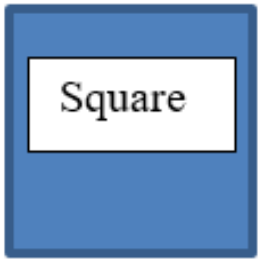
[Figure 1]

Montgomery Middle School is going to host a school wide Olympics for the first time. The initial preparations have already started and a fantastic two day Olympic event will take place in six weeks. Mrs. Meery's class will be building the platform for the award's ceremony. The platform is in the shape of a trapezoid with bases 35 feet and 41 feet and a height of 7.5 feet. If one bucket of cement covers 25 square feet, how many buckets will the students need to build the platform?

In this concept, you will learn to find the dimensions and areas of different quadrilaterals.

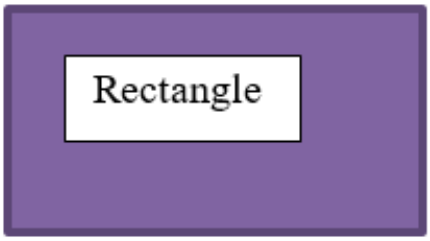
Quadrilaterals

Quadrilaterals are four-sided polygons. They are classified by the characteristics of their sides and angles. Rectangles, squares, parallelograms, rhombi, and trapezoids are all quadrilaterals. The images below show some of the quadrilaterals and their characteristics.



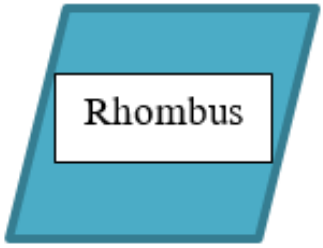
All sides the same length
All angles are 90^0

[Figure 2]



Opposite sides the same length
All angles are 90^0

[Figure 3]



All sides the same length
Opposite sides are parallel

[Figure 4]

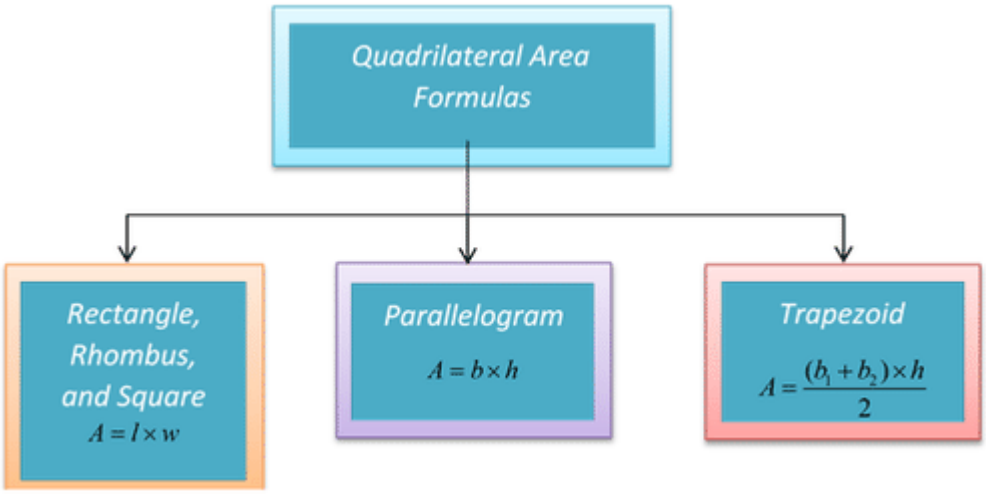
Opposite sides the same length
Opposite sides are parallel
Opposite angles have the same measure

[Figure 5]

One pair of parallel sides

[Figure 6]

Each of these quadrilaterals has its own area formula.



[Figure 7]

Let's look at an example.

What is the area of a rectangle with a length of 6 inches and a width of 4 inches?

First, fill in what you know into the formula for the area of a rectangle.

$$\begin{aligned} A &= l \times w \\ A &= 6 \times 4 \end{aligned}$$

Next, solve for A.

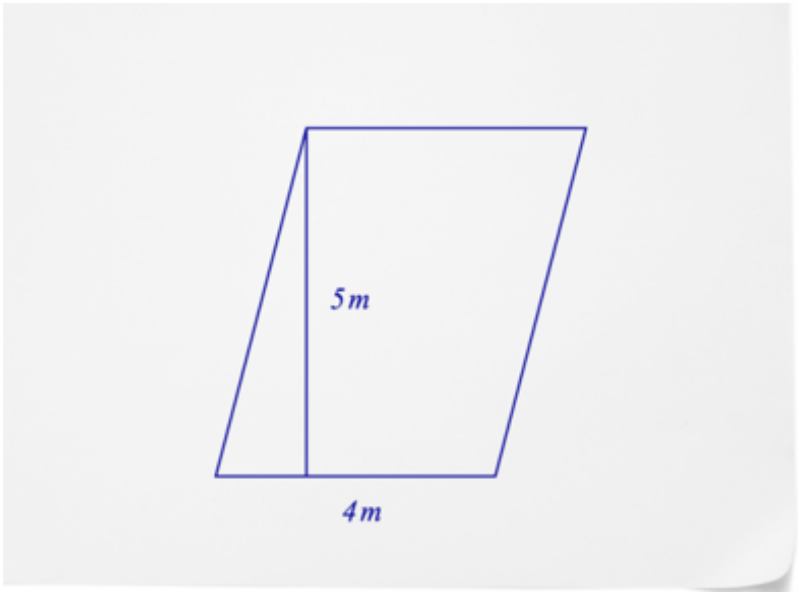
$$\begin{aligned} A &= 6 \times 4 \\ A &= 24 \end{aligned}$$

The answer is 24.

The area of the rectangle is $24\ in^2$, or 24 square inches.

Let's look at another example.

What is the area of the parallelogram below?



[Figure 8]

First, substitute what you know into the formula for the area of a parallelogram.

$$\begin{aligned} A &= b \times h \\ A &= 4 \times 5 \end{aligned}$$

Next, solve for A.

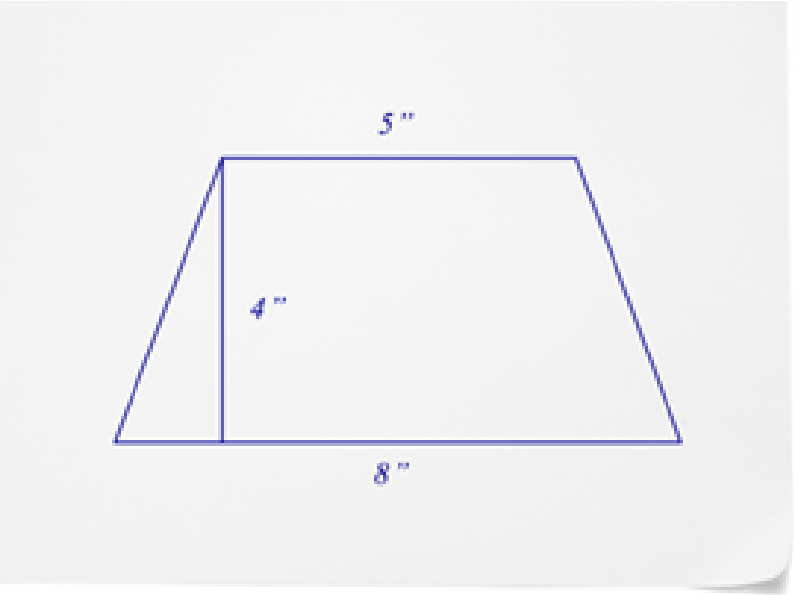
$$\begin{aligned} A &= 4 \times 5 \\ A &= 20 \end{aligned}$$

The answer is 20.

The area of the parallelogram is $20\ m^2$, or 20 square meters.

Let's look at one more example.

Find the area of the trapezoid below.



[Figure 9]

First, substitute what you know into the formula for the area of a trapezoid.

$$A = \frac{(b_1+b_2)\times h}{2}$$
$$A = \frac{(5+8)\times 4}{2}$$

Next, solve for A.

$$A = \frac{(5+8)\times 4}{2}$$
$$A = 26$$

The answer is 26.

The area of the trapezoid is $26\ in^2$, or 26 square inches.

Examples

Example 1

Earlier, you were given a problem about the school's podium.

The podium is in the shape of a trapezoid that has base measures of 35 feet and 41 feet and a height of 7.5 feet. The podium is being made of cement where one bucket of cement covers 25 square feet. You need to find the area of the podium and then the number of buckets of cement to make it.

First, substitute what you know into the formula for the area of a trapezoid.

$$\begin{aligned} A &= \frac{(b_1+b_2)\times h}{2} \\ A &= \frac{(35+41)\times 7.5}{2} \end{aligned}$$

Next, solve for A.

$$\begin{aligned} A &= \frac{(35+41)\times 7.5}{2} \\ A &= 285 \end{aligned}$$

Then, divide the area by 25 in order to determine the number of buckets of cement to use.

$$\begin{aligned} \#\text{ of buckets} &= \frac{285}{25} \\ \#\text{ of buckets} &= 11.4 \end{aligned}$$

The answer is 11.4.

The students will have to buy 12 buckets of cement for their project.

Example 2

A parallelogram has an area of $105\ m^2$. The height of the parallelogram is $7\ m$. What is its base?

First, substitute what you know into the formula for the area of a parallelogram.

$$\begin{aligned} A &= b \times h \\ 105 &= b \times 7 \end{aligned}$$

Next, divide both sides by 7 to solve for b.

$$\begin{aligned} 105 &= b \times 7 \\ \frac{105}{7} &= \frac{7b}{7} \\ b &= 15 \end{aligned}$$

The answer is 15.

The base of the parallelogram has a length of $15\ m$.

Example 3

What is the area of a square with a side length of 4.5 inches?

First, substitute what you know into the formula for the area of a square.

$$\begin{aligned} A &= l \times w \\ A &= 4.5 \times 4.5 \end{aligned}$$

Next, solve for A.

$$\begin{aligned} A &= 4.5 \times 4.5 \\ A &= 20.25 \end{aligned}$$

The answer is 20.25. Therefore the area of the square is $20.25\ in^2$, or 20.25 square inches.

Example 4

What is the area of a rectangle with a length of 8 feet and a width of 6.25 feet?

First, substitute what you know into the formula for the area of a rectangle.

$$\begin{aligned} A &= l \times w \\ A &= 8 \times 6.25 \end{aligned}$$

Next, solve for A.

$$\begin{aligned} A &= 8 \times 6.25 \\ A &= 50 \end{aligned}$$

The answer is 50.

The area of the rectangle is $50\ ft^2$, or 50 square feet.

Example 5

What is the area of a parallelogram with a base of 10 meters and a height of 7.5 meters?

First, substitute what you know into the formula for the area of a parallelogram.

$$\begin{aligned} A &= b \times h \\ A &= 10 \times 7.5 \end{aligned}$$

Next, solve for A.

$$\begin{aligned} A &= 10 \times 7.5 \\ A &= 75 \end{aligned}$$

The answer is 75.

The area of the parallelogram is $75\ m^2$, or 75 square meters.

Review

1. $l = 10\ in,\ w = 7.5\ in$

2. $l = 12\ ft,\ w = 9\ ft$

3. $l = 14\ ft,\ w = 11\ ft$

4. $l = 21\ ft,\ w = 19\ ft$

Find the area of each parallelogram.

5. $b = 11\ ft,\ h = 9\ ft$

6. $b = 13\ in,\ h = 11\ in$

7. $b = 22\ ft,\ h = 19\ ft$

8. $b = 31 \text{ meters},\ h = 27 \text{ meters}$

Find the area of each trapezoid.

9. $\text{Bases} = 5\ in \text{ and } 8\ in,\ \text{height} = 4 \text{ inches}$

10. $\text{Bases} = 6\ in \text{ and } 8\ in,\ \text{height} = 5 \text{ inches}$

11. $\text{Bases} = 10 \text{ feet and } 12 \text{ feet},\ \text{height} = 9 \text{ feet}$

Find the area of each square. Round your answer to the nearest hundredths place if needed.

12. side length of 8 inches

13. side length of 15 feet

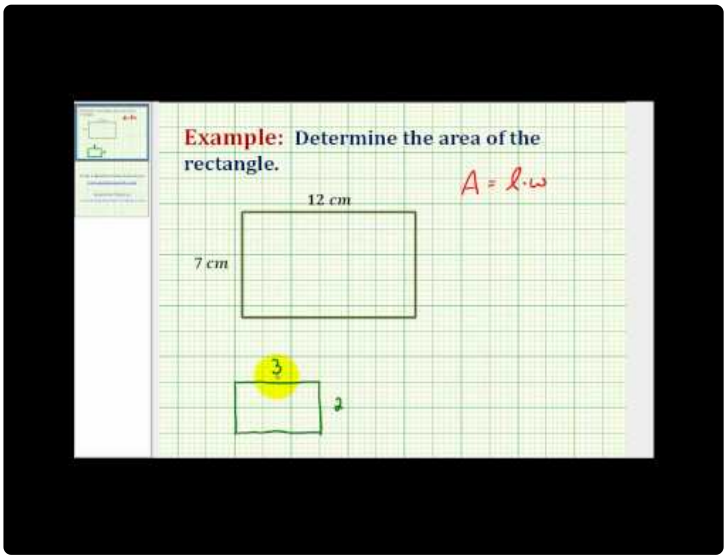
14. side length of 22.5 mm

15. side length of 18.25 cm

Review (Answers)

To see the review answers, return to the Table of Contents and select 'Other Versions' or 'Resources'.

Resources



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