Warm Up

Check Pg. 274 answers from yesterday.

1. 29
2. 13
3. 224
4. 351.25
5. 38
6. 4.5

21. Area 29.76 and Perimeter 45.12

Problem of the Day

The volume of a 10-meter-tall square pyramid is 120 m^3. What is the length of each side of the base?

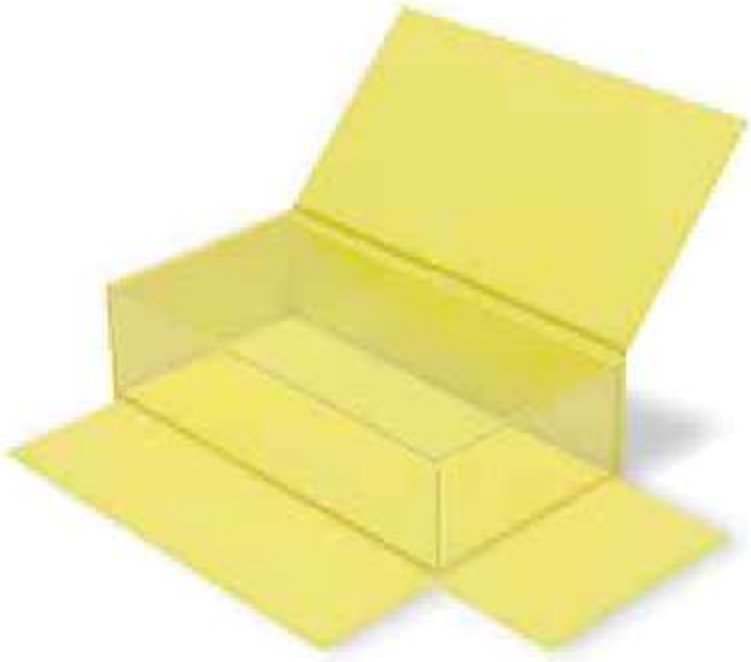
6 m

Surface Area of Prisms and Cylinders

Learn to find the surface area of prisms and cylinders.

Surface Area of Prisms and Cylinders

If you remove the surface from a three-dimensional figure and lay it out flat, the pattern you make is called a **net**.



Nets allow you to see all the surfaces of a solid at one time. You can use nets to help you find the *surface area* of a three-dimensional figure. **Surface area** is the sum of the areas of all of the surfaces of a figure expressed in square units.

Surface Area of Prisms and Cylinders

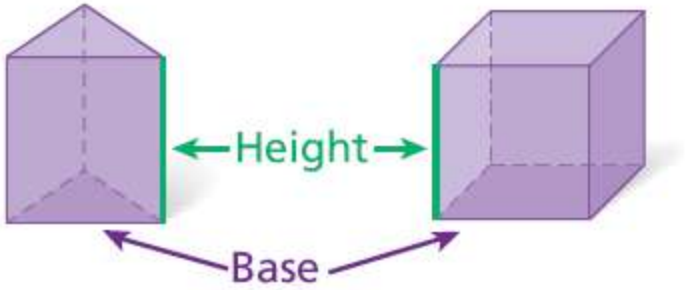
The **lateral faces** of a prism are parallelograms that connect the bases. The **lateral area** of a prism is the sum of the areas of the lateral faces.

Surface Area of Prisms and Cylinders

SURFACE AREA OF A PRISM

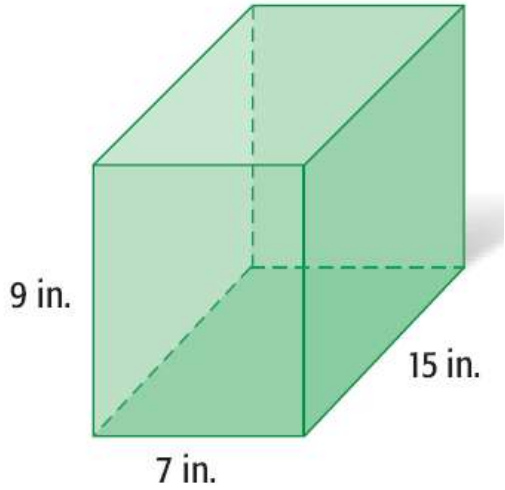
The surface area S of a prism is twice the base area B plus the lateral area L. The lateral area is the base perimeter P times the height h.

$$S = 2B + L$$
or
$$S = 2B + Ph$$



Additional Example 1: Finding the Surface Area of a Prism

Find the surface area of the prism.



$S = 2B + Ph$ *Use the formula.*

$S = 2(7)(15) + (44)(9)$ *Substitute.*

P = 2(7) + 2(15) = 44

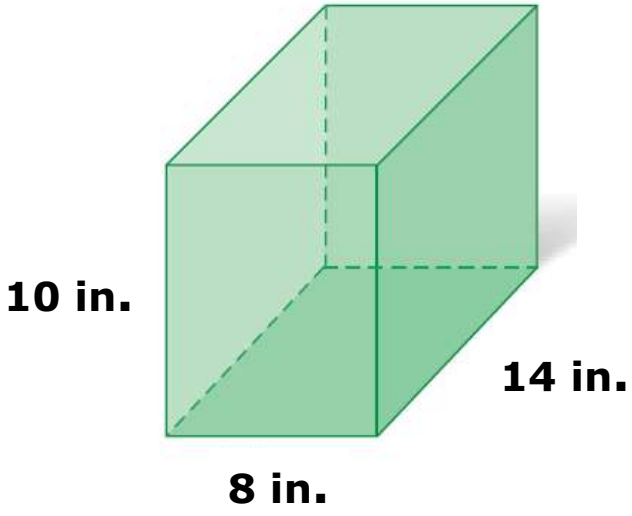
$S = 210 + 396$

$S = 606$

The surface area of the prism is 606 in^2.

Check It Out: Example 1

Find the surface area of the prism.



$S = 2B + Ph$ *Use the formula.*

$S = 2(8)(14) + (44)(10)$ *Substitute.*

$P = 2(8) + 2(14) = 44$

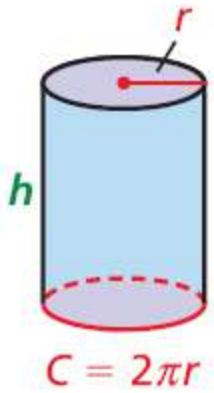
$S = 224 + 440$

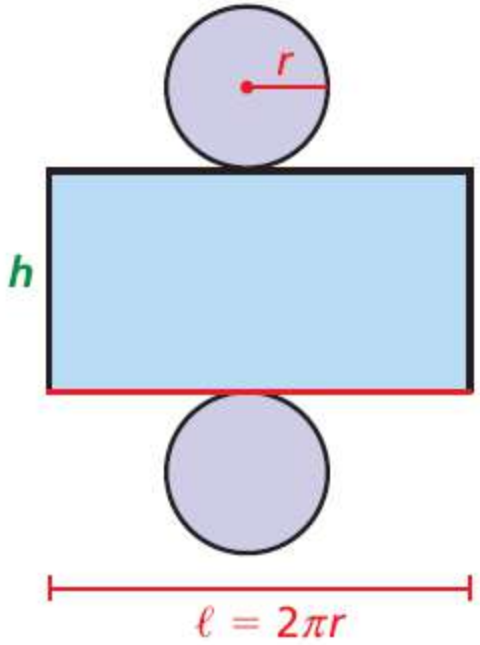
$S = 664$

The surface area of the prism is 664 in^2.

Surface Area of Prisms and Cylinders

The lateral area of a cylinder is the curved surface that connects the two bases. The net of a cylinder can be drawn so that the lateral area forms a rectangle with the same height as the cylinder. The length of the rectangle is equal to the circumference of the base of the height.



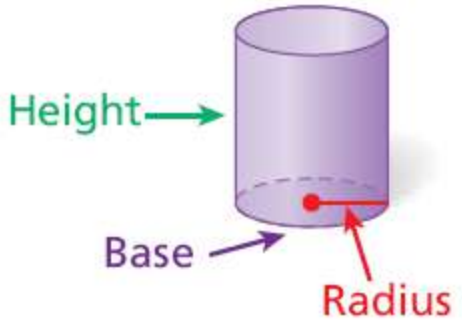


Surface Area of Prisms and Cylinders

SURFACE AREA OF A CYLINDER

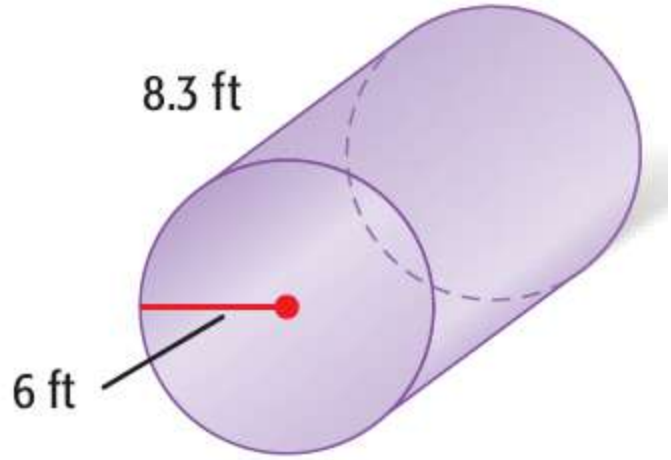
The surface area S of a cylinder is twice the base area B plus the lateral area L. The lateral area is the base circumference $2\pi r$ times the height h.

$$S = 2B + L$$
or
$$S = 2\pi r^2 + 2\pi rh$$



Additional Example 2: Finding the Surface Area of a Cylinder

Find the surface area of the cylinder to the nearest tenth. Use 3.14 for π.



$S = 2\pi r^2 + 2\pi rh$ *Use the formula.*

$S \approx (2 \cdot 3.14 \cdot 6^2) + (2 \cdot 3.14 \cdot 6 \cdot 8.3)$ *Substitute.*

$S \approx 226.08 + 312.744$ *Multiply.*

$S \approx 538.824$ *Add.*

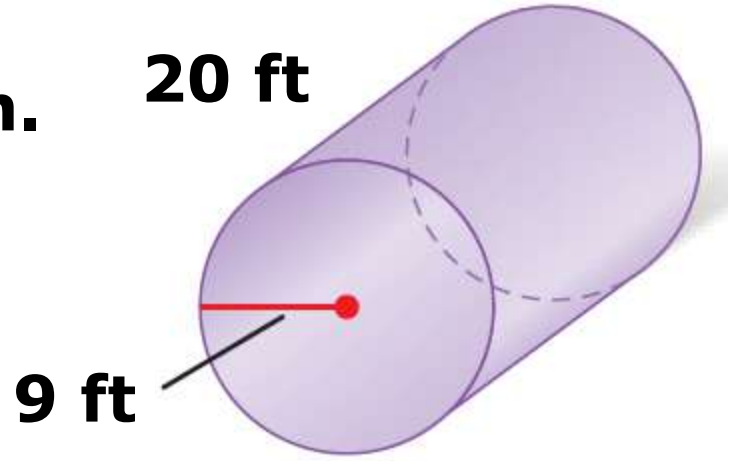
$S \approx 538.8$ *Round.*

The surface area of the cylinder is about 538.8 ft^2.

Surface Area of Prisms and Cylinders

Check It Out: Example 2

Find the surface area of the cylinder to the nearest tenth. Use 3.14 for π.



$S = 2\pi r^2 + 2\pi rh$ *Use the formula.*

$S \approx (2 \cdot 3.14 \cdot 9^2) + (2 \cdot 3.14 \cdot 9 \cdot 20)$ *Substitute.*

$S \approx 508.68 + 1130.4$ *Multiply.*

$S \approx 1{,}639.08$ *Add.*

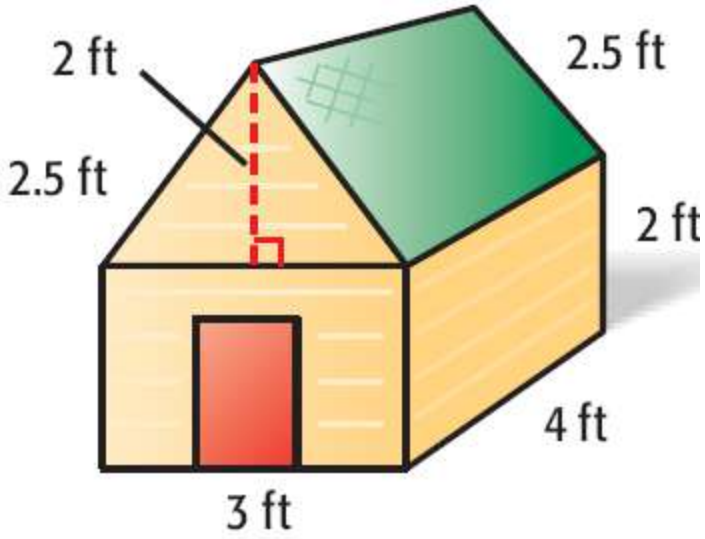
$S \approx 1{,}639.1$ *Round.*

The surface area of the cylinder is about 1,639.1 ft^2.

Additional Example 3: Problem Solving Application

PROBLEM SOLVING

The playhouse is a composite figure with a floor and no windows. What is the surface area of the playhouse?



Additional Example 3 Continued

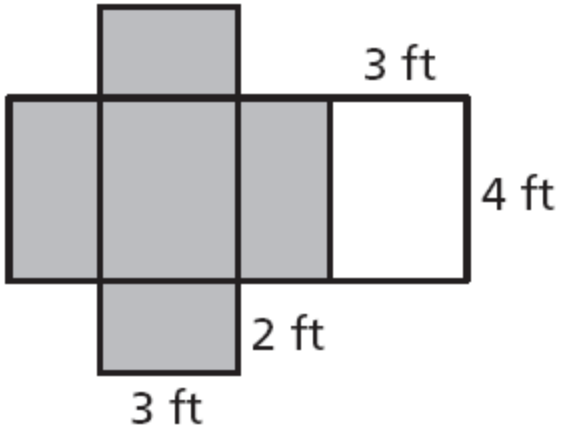
1 Understand the Problem

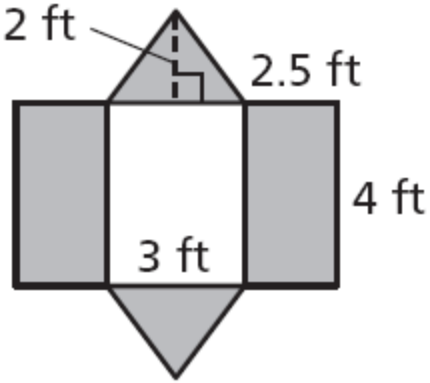
- The playhouse is a rectangular prism and triangular prism.
- The base of the playhouse is 3 ft by 4 ft and the height is 2 ft.
- The base of the roof is 3 by 2 ft. The height of the prism is 4 ft.

Additional Example 3 Continued

2 Make a Plan

Draw nets of the figures and shade the parts that show the surface area of the playhouse.





Additional Example 3 Continued

3 Solve

Find the surface are of the rectangular prism.

$S = B + Ph$

$= (3)(4) + (14)(2)$

$= 40 \text{ ft}^2$

Use only one base.

Find the surface area of the triangular prism.

$S = 2B + Ph - lw$

$= 2(\frac{1}{2}bh) + Ph - lw$

$= 2(\frac{1}{2})(3)(2) + (8)(4) - (3)(4)$

$= 6 + 32 - 12 = 26$

Subtract the area of the bottom of the triangular prism.

Additional Example 3 Continued

Add to find the total surface area: 40 + 26 = 66.

The surface area of the playhouse is 66 ft^2.

4 Look Back

The surface area of the playhouse should be less than the surface area of a rectangular prism with the same base and height of 4 ft.

$S = 2B + Ph$

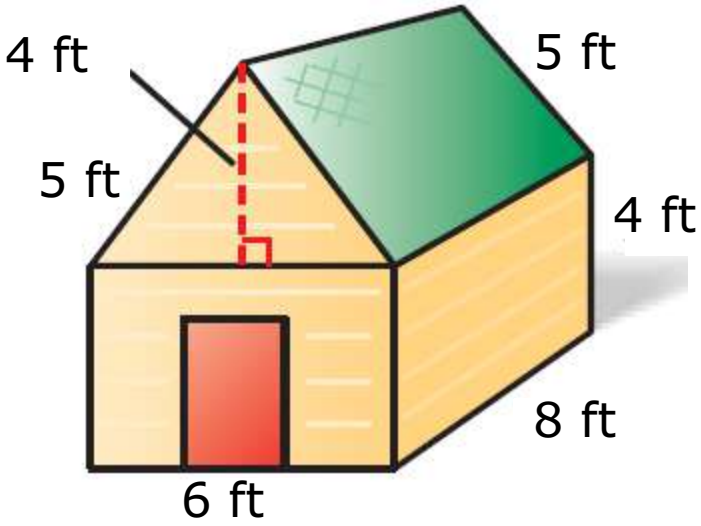
$= 2(3)(4) + (14)(4) = 80$

66 ft^2 is less than 80ft^2 so the answer is reasonable.

Check It Out: Example 3

PROBLEM SOLVING

The playhouse is a composite figure with a floor and no windows. What is the surface area of the playhouse?



Check It Out: Example 3 Continued

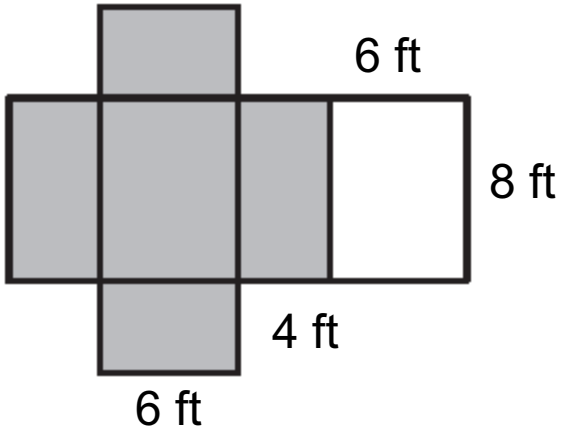
1 Understand the Problem

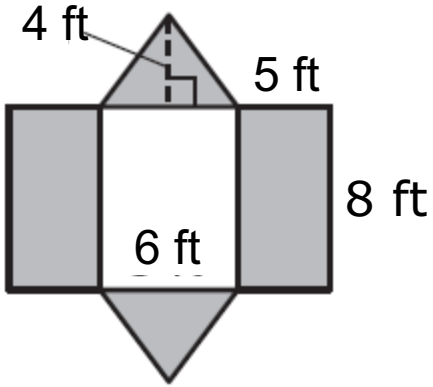
- The playhouse is a rectangular prism and triangular prism.
- The base of the playhouse is 6 ft by 8 ft and the height is 4 ft.
- The base of the roof is 6 by 4 ft. The height of the prism is 8 ft.

Check It Out: Example 3 Continued

2 Make a Plan

Draw nets of the figures and shade the parts that show the surface area of the playhouse.





Check It Out: Example 3 Continued

3 Solve

Find the surface are of the rectangular prism.

$S = B + Ph$

$= (6)(8) + (28)(4)$

$= 160 \text{ ft}^2$

Use only one base.

Find the surface area of the triangular prism.

$S = 2B + Ph - lw$

$= 2(\frac{1}{2}bh) + Ph - lw$

$= 2(\frac{1}{2})(6)(4) + (16)(8) - (6)(8)$

$= 24 + 128 - 48 = 104$

Subtract the area of the bottom of the triangular prism.

Check It Out: Example 3 Continued

Add to find the total surface area: 160 + 104 = 264.

The surface area of the playhouse is 264 ft^2.

4 Look Back

The surface area of the playhouse should be less than the surface area of a rectangular prism with the same base and height of 8 ft.

$S = 2B + Ph$

$= 2(6)(8) + (28)(8) = 320$

264 ft^2 is less than 320 ft^2 so the answer is reasonable.

Lesson Quizzes

Standard Lesson Quiz

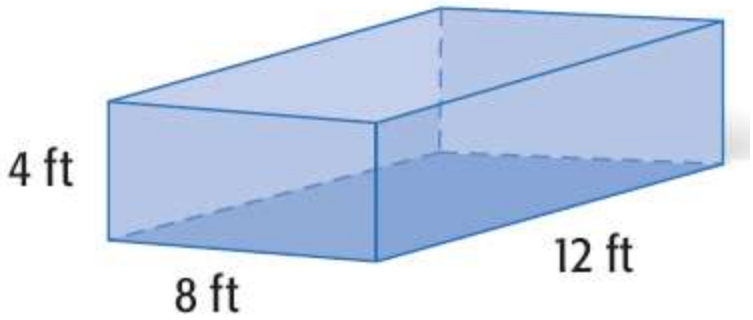
Lesson Quiz for Student Response Systems

Surface Area of Prisms and Cylinders

Lesson Quiz

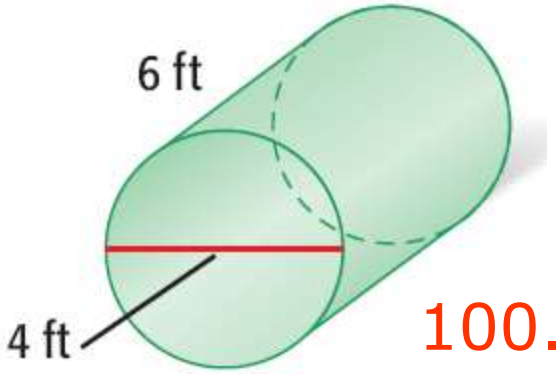
Find the surface area of each figure to the nearest tenth.

1.



352 ft^2

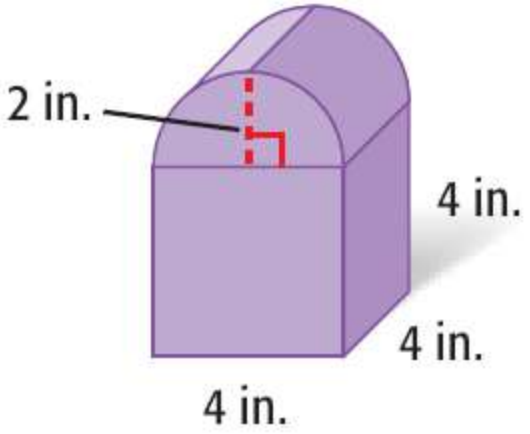
2.



100.5 ft^2

3. The jewelry box is a composite figure. What is its surface area to the nearest tenth? Use 3.14 for π.

117.7 in^2



Lesson Quiz for Student Response Systems

1. Identify the surface area of the prism with dimensions 16 ft by 9 ft by 5 ft.

A. 588 ft^2

B. 538 ft^2

C. 288 ft^2

D. 240 ft^2

Lesson Quiz for Student Response Systems

2. Identify the surface area of the cylinder with diameter 10 cm and height 22 cm to the nearest tenth. Use 3.14 for π.

A. 1657.9 cm^2

B. 2417.8 cm^2

C. 3530.7 cm^2

D. 4835.6 cm^2