



Math Virtual Learning

Pre-Algebra

Surface Area of Pyramids & Cylinders

May 11, 2020



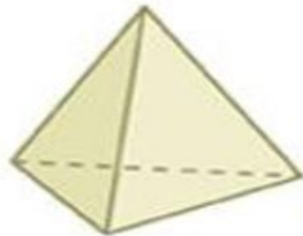
Pre-Algebra
Lesson: May 11, 2020

Objective/Learning Target:
Find the surface area of pyramids and cylinders.

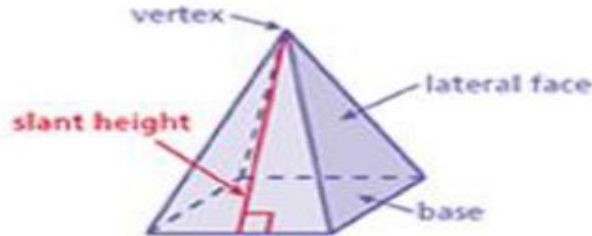
Let's Get Started:
Watch Video: [Surface Area of a Pyramid](#)

Pyramids

- Pyramids are named from their base shape
- Most pyramids we've seen are square pyramids but there are plenty of others as well...



Triangular Base



Square Base

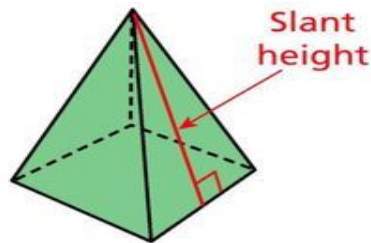


Hexagonal Base



Parts of a pyramid

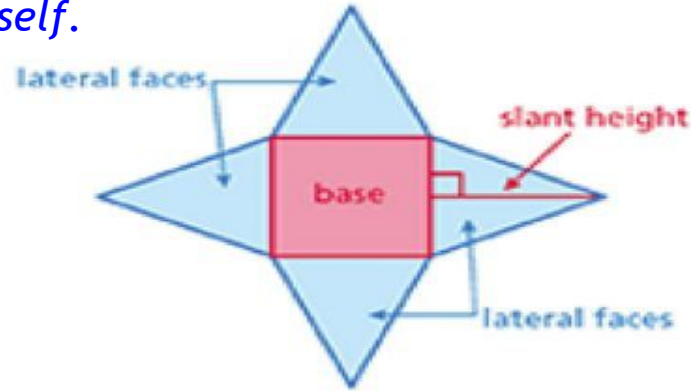
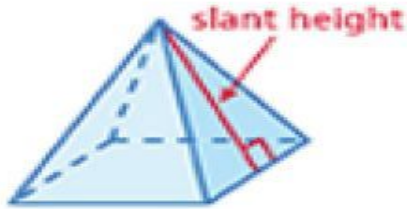
- A regular pyramid is a pyramid whose base is a regular polygon (all sides equal). The lateral faces are triangles.
- The height of each triangle is the ***slant height*** of the pyramid.



Here is one way to find the surface area.

Another look

To find the base area, just square the base side length. In other words, multiply it by itself.

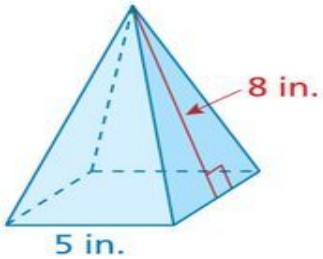


Surface Area of Pyramid =

Area of Base + Areas of Lateral Faces

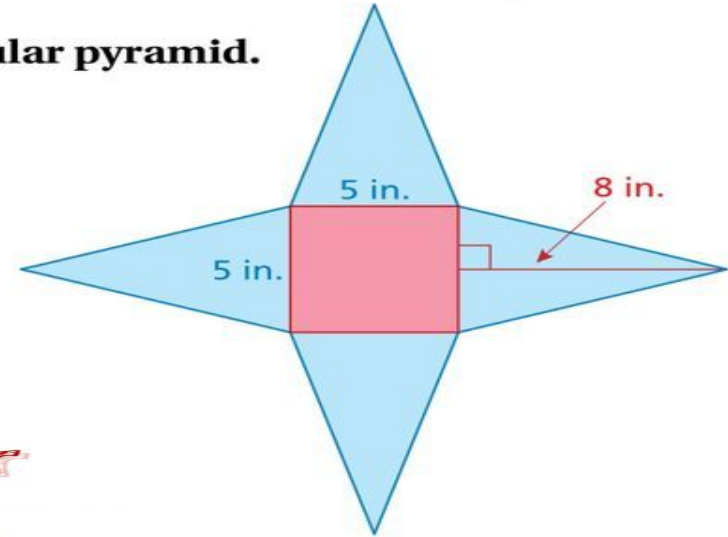


Example 1A: Finding Surface Area using a net



Find the surface area of the regular pyramid.

Remember, to find the area of the base, just square the base side length. In other words, multiply it by itself.

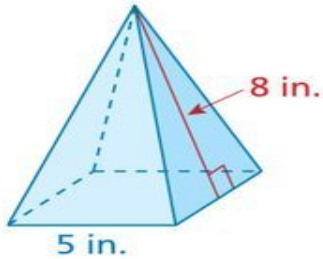


answer

There are 4 identical lateral faces. Count the area 4 times.



Example 1A: Finding Surface Area using a net



Find the surface area of the regular pyramid.

Triangle Faces

$$\frac{1}{2} b \times h = \text{area}$$

$$\frac{1}{2}(5) \times 8 = \text{area}$$

$$2\frac{1}{2} \times 8 = \text{area}$$

$$20 = \text{area of one triangle}$$

$$20 \times 4 = \text{area of four triangles}$$

$$80 = \text{area of four triangles}$$

Rectangle Face

$$l \times w = \text{area}$$

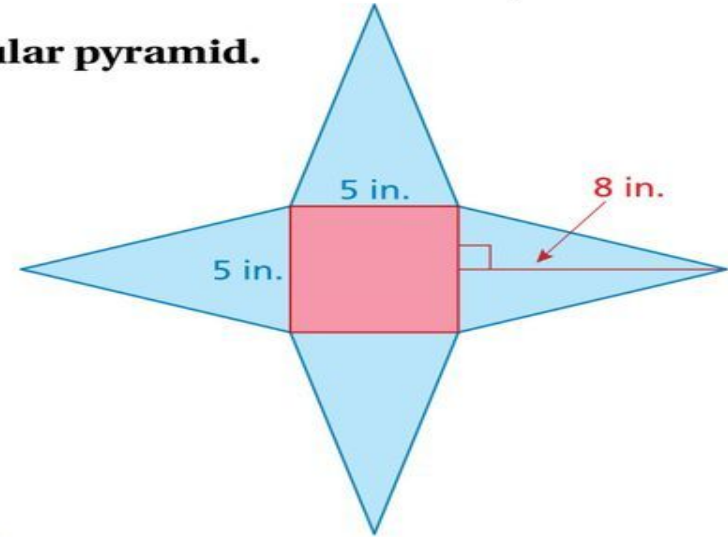
$$5 \times 5 = \text{area}$$

$$25 = \text{area of one rectangle}$$

Add All Faces

$$80 + 25 = \text{surface area}$$

$$105 \text{ in}^2 = \text{surface area of the pyramid}$$



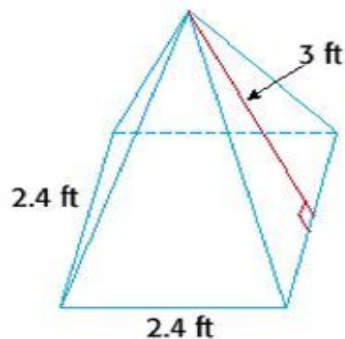
There are 4 identical lateral faces. Count the area 4 times.

Example 1B: Find the Surface Area of a Pyramid



Find the surface area of the figure.

answer



Example 1B: Find the Surface Area of a Pyramid



Find the surface area of the figure.



Surface Area

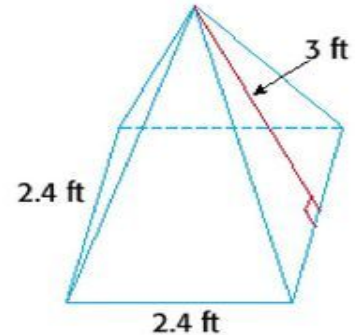
Area of the base + 4 x Area of lateral face = surface area

$$2.4 \times 2.4 + 4\left(\frac{1}{2} \times 3 \times 2.4\right) = \text{surface area}$$

$$5.76 + 4(3.6) = \text{surface area}$$

$$5.76 + 14.4 = \text{surface area}$$

$$20.16 \text{ ft}^2 = \text{surface area}$$





You Try!

- What is the surface area of a square pyramid with a base side length of 9 cm and a slant height of 7 cm? (Draw a picture, then solve)

To find the area of the base, just square the base side length. In other words, multiply it by itself.

answer



You Try!

- What is the surface area of a square pyramid with a base side length of 9 cm and a slant height of 7 cm? (Draw a picture, then solve)

Surface Area

Area of the base + 4 x Area of lateral faces = surface area

$$9 \times 9 + 4 \left(\frac{1}{2} \times 9 \times 7 \right)$$

$$81 + 4(31.5) = \text{surface area}$$

$$81 + 126 = \text{surface area}$$

$$207 \text{ cm}^2 = \text{area of one triangle}$$

207 cm²

You Try!



D. 329 units^2

A. 140 units^2

B. 189 units^2

C. 280 units^2

You Try!

Surface Area

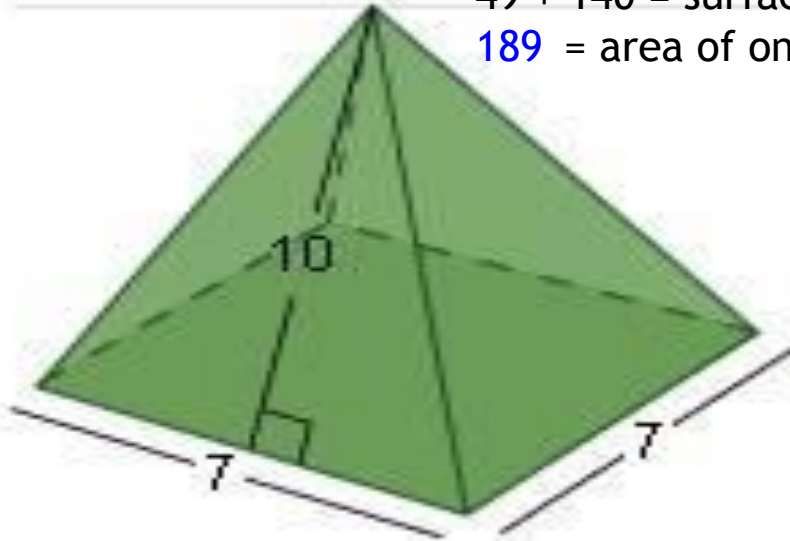
Area of base + 4(Area of lateral faces = surface area

$$7 \times 7 + 4\left(\frac{1}{2} \times 7 \times 10\right) = \text{surface area}$$

$$49 + 4(35) = \text{surface area}$$

$$49 + 140 = \text{surface area}$$

$$189 = \text{area of one triangle}$$



D. 329 units²



A. 140 units²

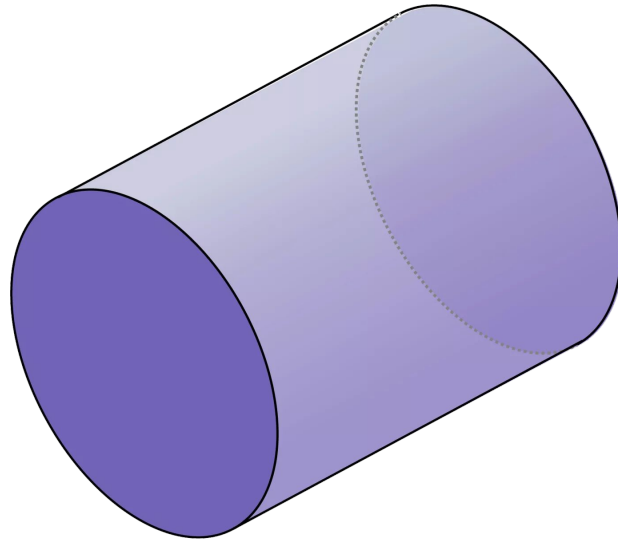


B. 189 units²

C. 280 units²

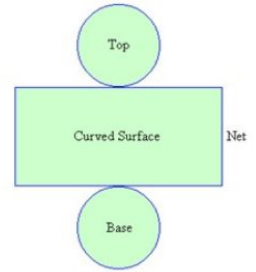
Now we'll learn to find the surface area of cylinders!

Watch Video: [Surface Area of Cylinder](#)



Practice:

Find the surface area of the cylinder.



Surface Area of Cylinders.

To find the surface area of a cylinder, add the surface area of each end plus the surface area of the side. Each end is a circle, so the surface area of each end is $\pi * r^2$, where r is the radius of the end. There are two ends, so their combined surface area is $2 \pi * r^2$. The surface area of the side is the circumference times the height or $2 \pi * r * h$, where r is the radius and h is the height of the side.

The entire formula for the surface area of a cylinder is $2 \pi r^2 + 2 \pi r h$.

$$\text{Surface Area} = 2\pi r^2 + 2\pi r h$$

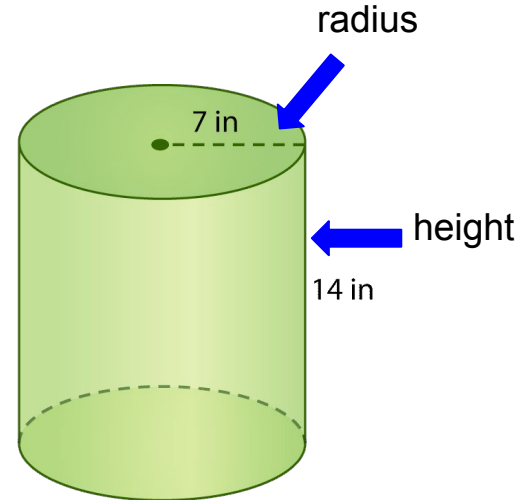
$$\text{Surface Area} = 2(3.14) 7^2 + 2(3.14)7(14)$$

$$\text{Surface Area} = 2(3.14)49 + 2(3.14)7(14)$$

$$\text{Surface Area} = 307.72 + 615.44$$

$$\text{Surface Area} = 923.16 \text{ in}^2$$

Correct Answer



Practice:

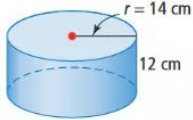
Go to this website:
[Surface Area of Cylinder](#)

1. Look at the cylinder carefully.
2. Solve for the surface area.
3. Select the correct answer and then click “OK”.

Length Level

Surface Area of cylinder 1

Find the Surface Area of cylinder. **Round to the nearest whole number.**



$SA = 2 \pi r^2 + 2 \pi r h$


A) 2286 cm² C) 2291 cm²
 B) 2289 cm² D) 2270 cm²

OK

Right
Wrong
Clock

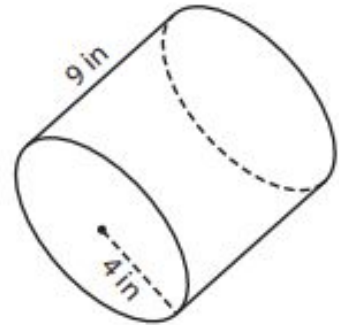
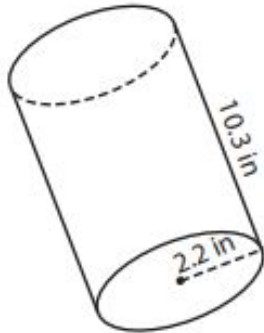
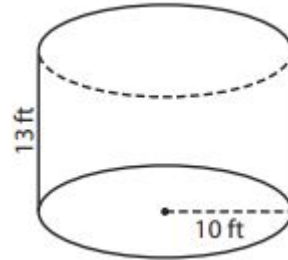
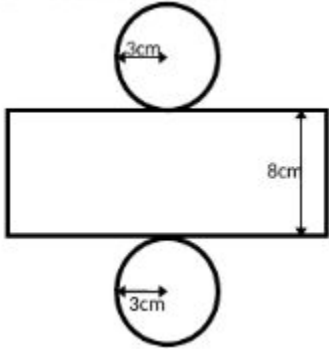
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math



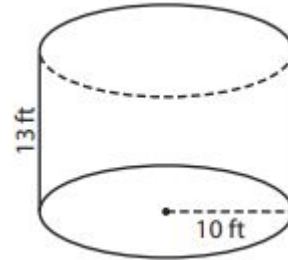
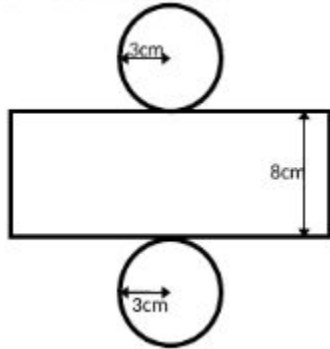
Practice:

Answer the questions on a piece of paper.
Find the surface area of the cylinders.



Answer Key:

Once you have completed the problems, check your answers here.



$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

$$\text{Surface Area} = 2(3.14)3^2 + 2(3.14)3(8)$$

$$\text{Surface Area} = 2(3.14)9 + 2(3.14)3(8)$$

$$\text{Surface Area} = 56.52 + 150.72$$

$$\text{Surface Area} = 207.24 \text{ cm}^2$$

$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

$$\text{Surface Area} = 2(3.14)10^2 + 2(3.14)10(13)$$

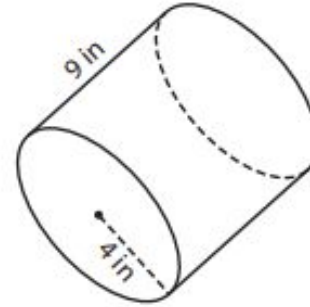
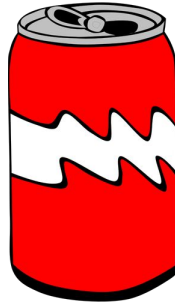
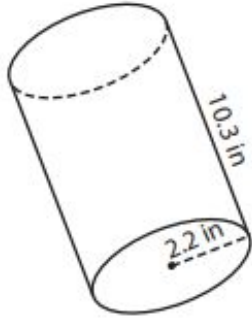
$$\text{Surface Area} = 2(3.14)100 + 2(3.14)10(13)$$

$$\text{Surface Area} = 628 + 816.4$$

$$\text{Surface Area} = 1,444.4 \text{ ft}^2$$

Answer Key:

Once you have completed the problems, check your answers here.



$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

$$\text{Surface Area} = 2(3.14)2.2^2 + 2(3.14)2.2(10.3)$$

$$\text{Surface Area} = 2(3.14)4.84 + 2(3.14)2.2(10.3)$$

$$\text{Surface Area} = 30.3952 + 142.3048$$

$$\text{Surface Area} = 172.7 \text{ in}^2$$

$$\text{Surface Area} = 2\pi r^2 + 2\pi rh$$

$$\text{Surface Area} = 2(3.14)4^2 + 2(3.14)4(9)$$

$$\text{Surface Area} = 2(3.14)16 + 2(3.14)4(9)$$

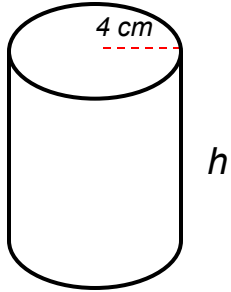
$$\text{Surface Area} = 100.48 + 226.08$$

$$\text{Surface Area} = 326.56 \text{ in}^2$$

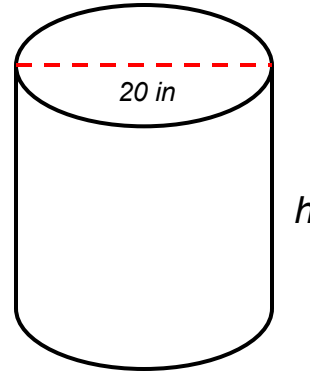
Additional Practice: Challenge

Find the height of the cylinders.

Surface Area = 251.2 cm^2



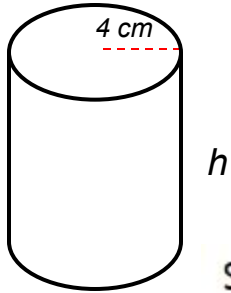
Surface Area = $1,570 \text{ in}^2$



Additional Practice: Challenge Answers

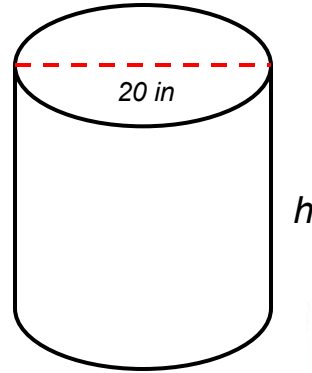
Once you have completed the problems, check your answers here.

Surface Area = 251.2 cm^2



$$\begin{aligned}\text{Surface Area} &= 2\pi r^2 + 2\pi r h \\ 251.2 &= 2(3.14)4^2 + 2(3.14)4(h) \\ 251.2 &= 2(3.14)16 + 2(3.14)4(h) \\ 251.2 &= 100.48 + 25.12h \\ 251.2 - 100.48 &= 100.48 - 100.48 + 25.12h \\ 150.72 &= 25.12h \\ 150.72 \div 25.12 &= 25.12h \div 25.12 \\ 6 &= h\end{aligned}$$

Surface Area = $1,570 \text{ in}^2$



$$\begin{aligned}\text{Surface Area} &= 2\pi r^2 + 2\pi r h \\ 1,570 &= 2(3.14)10^2 + 2(3.14)10(h) \\ 1,570 &= 2(3.14)100 + 2(3.14)10(h) \\ 1,570 &= 628 + 62.8h \\ 1,570 - 628 &= 628 - 628 + 62.8h \\ 942 &= 62.8h \\ 942 \div 62.8 &= 62.8h \div 62.8 \\ 15 &= h\end{aligned}$$

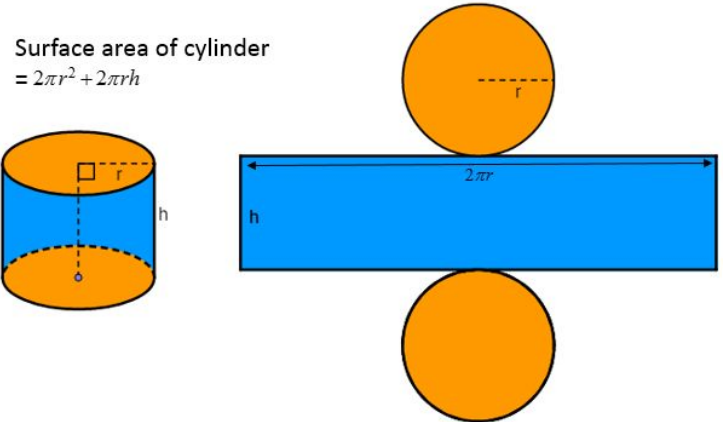
Additional Practice: Cylinders

Click on the links below to get additional practice and to check your understanding!

[IXL](#) - Practice

[Quizizz](#) - Practice

The **lateral surface area** is the **area** of all sides excluding the **area** of the base. **Total surface area** of any solid is the sum of **areas** of all the faces of the solid.



Additional Practice: Pyramids

Click on the links below to get additional practice and to check your understanding!

[Khan Academy](#) - (Practice using nets, like on slide 7)

[IXL](#) - Practice

[IXL](#) - Challenge