LEARNING GUIDE 5: SURFACE AREA

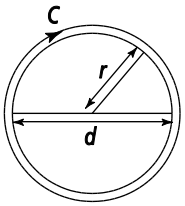
Watch the following instructional video. In your handout:
i) Copy down the given notes and examples
ii) Complete the assigned questions

https://youtu.be/_xN1Ms01jls

Review: Circles

radius
- the distance from the centre of the circle to the outside edge
- r shows the radius
- the radius is half the diameter: $r = d \div 2$ *or* $r = \frac{d}{2}$

diameter
- the distance across a circle through its centre
- d shows the diameter
- the diameter is twice the radius: $d = 2 \times r$ *or* $d = 2r$



circumference
- the distance around a circle (the perimeter)
- C shows the circumference
- $C = 2 \times \pi \times r$ *or* $C = \pi \times d$

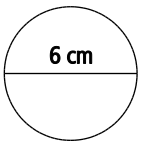
π is about 3.14

area
- $A = \pi \times r^2$ *or* $A = \pi r^2$

r^2 means $r \times r$

1. Find the circumference of each circle to the nearest tenth (1 decimal place).

a)

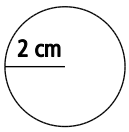


$C = \pi \times d$

$= 3.14 \times$ _____

$=$ _____ cm

b)



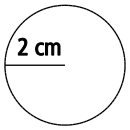
$C = 2 \times \pi \times r$

$= 2 \times$ _____ $\times$ _____

$=$ _____

2. Find the area of each circle to the nearest tenth (1 decimal place).

a)



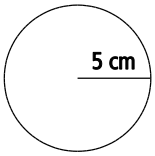
$A = \pi \times r^2$

$A = \pi \times r \times r$

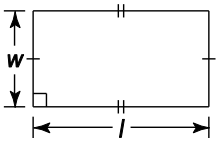
$=$ _____ $\times$ _____ $\times$ _____

$=$ _____ cm^2

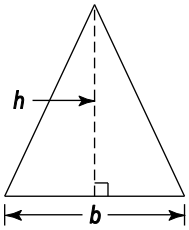
b)



Area Formulas



Area of a rectangle = $l \times w$

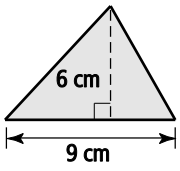


Area of a triangle = $b \times h \div 2$

3. Find the area of this shape.

Area is measured in square units.

a)



$A = b \times h \div 2$

$=$_____ $\times$ _____ $\div 2$

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https://youtu.be/A5qMGnEBvwA

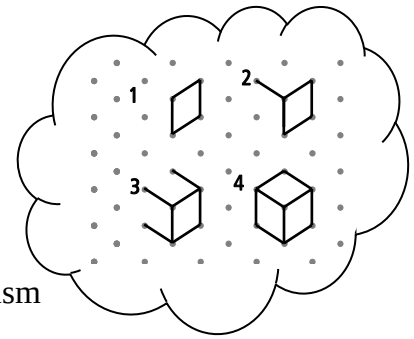
Warm Up

1. Draw a square and a rectangle.

a) square

b) rectangle

2. Use isometric dot paper to make it easier to draw 3-D shapes. Follow the steps to draw each solid.



a) cube

b) rectangular prism

3. Draw the top, front, and side view of your cube and rectangular prism.

a) cube

top front side

b) rectangular prism

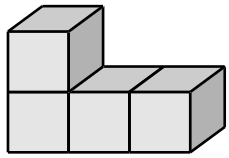
top front side

5.1 Views of Three-Dimensional Objects

A 3-D object has length, width, and height.

Example 1: Draw and Label Top, Front, and Side Views

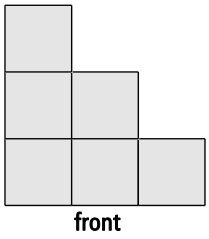
Draw the top, front, and side views of this object.

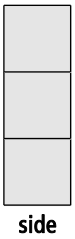


top front side

Example 2: Sketch a Three-Dimensional Object When Given Views

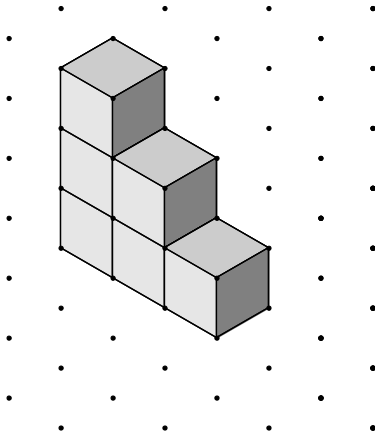
An object made of 6 blocks has these views.
Sketch the object.





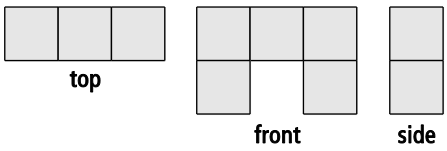
Solution

Sketch the object on isometric paper.

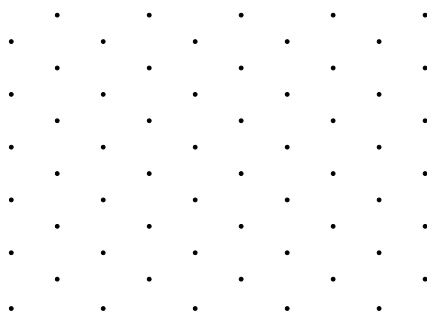


Show You Know

An object is made using 5 blocks.
The top, front, and side views are shown.

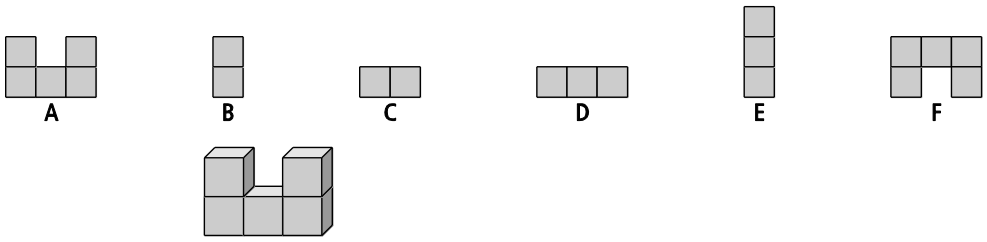


Sketch the object on isometric dot paper.



Practise

1.



a) Circle the top view.

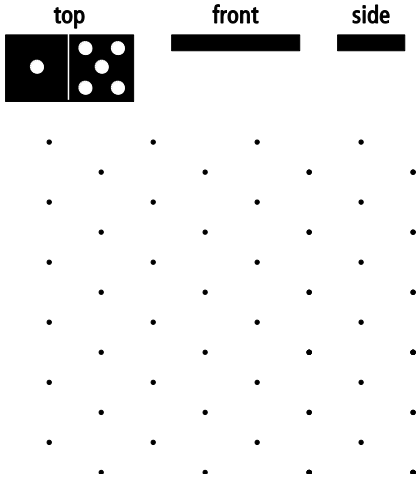
b) Put a square around the front view.

c) Put an X on the side view.

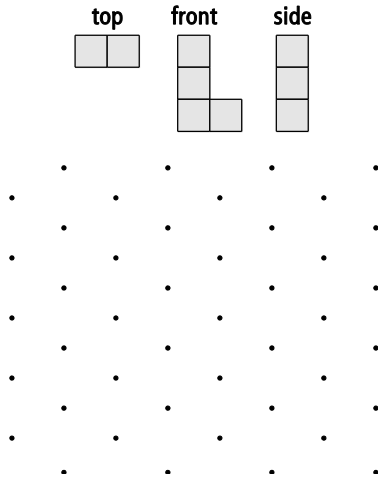
2.

Draw each 3-D object using the views.

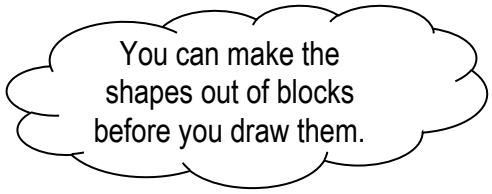
a)



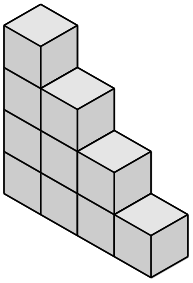
b)



3.
Draw the top, front, and side views.



a)

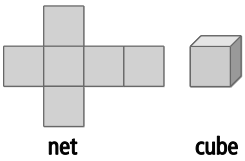


top	front	side

Nets of Three-Dimensional Objects

rectangular prism
- a box with dimensions that are not all equal

net
- a 2-dimensional shape that, when folded, creates a 3-D object



Example: Draw a Net for a Three-Dimensional Object

Draw a net for the umbrella stand.

Solution

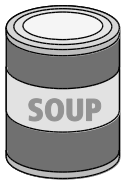
Think, "What would the umbrella stand look like if you could cut it open and flatten it?"

The net has 1 _____ and 1 rectangle.

The width of the rectangle is equal to the distance around the circle, which is called the

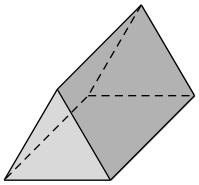
_____.

Draw a net for a soup can.

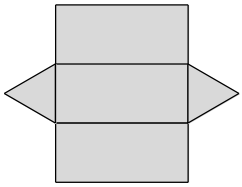


Example: Build a Three-Dimensional Object from a Given Net

triangular prism
- a prism with 2 triangular bases
- each base is the same size and shape
- the sides are rectangles

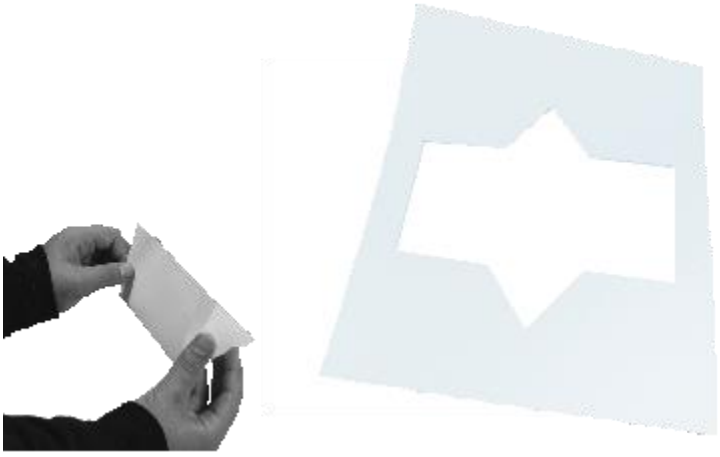


Can this net be folded to form a tent?



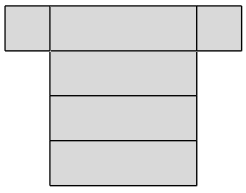
Solution

Trace the net on a sheet of paper.
Cut along the outside edges.
Fold along the inside edges.
Tape the edges together to build a **triangular prism**.



Build a 3-D object from this net.

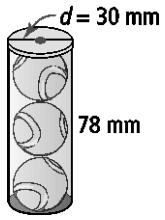
What object does it make? _____



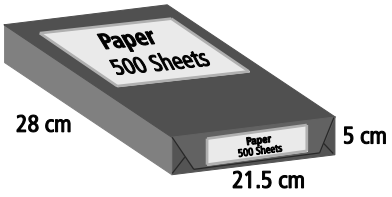
Practise

1. Draw the net for each object.
Label the measurements on the net.

a)

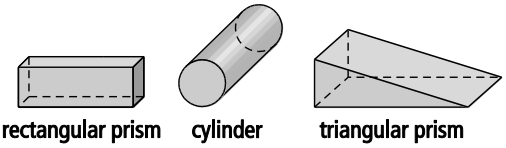


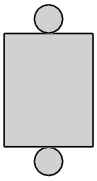
b)



2.

Match each solid with its net.
Write your answers on the blanks.
Some solids are used more than once.





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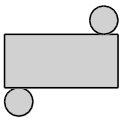

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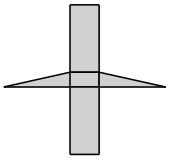

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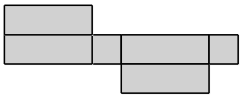

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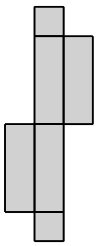

_____

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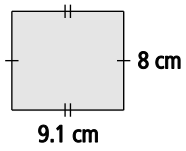
https://youtu.be/z3zGCasqNVg

Warm Up

1. Find the area of the rectangle.

a)



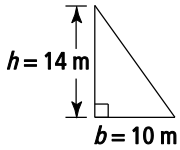
$A = l \times w$

$= 9.1 \times 8$

$=$ _____ cm^2

2. Find the area of the triangle.

a)



$A = (b \times h) \div 2$ ← Formula

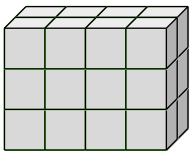
$= (10 \times 14) \div 2$ ← Substitute

$=$ _____ $\div 2$

$=$ _____ m^2 ← Answer

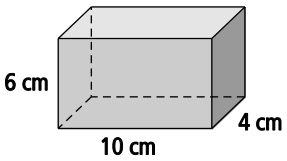
Surface Area of a Prism

surface area
- the number of square units needed to cover all the faces of a 3-D object
- the sum of the areas of all the faces of an object
- measured in square units (cm^2, m^2)

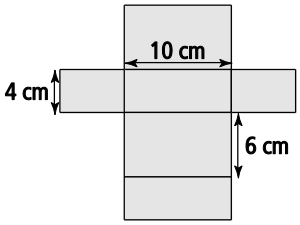


Example : Calculate the Surface Area of a Rectangular Prism

a) Draw the net of this right rectangular prism.



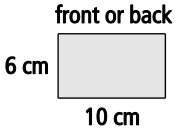
Solution



b) What is the **surface area** of the prism?

Solution

The right rectangular prism has 6 faces. There are 3 different sizes of faces.



$A = l \times w$

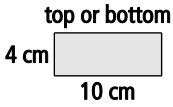
$= 10 \times 6$

$=$ _____ cm^2

Area of front and back

$= 60 \times 2$

$=$ _____ cm^2



$A = l \times w$

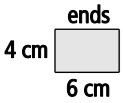
$= 10 \times$ _____

$=$ _____ cm^2

Area of top and bottom

$= 40 \times 2$

$=$ _____ cm^2



$A = l \times w$

$= 6 \times$ _____

$=$ _____ cm^2

Area of both sides

$= 24 \times 2$

$=$ _____ cm^2

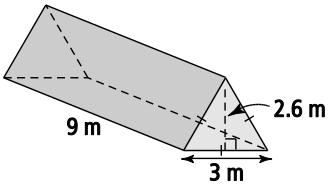
Surface Area = (area of front and back) + (area of top and bottom) + (area of ends)

$=$ 120 + 80 + 48

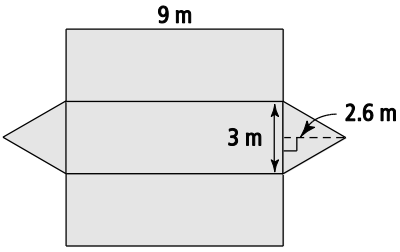
$=$ _____ cm^2

Example: Calculate the Surface Area of a Right Triangular Prism

a) Draw the net of this triangular prism.



Solution

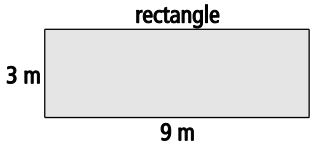


b) What is the surface area?

Solution

3 sides with the same length

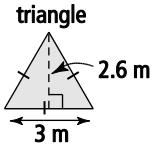
The bases of the prism are equilateral triangles. The sides of the prism are rectangles.



$A = l \times w$

$= 9 \times$ _____

$=$ _____ m^2



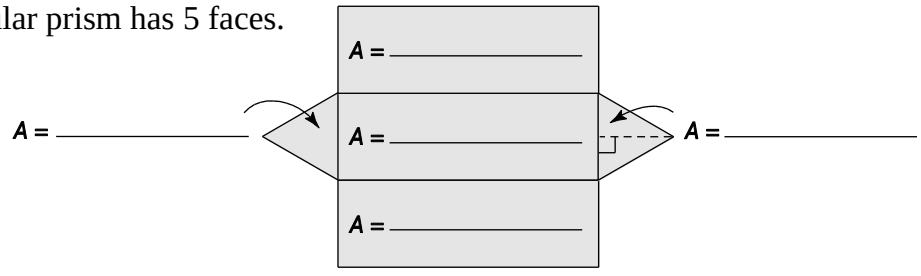
$A = (b \times h) \div 2$

$= (3 \times 2.6) \div 2$

$=$ _____ $\div 2$

$=$ _____ m^2

The right triangular prism has 5 faces.



Surface Area = (3 × area of rectangle) + (2 × area of triangle)

= (3 × 27) + (2 × 3.9)

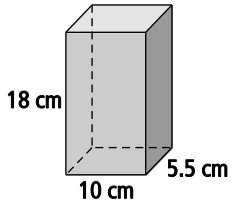
= _____ + _____

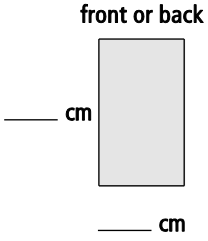
= _____

The surface area of the right triangular prism is _____ m^2.

Practise

1. Find the surface area of the rectangular prism to the nearest tenth of a square centimetre (1 decimal place).





$A = l \times w$

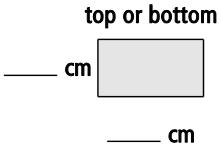
= _____ × _____

= _____

Area of front and back:

A = _____ × 2

= _____



$A = l \times w$

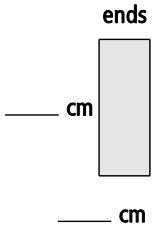
= _____ × _____

= _____

Area of top and bottom:

A = _____ × 2

= _____



A = _____ × _____

= _____ × _____

= _____

Area of 2 ends:

A = _____ × _____

= _____

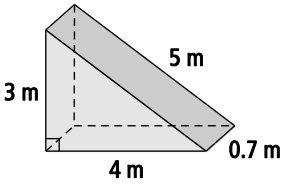
Surface Area = (area of front and back) + (area of top and bottom) + (area of ends)

= _____ + _____ + _____

= _____ cm^2

The surface area of the right rectangular prism is _____ cm^2.

2. Find the surface area of this ramp in the shape of a right triangular prism.



ramp rectangle

$A = l \times w$

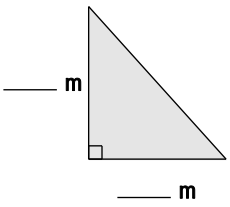
= _____ × _____

= _____ m^2

bottom rectangle

end rectangle

triangle



$A = (b \times h) \div 2$

= (_____ × _____) ÷ 2

= _____ ÷ 2

= _____ m^2

Surface Area = (area of 3 rectangles) + (2 × area of triangle)

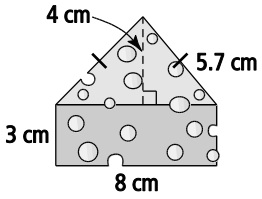
= (_____ + _____ + _____) + (2 × _____)

= _____ + _____

= _____

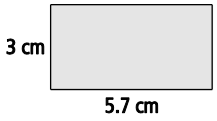
The surface area of the ramp is _____ m^2.

3. Sometimes cheese is packaged in a triangular box.
How much cardboard would you need to cover this piece of cheese?



The tick marks show that the sides are equal.

side rectangle

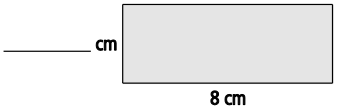


$A = l \times w$

$= \_\_\_\_\_ \times \_\_\_\_\_$

$= \_\_\_\_\_ \text{ cm}^2$

end rectangle



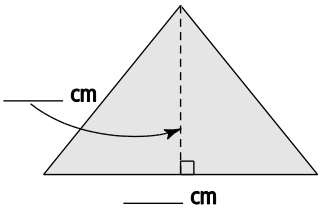
triangle

$A = (b \times h) \div 2$

$= (\_\_\_\_\_ \times \_\_\_\_\_) \div 2$

$= \_\_\_\_\_ \div 2$

$= \_\_\_\_\_ \text{ cm}^2$



Surface Area = (2 × area of side rectangle) + (area of end rectangle) + (2 × area of triangle)

$= (2 \times \_\_\_\_\_) + (\_\_\_\_\_) + (2 \times \_\_\_\_\_)$

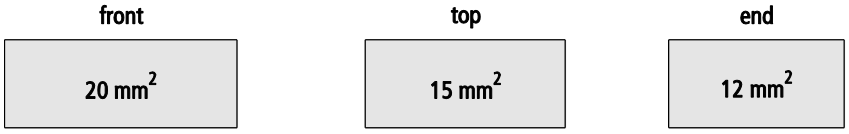
$= \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_$

$= \_\_\_\_\_$

Sentence:

_____

4. The area of each face of a rectangular prism is shown. What is the surface area of the prism?



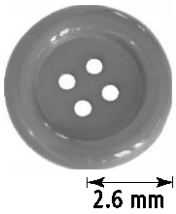
Surface Area = (area of front and back) + (area of top and bottom) + (area of ends)

Watch the following instructional video. In your handout:
i) Copy down the given notes and examples
ii) Complete the assigned questions
https://youtu.be/ZA_9hF8xMqo

Warm Up

1. Calculate the diameter or radius.

a)



$d = 2 \times r$

$= 2 \times$ _____

$=$ _____ cm

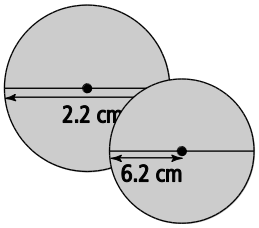
b)

$r = d \div 2$

$=$ _____ $\div 2$

$=$ _____

2. Calculate the circumference.



Calculate:

← Formula → $C = \pi \times d$

← Substitute → $= 3.14 \times 2.2$

← Solve → $=$ _____ cm

3. Calculate the area.

Round your answer to 1 decimal place.

Calculate:

$r =$ _____

← Formula → $A = \pi \times r^2$

← Substitute → $= 3.14 \times \square^2$

← Solve → $= 3.14 \times$ _____ $\times$ _____

$=$ _____ cm^2

Surface Area of a Cylinder

cylinder

- a 3-D object with 2 parallel and congruent circular bases

Congruent means the exact same size.


cylinder

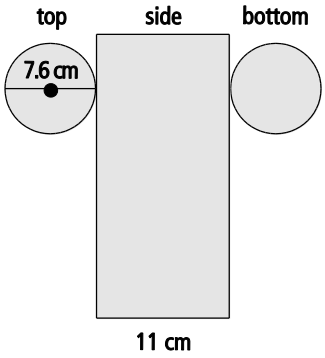
Example: Determine the Surface Area of a Cylinder

a) Calculate the surface area of the can.
Round your answer to the nearest hundredth of a square centimetre (2 decimal places).

Solution

Method 1: Use a Net

Step 1: Draw the net and label the measurements.



Step 2: Find the radius.

diameter = 7.6 cm

radius = 7.6 ÷ 2

= _____

Step 3: Find the area of 1 circle.

$A = \pi \times r^2$

$= 3.14 \times 3.8^2$ C 3.14 × 3.8 × 3.8

= _____

Step 4: Find the area of 2 circles.

$2 \times 45.3416 =$ _____

Step 5: Find the area of the rectangle using the circumference.

$A = l \times w$

length of rectangle = circumference

$A = (\pi \times d) \times w$

$A \approx 3.14 \times 7.6 \times 11$

$A \approx$ _____

Step 6: Total surface area = area of 2 circles + area of 1 rectangle

= _____ + _____

= _____

Round your answer to the nearest hundredth (2 decimal places).

The total surface area is approximately _____ cm^2.

Method 2: Use a Formula

The formula for the surface area of a cylinder is

$S.A. = 2 \times (\pi \times r^2) + (\pi \times d \times h)$

- 2: 2 circles
- $(\pi \times r^2)$: circle area
- $(\pi \times d \times h)$: rectangle area
  - length is the circumference of a circle ($\pi \times d$)
  - width is the height of the cylinder (h)

$d = 7.6$ cm $\qquad r = 7.6 \div 2 = 3.8$ cm $\qquad h = 11$ cm

$S.A. = 2 \times (\pi \times r^2) + (\pi \times d \times h)$

$S.A. = 2 \times (3.14 \times 3.8^2) + (3.14 \times 7.6 \times 11)$

$S.A = 2 \times (3.14 \times 3.8 \times 3.8) + (3.14 \times 7.6 \times 11)$

$S.A. = 2 \times$ _____ + _____

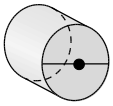
$S.A. =$ _____ + _____

$S.A. =$ _____

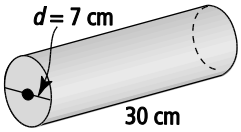
The surface area of the can is _____ cm^2, to the nearest hundredth (2 decimal places).

Practise

1. Draw a net for this cylinder.



2. Calculate the surface area of the cylinder.
Then, calculate the surface area to the nearest tenth of a square centimetre (1 decimal place).



Calculate area of circle:

Area = $\pi \times r^2$

Calculate area of 2 circles:

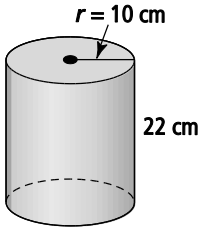
Calculate area of rectangle:

Calculate surface area:

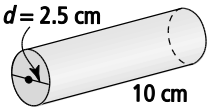
$A =$ _____ + _____

= _____

3. Calculate the surface area of the cylinder.
Round your answer to the nearest tenth of a square centimetre.



4. Use the formula $S.A. = 2 \times (\pi \times r^2) + (\pi \times d \times h)$ to calculate the surface area of each object.
Round each answer to the nearest hundredth of a square unit (2 decimal places).

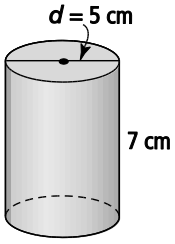
a) 

d = _____ r = _____ h = _____

Formula →

Substitute →

Solve →

b) 

d = _____ r = _____ h = _____

Formula →

Substitute →

Solve →

5. Which method do you like best for finding the surface area of a cylinder?
Circle your answer.

Using the sum of the area of each face, like in #3 and #4.

or

Using a formula, like in #5.

6. Kaitlyn and Hakim each bought a tube of candy.
Both containers cost the same amount.

a) How much plastic is needed to make Kaitlyn's container?

b) How much plastic is needed to make Hakim's container?

← Formula →

← Substitute →

← Solve →

Sentence: _____

_____

Sentence: _____

_____

c) Which container is made of more plastic?

_____