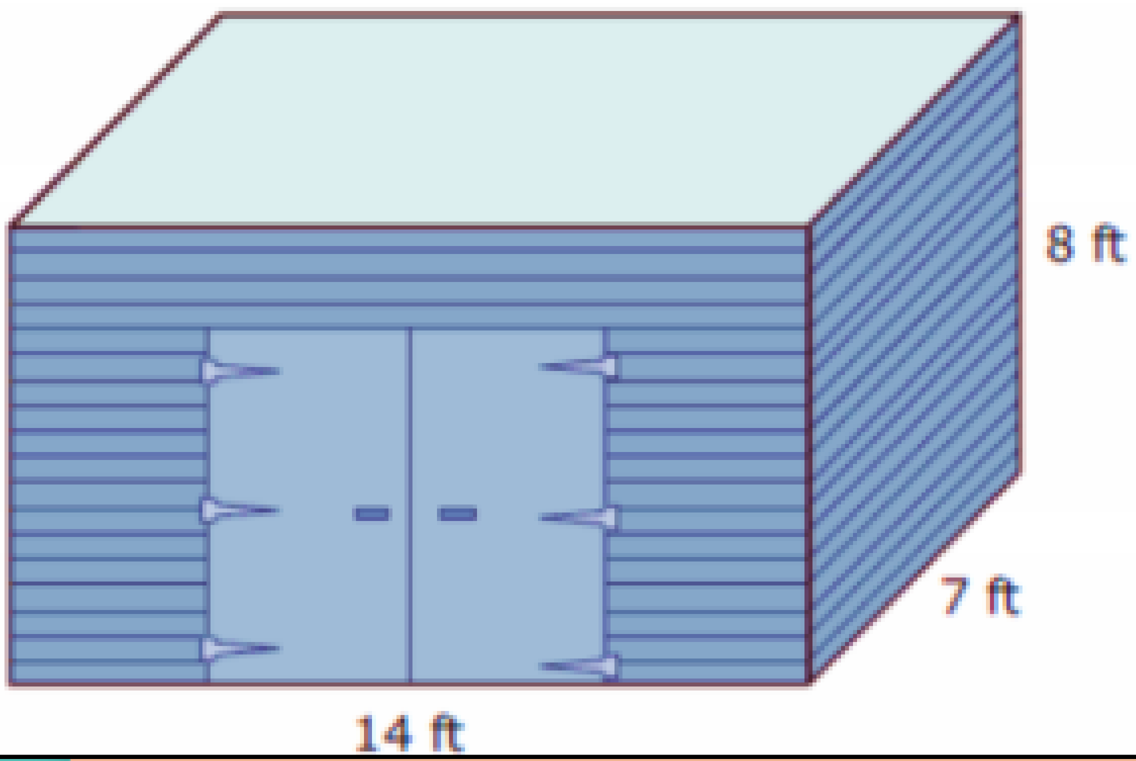
FINDING THE SURFACE AREA AND SOLVING WORD PROBLEMS RELATED TO IT

MR. REYES WANTS TO PAINT HIS STORAGE SHED. THE SHED IS IN THE SHAPE OF A RECTANGULAR PRISM, SHOWN BELOW. HE ONLY HAS 3 GALLONS OF PAINT THAT CAN COVER 266 SQUARE FEET OF THE SURFACE OF THE STORAGE SHED. IS THERE ENOUGH PAINT FOR MR. REYES TO REPAINT THE WHOLE SHED?

MR. REYES WANTS TO PAINT HIS STORAGE SHED. THE SHED IS IN THE SHAPE OF A RECTANGULAR PRISM, SHOWN BELOW. HE ONLY HAS 3 GALLONS OF PAINT THAT CAN COVER 266 SQUARE FEET OF THE SURFACE OF THE STORAGE SHED. IS THERE ENOUGH PAINT FOR MR. REYES TO REPAINT THE WHOLE SHED?

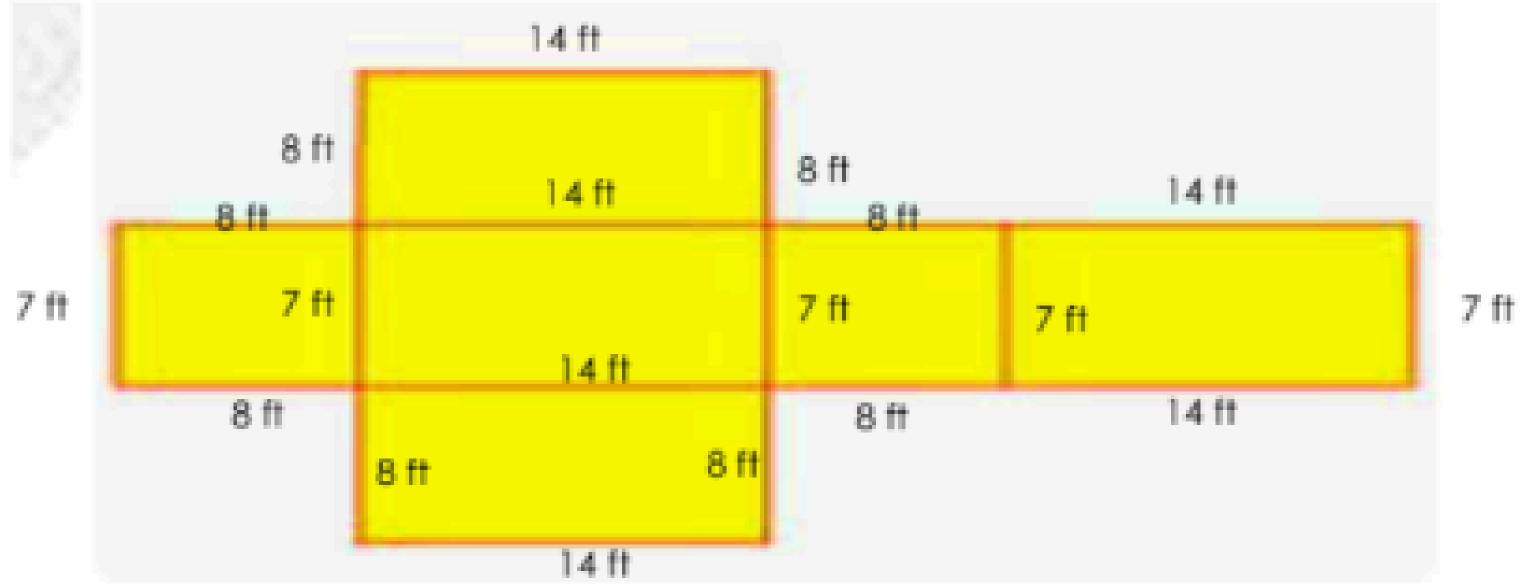


How many faces does the figure have?

What is the shape of the bottom and top faces of the storage shed?

What are the shapes of the side faces?

In order to know if there is enough paint left for Mr. Reyes, let us visualize the net of the storage shed, which is in the shape of a rectangular prism.



The simplest way to solve for the surface area of a prism is to compute the area of each face, and add all the areas of the faces.

Area of left side: 8 ft × 7 ft = 56 ft^2

Area of right side: 8 ft ×7 ft = 56 ft^2

Area of top: 14 ft × 7 ft = 98 ft^2

Area of bottom: 14 ft × 7 ft = 98 ft^2

Area of front: 14 ft × 8 ft = 112 ft^2

Area of back: 14 ft × 8 ft = 112 ft^2

Therefore the surface area of a rectangular prism can be derived as follows.

Surface area	= Sum of area of left and right sides	+	= Sum of area of top and bottom	+	= Sum of area of front and back

$$SA = 2\,(8ft \times 7ft) + 2\,(14ft \times 7ft) + 2\,(14ft \times 8ft)$$

$$SA = 2\left(56ft^2\right) + 2\left(98ft^2\right) + 2\left(112ft^2\right)$$

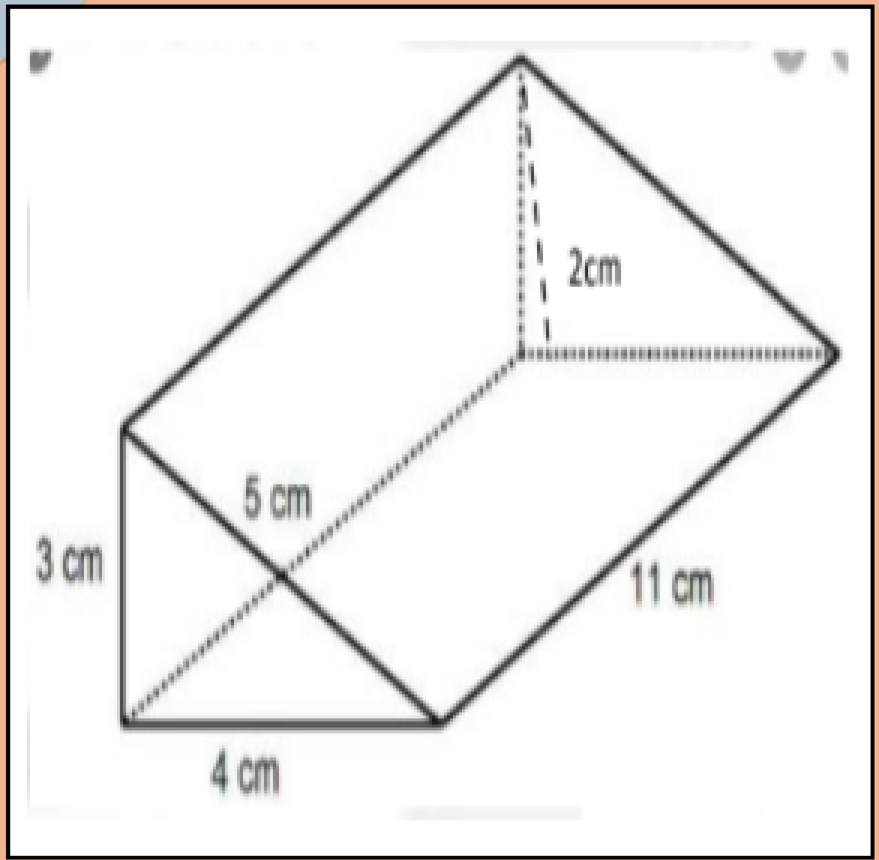
$$SA = 112ft^2 + 196ft^2 + 224ft^2$$

$$SA = 532ft^2$$

The total surface area of Mr. Reyes storage shed is 532 ft 2 . The paint left for Mr. Reyes is not enough to cover the whole storage shed.

Remember: The surface area refers to the sum of the areas of the bases and lateral faces of a solid figure. One way to find the surface area of a solid figure is to find the area of its net. It can be measured in square units (cm^2, ft^2, m^2,) and other units.

Example 1: Find the surface area of the triangular prism.



Solution:

Step 1: Find the lateral area

LA = ph

= (3 + 5 + 4)11

= 12 × 11

= 132 cm²

Step 2: Find the surface area

SA = LA + 2B

$= LA + 2\left(\frac{1}{2} \times b \times h\right)$

$= 132 + 2\left(\frac{1}{2} \times 4 \times 2\right)$

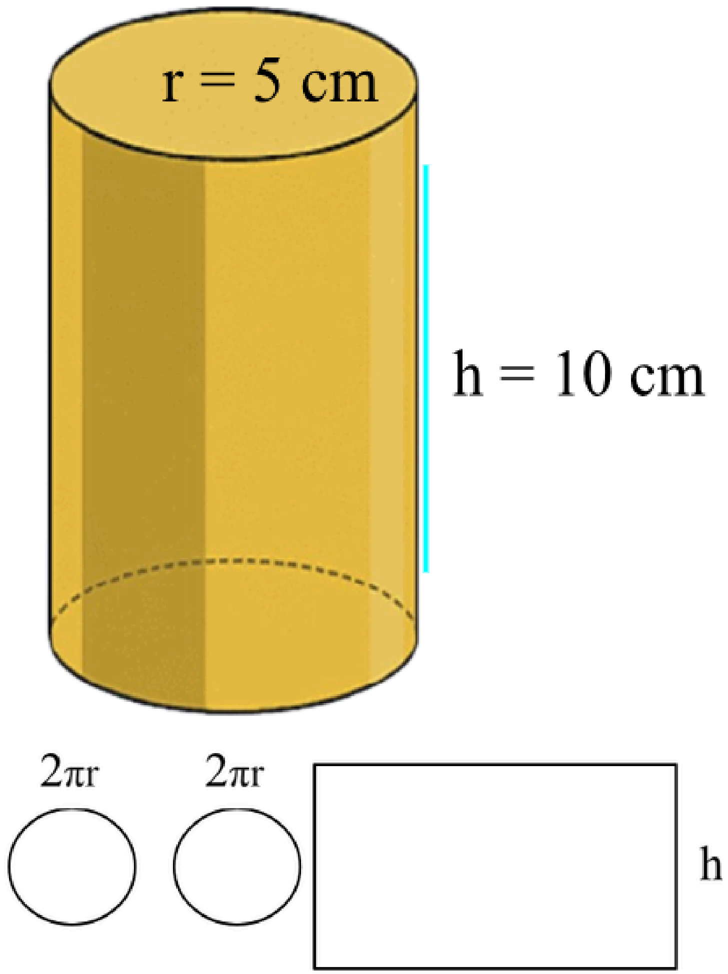
= 132 + 8

= 140 cm²

The surface area of the triangular prism is 140 cm^2.

Example 2: Find the surface area of a can of soda. The radius of the base is 5 cm, and the height is 10 cm. Assume that the can is shaped exactly like a cylinder.

To find the total surface area of the cylinder, we add the areas of the two circles to the area of the rectangle.



Solution:

Step 1: Find the lateral area

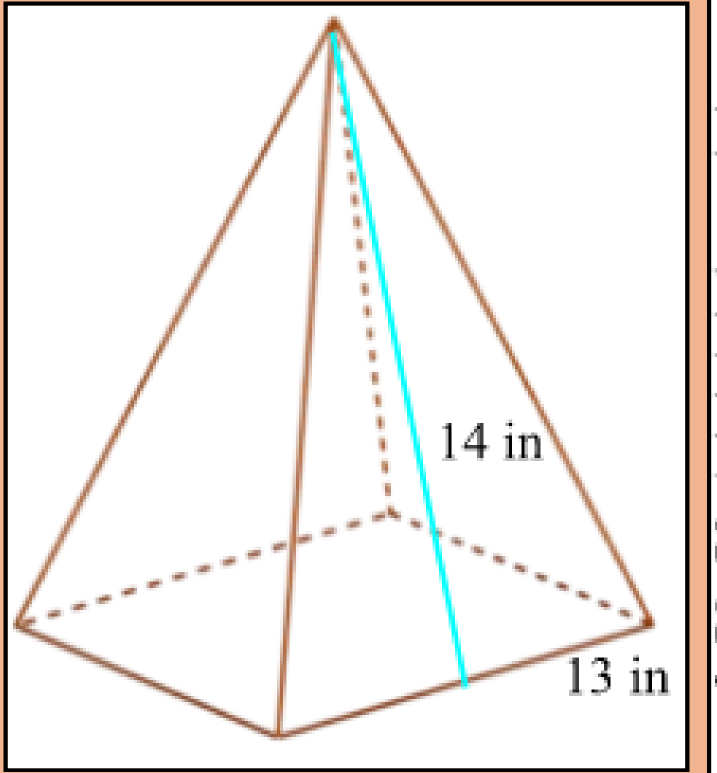
$$\begin{aligned} LA &= 2\pi r h \\ &= 2(3.14)(5)(10) \\ &= \mathbf{314\ cm^2} \end{aligned}$$

Step 2: Find the surface area

$$\begin{aligned} SA &= LA + 2B \\ &= LA + 2\pi r^2 \\ &= 314 + 2(3.14)(5)^2 \\ &= \mathbf{345.28\ cm^2} \end{aligned}$$

The surface area of the can soda is 345.28 cm^2

Example 3: Find the total surface area of a regular pyramid with a square base if each edge of the base measures 13 inches and the slant height of a side is 14 inches.



Solution: There are **4 congruent lateral faces**. Find the area of triangles.

Step 1: Find the lateral area

$LA = 4\left(\frac{1}{2} \times b \times h\right)$

$LA = 4\left(\frac{1}{2} \times 13 \times 14\right)$

$LA = 4\,(182 \div 2)$

$LA = 4\,(91)$

$\mathbf{LA = 364\ in^2}$

Step 2: Find the surface area

$SA = LA + B$

The base is a square: $B = s \times s$

$B = 13 \times 13$

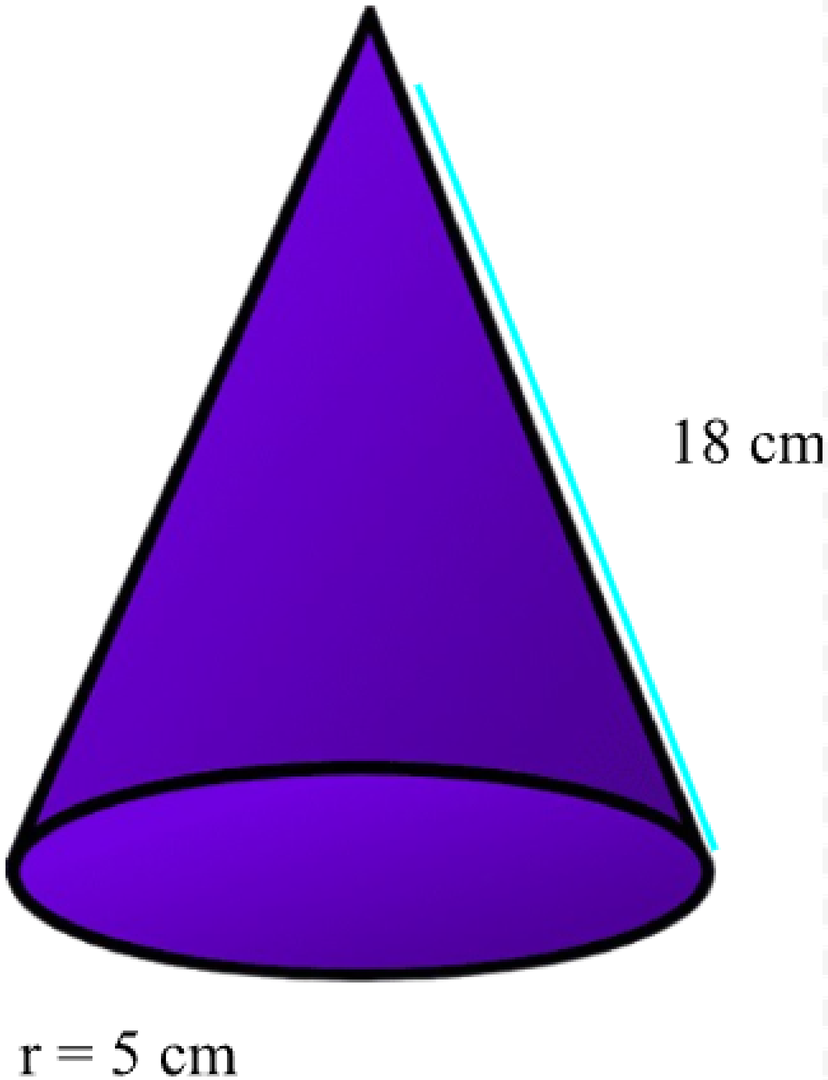
$\mathbf{B = 169\ in^2}$

$SA = LA + B$

$SA = 364 + 169$

$\mathbf{SA = 533\ in^2}$

Example 4: How much plastic was used to make this traffic cone? Suppose that it is a perfect cone.



a. **What is asked?**

- The amount of plastic used for the traffic cone.

b. **What are the given facts?**

- The radius of the figure is 5 cm, and the slant height is 18 cm.

Plan: Which formula should we use to solve the problem?

$$\mathbf{SA = \pi\, r\, s = \pi\ r^2}$$

Solve:

Step 1: Find the lateral area using the formula $LA = \pi\, r\, s$

$$LA = (3.14)\,(5)\,(18)$$

$$\mathbf{LA = 282.6\ cm^2}$$

Step 2: Find the surface area using the formula $SA = LA + B$

$$= \pi\, r\, s + \pi\ r^2$$

$$= 282.6 + (3.14)\,(5)^2$$

$$= 282.6 + 78.5$$

$$= \mathbf{361.1\ cm^2}$$

The amount of plastic used for the traffic cone is $361.1\, cm^2$

Example 5: How much rubber material was used to coat a soccer ball with a radius of 7.77 decimeters?

a. **What is asked?**

- The amount of rubber material used to coat a soccer ball

b. **What are the given facts?**

- The radius of the soccer ball is 7.77 decimeters.

Plan: Which formula should we use to solve the problem?

$$\mathbf{SA = 4 \pi r^2}$$

Solve:

Step 1: Find the surface area using the formula $SA = 4 \pi r^2$

$$SA = 4 \pi r^2$$
$$SA = 4\,(3.14)\,(7.77)^2$$
$$SA = (12.56)\,(60.37)$$
$$\mathbf{SA = 758.25\ dm^2}$$

Answer: The amount of rubber material used for the **soccer ball is 758.25 dm .**