

Objectives:

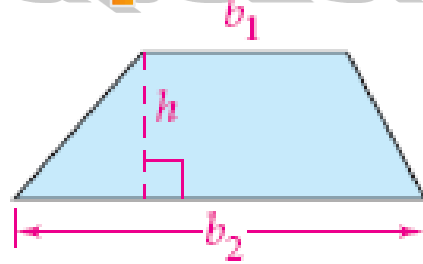
- find area of trapezoids, rhombus, and kites





Area and Perimeter of a Trapezoid

Trapezoid



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

Height:

- the perpendicular distance h between the bases.

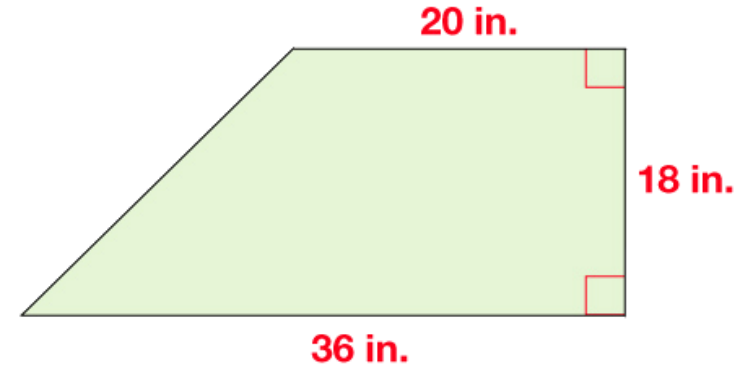
To find Perimeter:

- add the lengths of the sides
- may need to use
 - Pythagorean Thm
 - 30-60-90 Triangle Thm
 - 45-45-90 Triangle Thm



Find the Area of a Trapezoid

A car window is shaped like the trapezoid shown. Find the area of the window.



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

Area of a trapezoid

$$A = \frac{1}{2} (18)(20 + 36)$$

Substitute 18 for h , 20 for b_1 , and 36 for b_2 .

$$A = 504$$

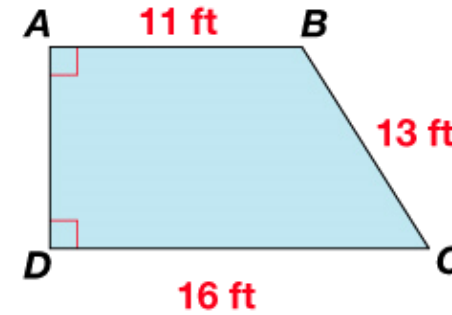
Simplify.

The area of the car window is 504 in.²

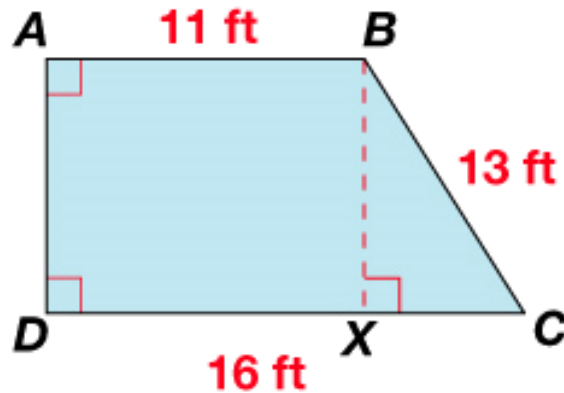


James Madison High School Find the Area of a Trapezoid

Find the area of trapezoid $ABCD$.



Draw an altitude from vertex B to \overline{DC} that divides trapezoid $ABCD$ into a rectangle and a right triangle.



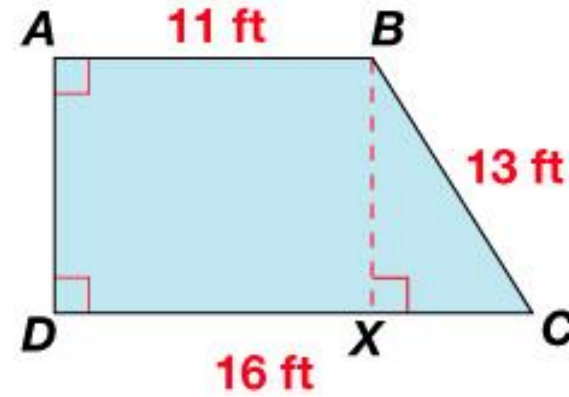
Because opposite sides of rectangle $ABXD$ are congruent,

$$DX = 11 \text{ ft}$$

$$XC = 16 \text{ ft} - 11 \text{ ft} = 5 \text{ ft.}$$



(continued)
By the Pythagorean Theorem,
 $BX^2 + XC^2 = BC^2$, so $BX^2 = 13^2 - 5^2 = 144$.
Taking the square root, $BX = 12$ ft.



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

Use the trapezoid area formula.

$$A = \frac{1}{2} (12)(11 + 16)$$
 Substitute 12 for h , 11 for b_1 , and 16 for b_2 .

$$A = 162$$

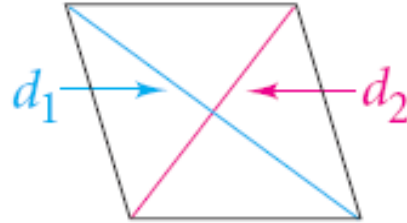
Simplify.

The area of trapezoid $ABCD$ is 162 ft^2 .



Area and Perimeter of a Rhombus or Kite

Rhombus or Kite



$$\text{Area} = \frac{1}{2} d_1 d_2$$

d is the diagonal

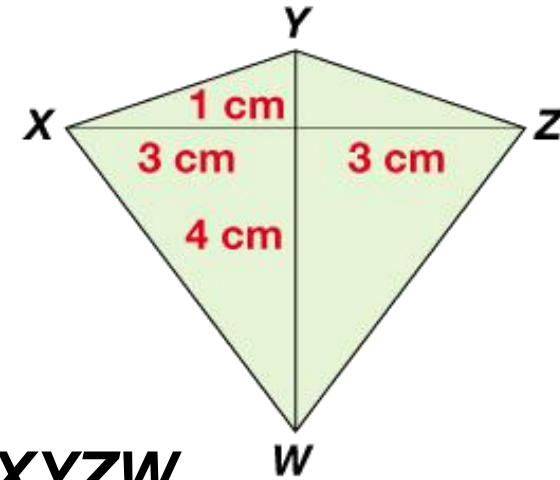
To find Perimeter:

- add the lengths of the sides



Find the area of kite $XYZW$.

Kite: 2 pairs of adjacent congruent sides.
Opposite sides not congruent



Find the lengths of the diagonals of kite $XYZW$.

$$XZ = d_1 = 3 + 3 = 6 \text{ and } YW = d_2 = 1 + 4 = 5$$

$$A = \frac{1}{2} d_1 d_2$$

Use the formula for the area of a kite.

$$A = \frac{1}{2} (6)(5)$$

Substitute 6 for d_1 and 5 for d_2 .

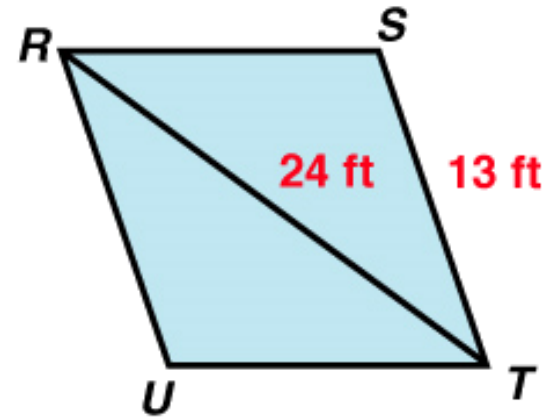
$$A = 15$$

Simplify.

The area of kite $XYZW$ is 15 cm^2 .

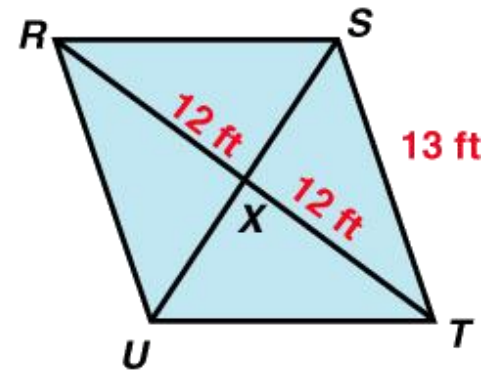


Find the area of rhombus $RSTU$.



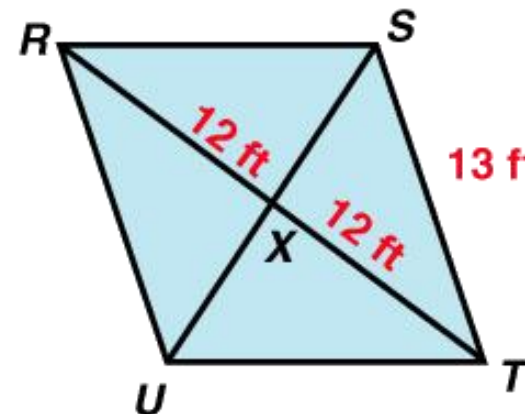
To find the area, you need to know the lengths of both diagonals.

Draw diagonal \overline{SU} , and label the intersection of the diagonals point X .





$\triangle SXT$ is a right triangle because the diagonals of a rhombus are perpendicular.



The diagonals of a rhombus bisect each other, so $TX = 12$ ft.

You can use the Pythagorean triple 5, 12, 13 or the Pythagorean Theorem to conclude that $SX = 5$ ft.

$SU = 10$ ft because the diagonals of a rhombus bisect each other.

$$A = \frac{1}{2} d_1 d_2 \quad \text{Area of a rhombus}$$

$$A = \frac{1}{2} (24)(10) \quad \text{Substitute 24 for } d_1 \text{ and 10 for } d_2.$$

$$A = 120 \quad \text{Simplify.}$$

The area of rhombus $RSTU$ is 120 ft².