Important Concepts . . .

Preview Review

Mathematics Grade 8 TEACHER KEY

W3 - Lesson 2: Calculating Surface Area

V6-10

Important Concepts of Grade 8 Mathematics

W1 - Lesson 1 ..... Perfect Squares and Square Roots
W1 - Lesson 2 ..... Working with Ratios and Rates
W1 - Lesson 3 ..... Multiplying and Dividing Fractions
W1 - Lesson 4 ..... Multiplying and Dividing Integers
W1 - Lesson 5 ..... Working with Percents
W1 - Review
W1 - Quiz

W2 - Lesson 1 ..... Modelling and Solving Linear Equations Using Algebra Tiles
W2 - Lesson 2 ..... Solving Linear Equations
W2 - Lesson 3 ..... Graphing and Analyzing Linear Relations
W2 - Lesson 4 ..... Critiquing the Representation of Data
W2 - Lesson 5 ..... Probability of Independent Events
W2 - Review
W2 - Quiz

W3 - Lesson 1 ..... Pythagorean Theorem
W3 - Lesson 2 ..... Calculating Surface Area
W3 - Lesson 3 ..... Calculating Volume
W3 - Lesson 4 ..... Drawing 3-D Objects
W3 - Lesson 5 ..... Congruence of Polygons
W3 - Review
W3 - Quiz

Materials Required

Protractor
Ruler
Calculator

No Textbook Required

This is a stand-alone course.

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Preview/Review Concepts for Grade Eight Mathematics

Teacher Key

W3 – Lesson 2:

Calculating Surface Area

OBJECTIVES

By the end of this lesson, you will be able to:

- Explain the relationship between the area of 2-D shapes and the surface area of a given 3-D object.
- Calculate the surface area of a given right rectangular, right triangular prism and a right cylinder.
- Solve a given problem involving surface area.

GLOSSARY

Right Prism – a three-dimensional object that can have any polygon as a base and rectangles as lateral faces. The prism is named according to its base.

Surface area – the total area of the surfaces of a three-dimensional object.

Net– a diagram that illustrates all the different shapes that make up a three-dimensional object; what the object would look like if it was laid out flat.

W3 – Lesson 2: Calculating Surface Area

Materials required:

- Paper, Pencil, Calculator

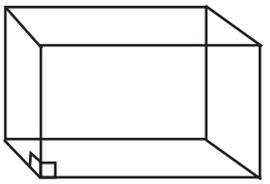
Calculating Surface Area of a Right Rectangular Prism

Surface area describes how much material is used to make the shell of a three-dimensional object. How much cardboard is used to make a box? How much aluminum is used to make a soup can?

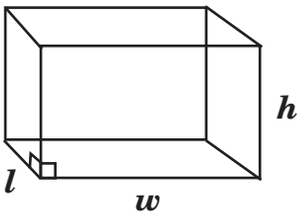
Key Points:

- Draw a net of the object
- Determine the shapes that are present in the net
- Add all the areas of the various shapes together

A right rectangular prism is a prism that has rectangular sides that are perpendicular to the rectangular bases of the prism.



In a right rectangular prism, the front and back faces are identical; the side faces are identical; and the top and bottom faces are identical.

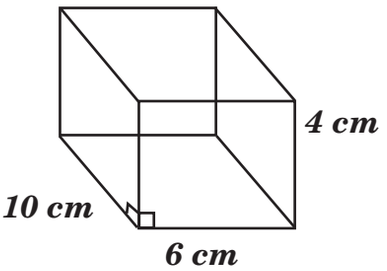


The formula to use to calculate the surface area of a right rectangular prism is:

$$SA = A_{\text{front \& back}} + A_{\text{both sides}} + A_{\text{top \& bottom}}$$
$$2(wh) + 2(lh) + 2(lw)$$

Example 1

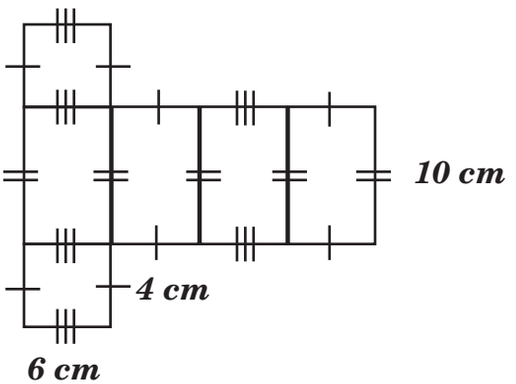
Calculate the surface area of the given right rectangular prism.



There are 6 faces on the right rectangular prism which are of 3 different sizes.

The front and back faces are identical, the side faces are identical, and the top and bottom faces are identical.

Drawing a net of the right rectangular prism will help in calculating its surface area.

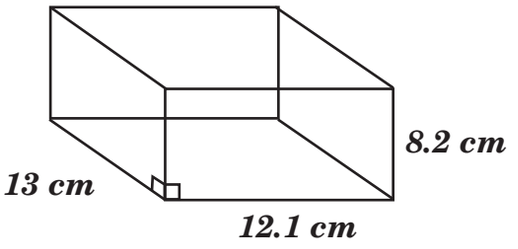


Use the surface area formula, substitute in the known values, and evaluate.

$$SA = A_{\text{front \& back}} + A_{\text{both sides}} + A_{\text{top \& bottom}}$$
$$= 2(wh) + 2(lh) + 2(lw)$$
$$= 2(6)(4) + 2(10)(4) + 2(10)(6)$$
$$= 48 + 80 + 120$$
$$= 248 \text{ cm}^2$$

Practice Questions

1. Calculate the surface area of the following right rectangular prism

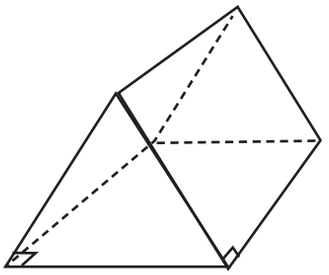


Use the surface area formula, substitute in the known values, and evaluate.

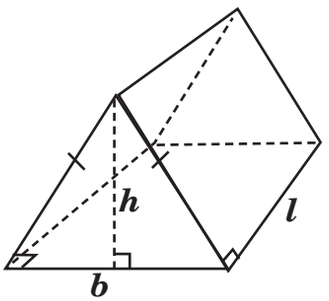
$$SA = A_{front\ \&\ back} + A_{both\ sides} + A_{top\ \&\ bottom}$$
$$= 2(wh) + 2(lh) + 2(lw)$$
$$= 2(12.1)(8.2) + 2(13)(8.2) + 2(13)(12.1)$$
$$= 198.44 + 213.2 + 314.6$$
$$= 726.24\ cm^2$$

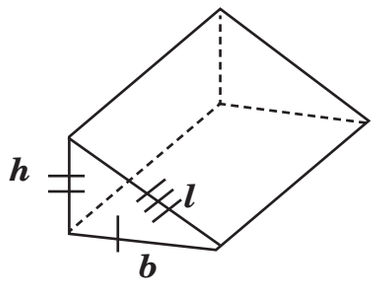
Calculating Surface Area of a Right Triangular Prism

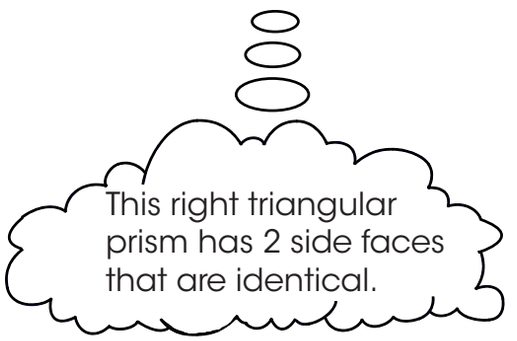
A right triangular prism is a prism that has triangular bases that are perpendicular to the rectangular sides of the prism.

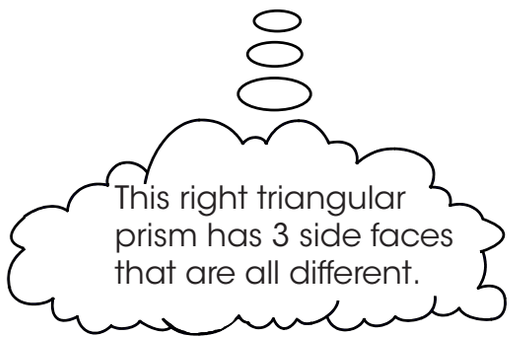


In a right triangular prism, the front and back faces are identical. The side faces and the bottom of the right triangular prism may or may not be identical.









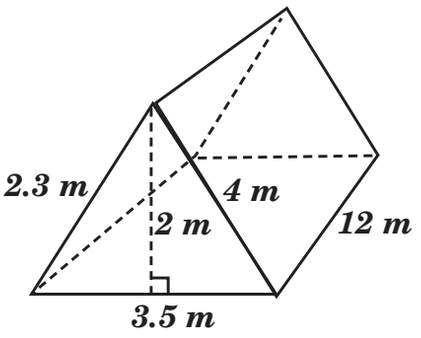
The formula to use to calculate the surface area of a right triangular prism is:

$$SA = A_{\text{front \& back}} + A_{\text{side1}} + A_{\text{side2}} + A_{\text{bottom}}$$

$$2\left(\frac{bh}{2}\right) + (lw)_{side\,1} + (lw)_{side\,2} + (lw)_{bottom}$$

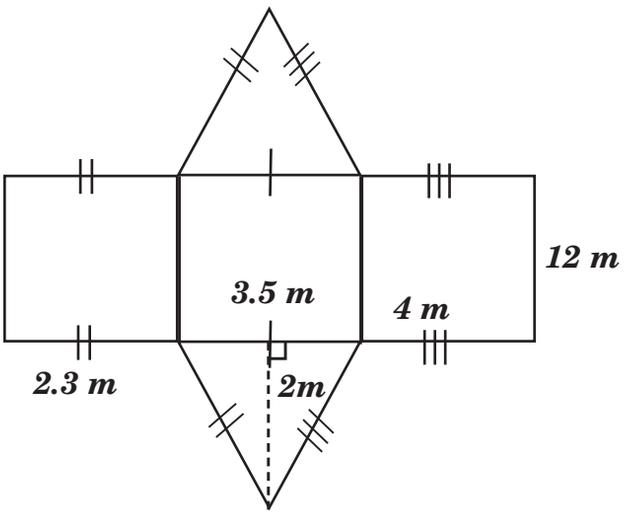
Example 1

Calculate the surface area of the given right triangular prism.



There are 5 faces on the right triangular prism, 2 identical triangles, and 3 rectangles.

Drawing a net of the right triangular prism will help in calculating its surface area.



Use the surface area formula, substitute in the known values, and evaluate.

$SA = A_{\text{front \& back}} + A_{\text{side1}} + A_{\text{side2}} + A_{\text{bottom}}$

$$2\left(\frac{bh}{2}\right) + (lw)_{side\,1} + (lw)_{side\,2} + (lw)_{bottom}$$

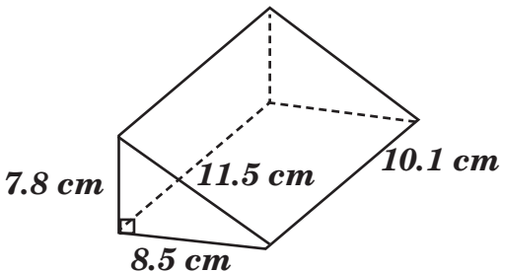
$$= 2\left(\frac{(3.5)(2)}{2}\right) + (12)(2.3)_{\text{side 1}} + (12)(4)_{\text{side 2}} + (12)(3.5)_{\text{bottom}}$$

$= 7 + 27.6 + 48 + 42$

$= 124.6 \text{ m}^2$

Practice Question

1. Calculate the surface area of the following right triangular prism.



Use the surface area formula, substitute in the known values, and evaluate.

$$SA = A_{front\ \&\ back} + A_{side1} + A_{side2} + A_{bottom}$$

$$2\left(\frac{bh}{2}\right) + (lw)_{side\,1} + (lw)_{side\,2} + (lw)_{bottom}$$

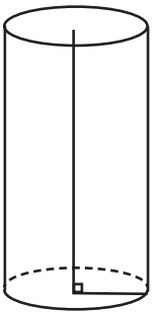
$$= 2\left(\frac{(8.5)(7.8)}{2}\right) + (10.1)(7.8)_{side\,1} + (10.1)(11.5)_{side\,2} + (10.1)(8.5)_{bottom}$$

$$= 66.3 + 78.78 + 116.5 + 85.85$$

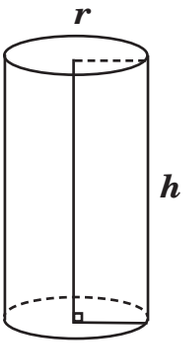
$$= 347.43\ cm^2$$

Calculating Surface Area of a Right Cylinder

A right cylinder prism has circular bases that are perpendicular to the curved rectangular side of the prism.



In a right cylinder, the top and bottom faces are identical. If the curved side of the cylinder is laid flat, it is in the shape of a rectangle. The length of the rectangle is equal to the circumference of the circular base.



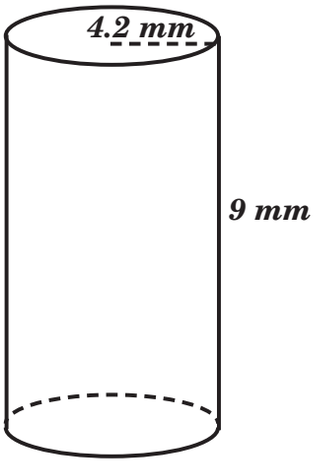
The formula to use to calculate the surface area of a right triangular prism is:

$$\begin{aligned} SA &= A_{top\&bottom} + A_{side} \\ &= 2(\pi r^2) + (lh) \\ &= 2(\pi r^2) + (\pi dh) \\ &= 2(\pi r^2) + (2\pi rh) \end{aligned}$$

When calculating the surface area of a right cylinder, use π = 3.14.

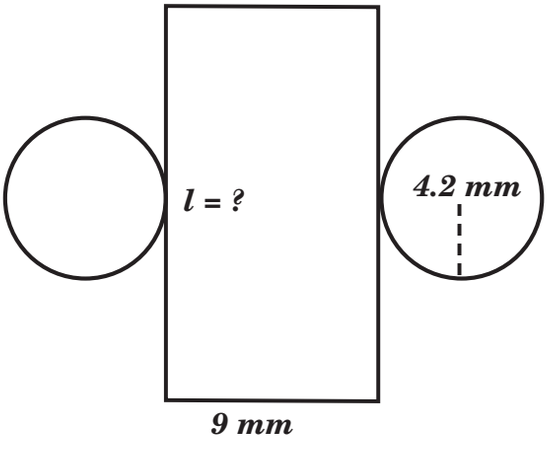
Example 1

Calculate the surface area of the given right cylinder. Use π = 3.14.



There are 3 faces on the right cylinder, 2 identical circles, and 1 rectangle.

Drawing a net of the right cylinder will help in calculating its surface area.

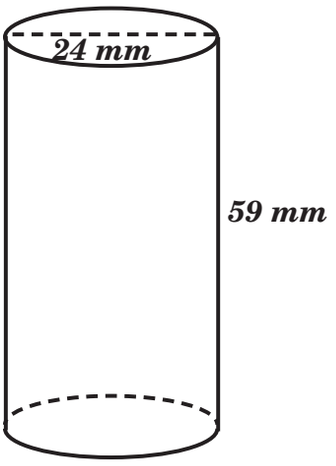


Use the surface area formula, substitute in the known values, and evaluate.

$$
\begin{aligned}
SA &= A_{top\&bottom} + A_{side} \\
&= 2(\pi r^2) + (\pi rh) \\
&= 2(\pi)(4.2)^2 + 2(\pi)(4.2)(9) \\
&= 2(3.14)(4.2)^2 + 2(3.14)(4.2)(9) \\
&= 110.78 + 237.38 \\
&= 348.16 mm^2
\end{aligned}
$$

Practice Question

Calculate the surface area of the following right cylinder.



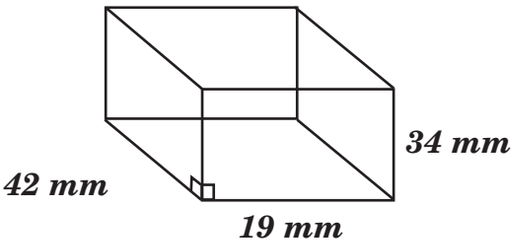
Use the surface area formula, substitute in the known values, and evaluate.

$$
\begin{aligned}
SA &= A_{top\,\&\,bottom} + A_{side} \\
&= 2(\pi r^2) + (\pi rh) \\
&= 2(\pi)(12)^2 + 2(\pi)(12)(59) \\
&= 2(3.14)(12)^2 + 2(3.14)(12)(59) \\
&= 904.32 + 4446.24 \\
&= 5350.56\,mm^2
\end{aligned}
$$

Lesson 2: Assignment

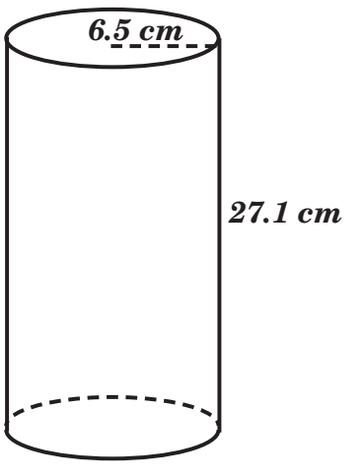
Calculate the surface area of each of the following right prisms. Round the answers to the nearest hundredth of a unit.

1.



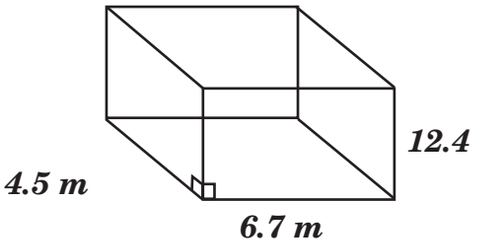
$$\begin{aligned} SA &= A_{top\&bottom} + A_{both\ sides + A\ top + bottom} \\ &= 2(wh) + 2(lh) + 2(lw) \\ &= 2(19)(34) + 2(42)(34) + 2(42)(19) \\ &= 1292 + 2856 + 1596 \\ &= 5744 mm^2 \end{aligned}$$

2.



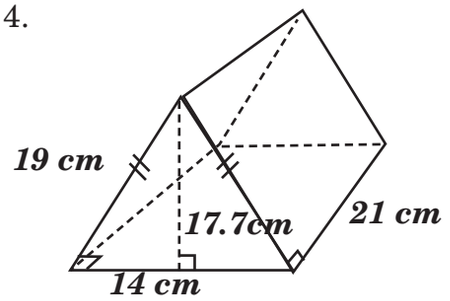
$$\begin{aligned} SA &= A_{top\&bottom} + A_{side} \\ &= 2(\pi r^2) + (\pi rh) \\ &= 2(\pi)(6.5)^2 + 2(\pi)(6.5)(27.1) \\ &= 265.33 + 1106.22 \\ &= 1371.55 cm^2 \end{aligned}$$

3.



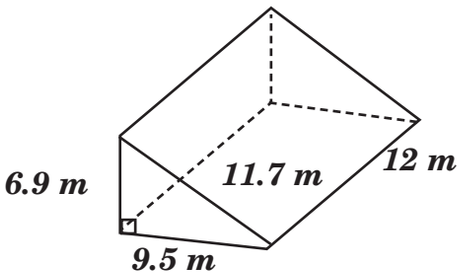
$$\begin{aligned} SA &= A_{front\&back} + A_{both\ sides} + A_{top\&bottom} \\ &= 2(wh) + 2(lh) + 2(lw) \\ &= 2(6.7)(12.4) + 2(4.5)(12.4) + 2(4.5)(6.7) \\ &= 166.16 + 111.6 + 60.3 \\ &= 338.06\,m^2 \end{aligned}$$

4.



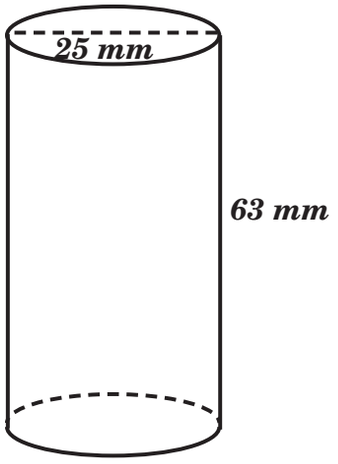
$$\begin{aligned} SA &= A_{front\&back} + A_{sides} + A_{bottom} \\ &= 2\left(\frac{bh}{2}\right) + 2(lw)_{sides} + (lw)_{bottom} \\ &= 2\left(\frac{(14)(17.7)}{2}\right) + 2(21)(19)_{sides} + (21)(14)_{bottom} \\ &= 247.8 + 798 + 294 \\ &= 1339.8\,cm^2 \end{aligned}$$

5.



$$SA = A_{front\&back} + A_{side1} + A_{side2} + A_{bottom}$$
$$= 2\left(\frac{bh}{2}\right) + (lw)_{side1} + (lw)_{side2} + (lw)_{bottom}$$
$$= 2\left(\frac{(9.5)(6.9)}{2}\right) + (12)(11.7)_{side1} + (12)(6.9)_{side2} + (12)(9.5)_{bottom}$$
$$= 65.55 + 140.4 + 82.8 + 114$$
$$= 402.75m^2$$

6.



$$SA = A_{top\&bottom} + A_{side}$$
$$= 2(\pi r^2) + (\pi rh)$$
$$= 2(\pi)(12.5)^2 + 2(\pi)(12.5)(63)$$
$$= 2(3.14)(12.5)^2 + 2(3.14)(12.5)(63)$$
$$= 981.25 + 4945.5$$
$$= 5926.75m^2$$

LEARNING
ANYTIME ANYWHERE