

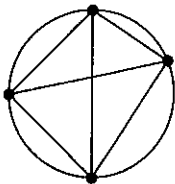
Measuring Prisms and Cylinders

Just for Fun

Handshakes

People are standing in a circle.
Each person shakes hands with every other person in the circle.

Draw a circle.
Then draw dots to represent the people.
Join any 2 dots to represent a handshake.



Record your results in the table.

Write a pattern for the number of handshakes.

Number of People	Number of Handshakes
1	0
2	1
3	3
4	6
5	10
6	15
7	21

Sample Answer: Starting from 1, as the number of people increases by 1, the number of handshakes increases in this pattern 1, 2, 3, 4, . . .

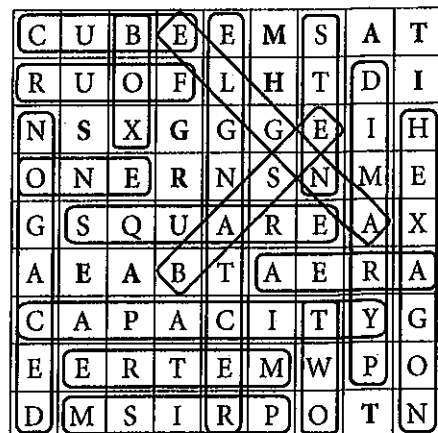
Word Search

1. Find the list of words in the word search table on the right. Words can be horizontal, vertical, or diagonal.

ANGLE, AREA, BASE, BOX, CAPACITY, CUBE, DECAGON, FOUR, HEXAGON, METRE, NETS, ONE, PRISM, PYRAMID, RECTANGLE, SQUARE, TWO

2. Write all unused letters in order, row by row, from left to right. Separate the letters to form a phrase.

MATH IS GREAT



Activating Prior Knowledge

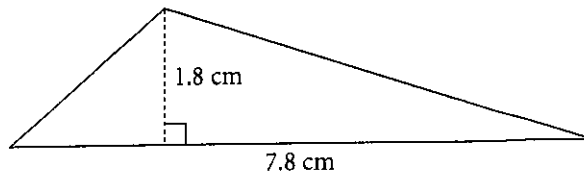
Area of Two-Dimensional Shapes

To calculate the area of this triangle, use the formula $\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$ or $A = \frac{1}{2}bh$.

Substitute $b = 7.8$ and $h = 1.8$.

$$A = \frac{1}{2}bh = \frac{1}{2}(7.8 \times 1.8) = 7.02$$

The area is about 7 cm^2 , to the nearest square centimetre.



✓ Check

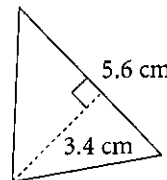
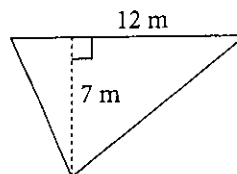
1. Calculate the area of each triangle.

a) $A = \frac{bh}{2} = \frac{12 \times 7}{2} = \underline{42}$

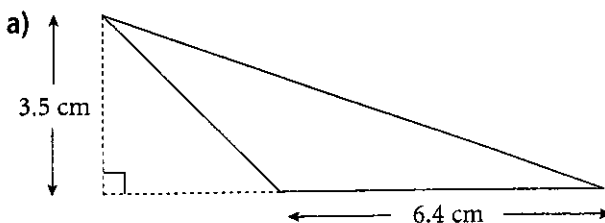
The area is 42 m^2 .

b) $A = \frac{bh}{2}$

The area is 9.52 cm^2 .

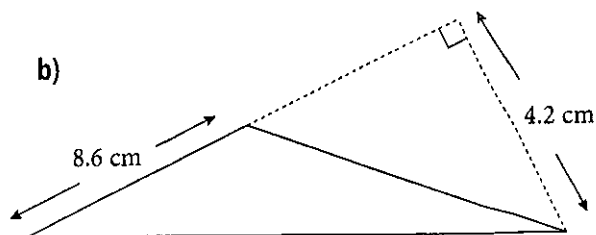


2. Calculate the area of each triangle.



$b = \underline{6.4 \text{ cm}}$ $h = \underline{3.5 \text{ cm}}$

$A = \underline{11.2 \text{ cm}^2}$



$b = \underline{8.6 \text{ cm}}$ $h = \underline{4.2 \text{ cm}}$

$A = \underline{18.06 \text{ cm}^2}$

To calculate the area of a circle with diameter 14 cm, use the formula $\text{Area} = \pi \times \text{radius}^2$ or $A = \pi r^2$. The diameter of the circle is 14 cm, so the radius is 7 cm.

Substitute $r = 7$ cm.

$$A = \pi r^2 = \pi \times 7^2 \doteq 153.938$$

The area is about 154 cm^2 , to the nearest square centimetre.

Tip
For π , use the π key on a calculator.

✓ Check

3. Calculate the area of each circle, to the nearest square unit.

a) diameter = 24 cm

$$r = \frac{d}{2} = \frac{24}{2} = \underline{12}$$

$A = \pi r^2 \doteq \underline{452.389}$ The area of the circle is 452 cm², to the nearest square centimetre.

b) radius = 9 m

$A = \pi r^2 \doteq \underline{254.469}$ The area of the circle is 254 m², to the nearest square metre.

c) diameter = 11 mm The area of the circle is 95 mm², to the nearest square millimetre.

d) radius = 8 km The area of the circle is 201 km², to the nearest square kilometre.

Circumference of a Circle

To calculate the circumference of a circle with diameter 4.8 cm, use the formula

Circumference = $\pi \times$ diameter, or $C = \pi d$.

Substitute $d = 4.8$.

$$C = \pi \times d = \pi \times 4.8 \doteq 15.080$$

The circumference of the circle is about 15.1 cm, to one decimal place.

To calculate the circumference of a circle with radius 5.2 cm, use the formula

Circumference = $2 \times \pi \times$ radius or $C = 2\pi r$.

Substitute $r = 5.2$.

$$C = 2 \times \pi \times r = 2 \times \pi \times 5.2 \doteq 32.673$$

The circumference of the circle is about 32.7 cm, to one decimal place.

✓ Check

4. Calculate the circumference of each circle, to one decimal place.

a) $d = 12$ cm $C = \pi \times d = \pi \times \underline{12} \doteq 37.699$

The circumference of the circle is 37.7 cm, to one decimal place.

b) $r = 8$ m $C = 2 \times \pi \times r = 2 \times \pi \times \underline{8} \doteq 50.265$

The circumference of the circle is 50.3 m, to one decimal place.

c) $d = 5.6$ mm The circumference of the circle is 17.6 mm, to one decimal place.

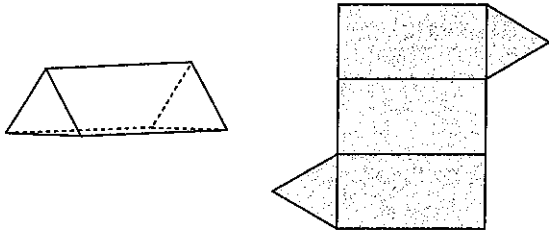
d) $r = 3.8$ m The circumference of the circle is 23.9 m, to one decimal place.



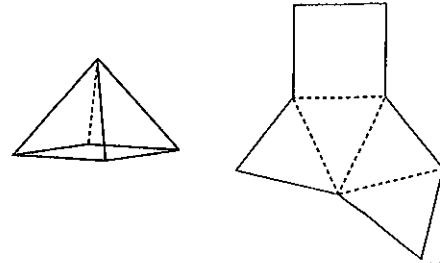
Quick Review

- A prism has two congruent bases and is named for its bases.
A pyramid has one base and the other faces are congruent triangles.
- A net is a diagram that can be folded to make an object.

The diagram shows a triangular prism and its net.

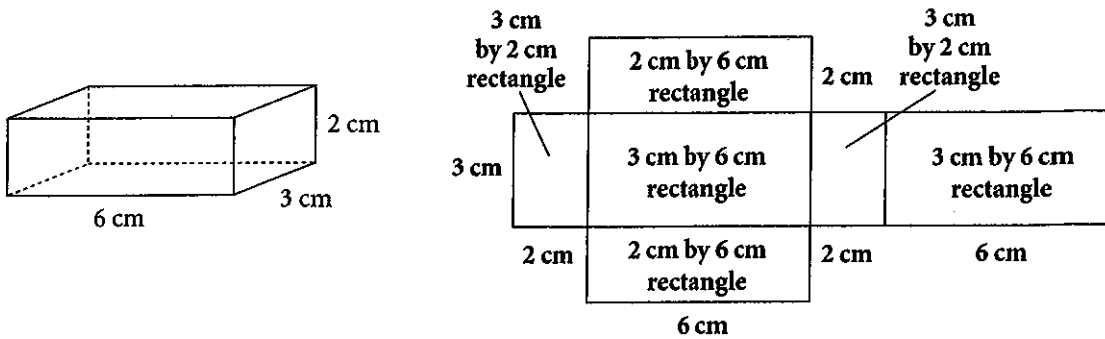


The diagram shows a square pyramid and its net.

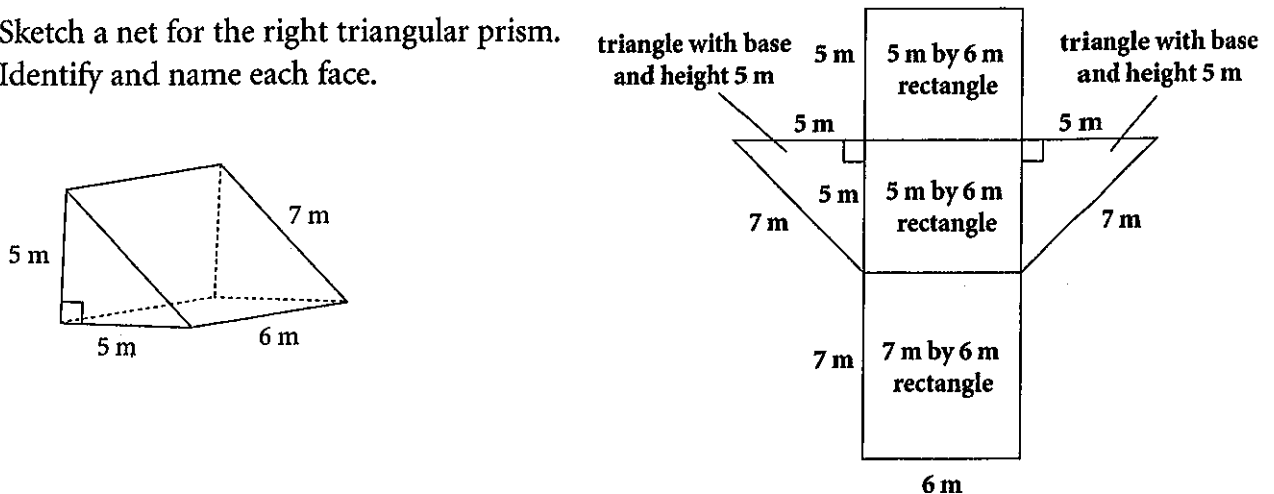


Practice

1. Sketch a net for the right rectangular prism. Identify and name each face.

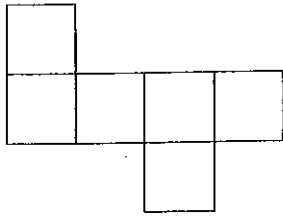


2. Sketch a net for the right triangular prism. Identify and name each face.

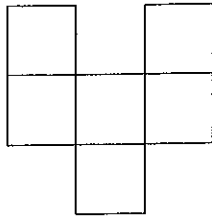


3. Which of the following diagrams is **not** the net of a cube?

A



B



C

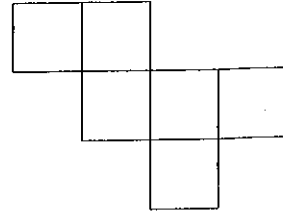


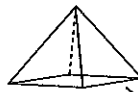
Diagram B is not the net of a cube.

4. a) Match each object to its net.

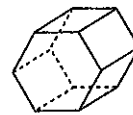
A



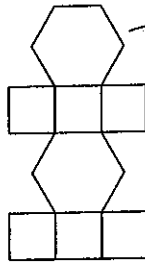
B



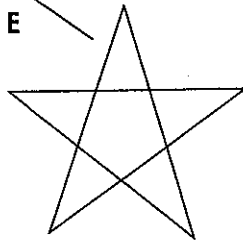
C



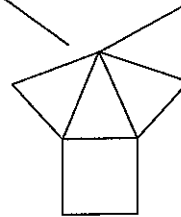
D



E



F



b) Identify and name each face of each object.

A and E represent a regular pentagonal pyramid with one pentagonal base and five isosceles triangles.

B and F represent a regular square pyramid with one square base and four isosceles triangles.

C and D represent a hexagonal prism with two hexagonal bases and six squares.

5. Use the descriptions to identify the object that has each set of faces.

a) six congruent triangles and one hexagon hexagonal pyramid

b) four congruent equilateral triangles triangular pyramid

c) two congruent squares and four congruent rectangles square prism

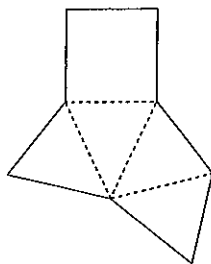
d) two congruent triangles and three rectangles right triangular prism



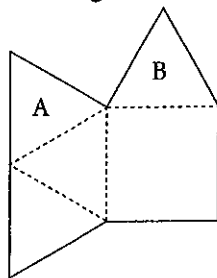
Quick Review

- To determine if a diagram is a net for an object, look at each shape and at how the shapes are arranged.

This is the net of a square pyramid.



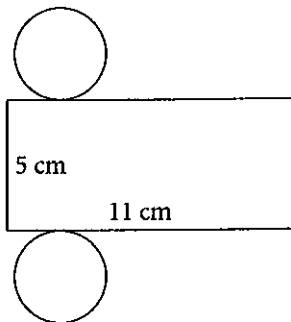
This is not the net of a square pyramid. If the design is cut out and folded, triangles A and B will coincide.



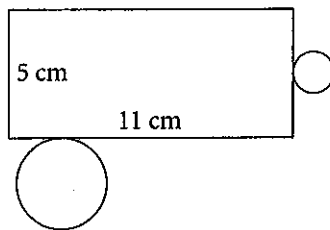
Practice

1. Which of the following diagrams is not the net of a right cylinder?

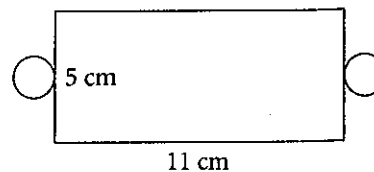
A



B



C



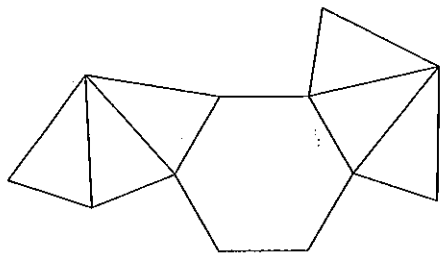
The figure in part B is not the net of a right cylinder.

2. Is each diagram the net of an object?

If your answer is yes, name and describe the object.

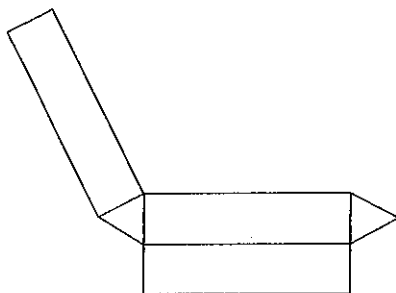
If your answer is no, what changes could you make so it could be a net?

a)



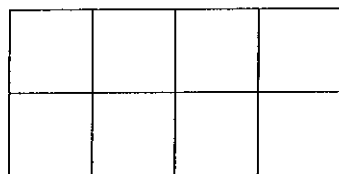
The diagram is the net of an object. It is the net of a hexagonal pyramid.

b)



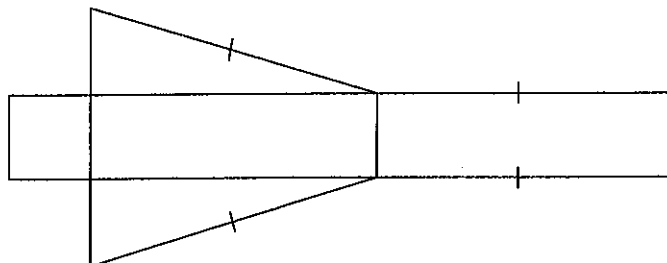
The diagram is the net of an object. It is the net of a triangular prism.

c)



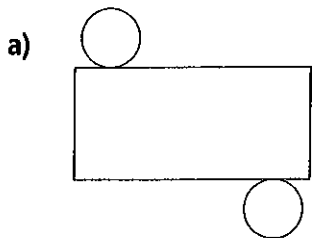
The diagram is not the net of an object. Move either square on the bottom edge to anywhere along the top edge to make the net of a cube.

3. Name and describe the object that can be made from the net.



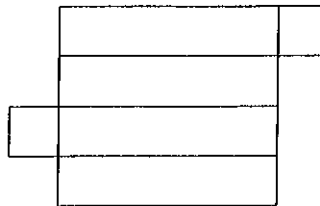
The object is a triangular prism with two congruent right triangle faces and three rectangular faces.

4. Identify the object that each net folds to form.



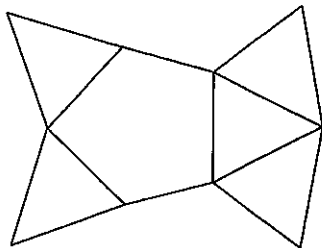
right cylinder

b)



square prism

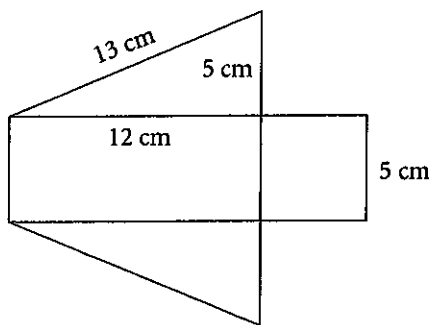
c)



pentagonal pyramid

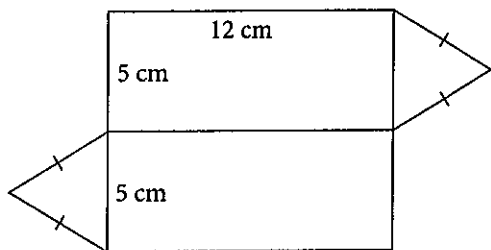
5. Describe the changes that have to be made to each diagram to make it a net. Name the object that can be made from the new net.

a)



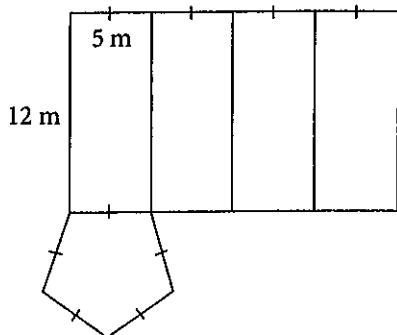
Add a 13 cm by 5 cm rectangle to form the net of a right triangular prism.

b)



Add a 12 cm by 5 cm rectangle to form the net of a triangular prism.

c)



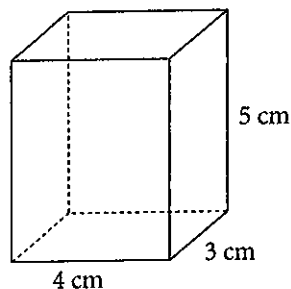
Add a regular pentagon of edge length 5 m to form the net of a pentagonal prism.



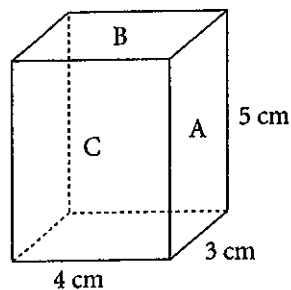
Quick Review

- The surface area of a rectangular prism is the sum of the areas of its rectangular faces. The surface area is the same as the area of the prism's net.

To determine the surface area of this rectangular prism:



Identify each rectangle with a letter.



Rectangle A has area $3 \text{ cm} \times 5 \text{ cm} = 15 \text{ cm}^2$

Rectangle B has area $4 \text{ cm} \times 3 \text{ cm} = 12 \text{ cm}^2$

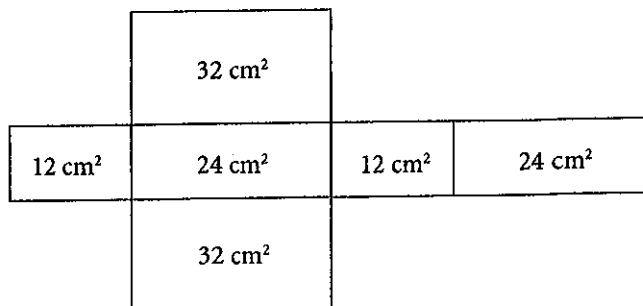
Rectangle C has area $4 \text{ cm} \times 5 \text{ cm} = 20 \text{ cm}^2$

$$\begin{aligned} \text{Surface area} &= 2 \times 15 \text{ cm}^2 + 2 \times 12 \text{ cm}^2 + 2 \times 20 \text{ cm}^2 \\ &= 30 \text{ cm}^2 + 24 \text{ cm}^2 + 40 \text{ cm}^2 \\ &= 94 \text{ cm}^2 \end{aligned}$$

The surface area of the rectangular prism is 94 cm^2 .

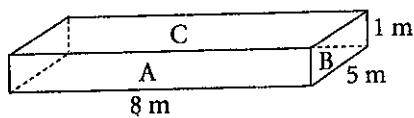
Practice

1. The diagram shows the net of a right rectangular prism. The area of each face is given. Calculate the surface area of the prism.



$$\text{Area} = \underline{12 \text{ cm}^2} + \underline{32 \text{ cm}^2} + \underline{24 \text{ cm}^2} + \underline{32 \text{ cm}^2} + \underline{12 \text{ cm}^2} + \underline{24 \text{ cm}^2} = \underline{136 \text{ cm}^2}$$

2. Determine the surface area of the rectangular prism.



$$\text{Rectangle A has area } \underline{8 \text{ m}} \times \underline{1 \text{ m}} = \underline{8 \text{ m}^2}$$

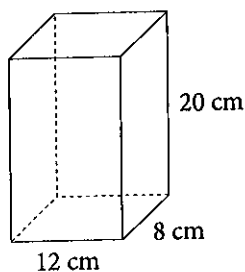
$$\text{Rectangle B has area } \underline{5 \text{ m}} \times \underline{1 \text{ m}} = \underline{5 \text{ m}^2}$$

$$\text{Rectangle C has area } \underline{8 \text{ m}} \times \underline{5 \text{ m}} = \underline{40 \text{ m}^2}$$

$$\text{Surface area} = 2 \times \underline{8 \text{ m}^2} + 2 \times \underline{5 \text{ m}^2} + 2 \times \underline{40 \text{ m}^2} \\ = \underline{106 \text{ m}^2}$$

3. Glenda and Louis each design a rectangular package.
Whose package has the greater surface area? Show your work.

Glenda's package:



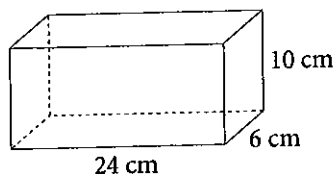
$$SA = \underline{2(12 \times 20)} + \underline{2(12 \times 8)} + \underline{2(20 \times 8)}$$

$$= \underline{480 + 192 + 320}$$

$$= \underline{992}$$

The surface area is 992 cm².

Louis's package:



$$SA = \underline{2(24 \times 10)} + \underline{2(24 \times 6)} + \underline{2(10 \times 6)}$$

$$= \underline{480 + 288 + 120}$$

$$= \underline{888}$$

The surface area is 888 cm².

992 > 888 So, Glenda's package has the greater surface area.

4. The surface area of a cube is 294 cm².

a) What is the area of each face of the cube?

$$\text{Area of each face} = \underline{294 \text{ cm}^2} \div \underline{6} = \underline{49 \text{ cm}^2}$$

b) What is the length of one edge of the cube?

$$\text{Edge length} = \underline{7 \text{ cm}}$$

5. An office building is in the shape of a right rectangular prism with height 200 m, length 60 m, and width 40 m. The top quarter of each vertical face of the building is to be covered with a large banner advertising a major sporting event. What is the total surface area to be covered with banners?

$$\frac{1}{4} \times \underline{200 \text{ m}} = \underline{50 \text{ m}}$$

$$\text{Total area to be covered} = 2 \times \underline{60 \text{ m}} \times \underline{50 \text{ m}} + 2 \times \underline{40 \text{ m}} \times \underline{50 \text{ m}} = \underline{10\,000 \text{ m}^2}$$



Quick Review

- To calculate the surface area of this right triangular prism, calculate the area of each face, and then sum the results.

Rectangle A has area $8 \text{ cm} \times 7 \text{ cm} = 56 \text{ cm}^2$

Rectangle B has area $14 \text{ cm} \times 7 \text{ cm} = 98 \text{ cm}^2$

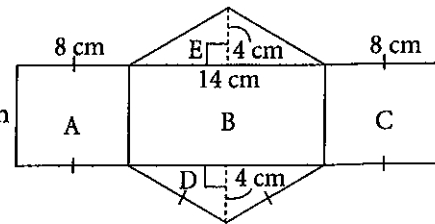
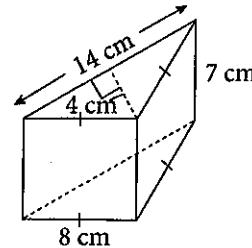
Rectangle C has area $8 \text{ cm} \times 7 \text{ cm} = 56 \text{ cm}^2$

Triangle D has area $= \frac{1}{2} \times 14 \text{ cm} \times 4 \text{ cm} = 28 \text{ cm}^2$

Triangle E has area $= \frac{1}{2} \times 14 \text{ cm} \times 4 \text{ cm} = 28 \text{ cm}^2$

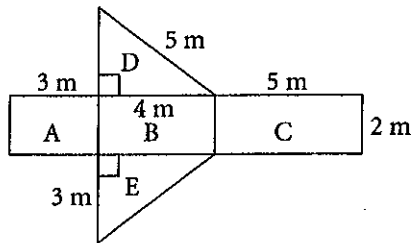
Surface area $= 56 \text{ cm}^2 + 98 \text{ cm}^2 + 56 \text{ cm}^2 + 28 \text{ cm}^2$
 $+ 28 \text{ cm}^2$
 $= 266 \text{ cm}^2$

The surface area of the triangular prism is 266 cm^2 .



Practice

1. The diagram shows the net of a right triangular prism.



Calculate the area of the net.

Rectangle A has area $\underline{2 \text{ m}} \times \underline{3 \text{ m}} = \underline{6 \text{ m}^2}$

Rectangle B has area $\underline{2 \text{ m}} \times \underline{4 \text{ m}} = \underline{8 \text{ m}^2}$

Rectangle C has area $\underline{2 \text{ m}} \times \underline{5 \text{ m}} = \underline{10 \text{ m}^2}$

Triangle D has area $\frac{1}{2} \times \underline{4 \text{ m}} \times \underline{3 \text{ m}} = \underline{6 \text{ m}^2}$

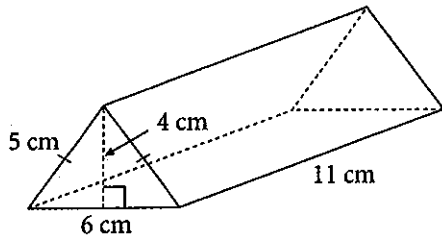
Triangle E has area $\frac{1}{2} \times \underline{4 \text{ m}} \times \underline{3 \text{ m}} = \underline{6 \text{ m}^2}$

Area $= \underline{6 \text{ m}^2} + \underline{8 \text{ m}^2} + \underline{10 \text{ m}^2} + \underline{6 \text{ m}^2} + \underline{6 \text{ m}^2} = \underline{36 \text{ m}^2}$

The area of the net is $\underline{36} \text{ m}^2$.

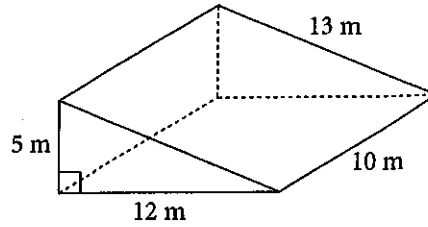
2. Calculate the surface area of each prism.

a)



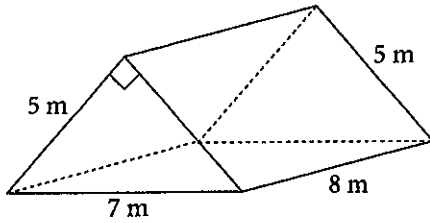
The surface area is 200 cm^2 .

b)



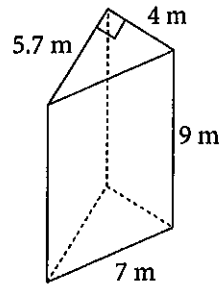
The surface area is 360 m^2 .

c)



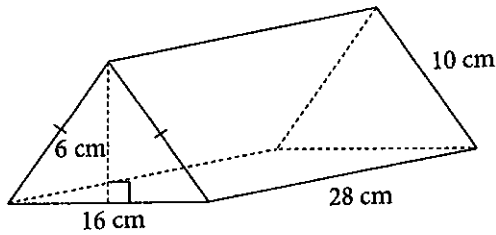
The surface area is 161 cm^2 .

d)



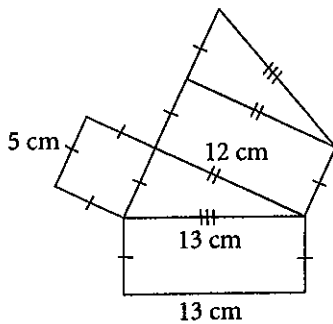
The surface area is 173.1 m^2 .

3. Calculate the total surface area of the right triangular prism.



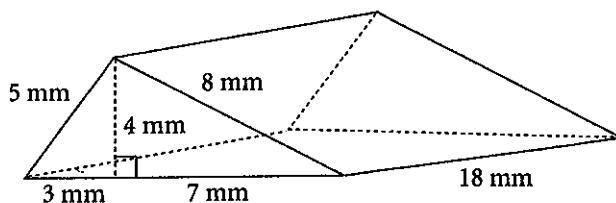
The surface area is 1104 cm^2 .

4. Calculate the area of the net of a prism.



The area of the net is 210 cm^2 .

5. Calculate the surface area of the prism.



The surface area is 454 mm^2 .



Quick Review

- To find the volume of this rectangular prism:

Let the base be one of the rectangles with length 10 cm and width 4 cm.

$$\begin{aligned} A &= 10 \times 4 \\ &= 40 \end{aligned}$$

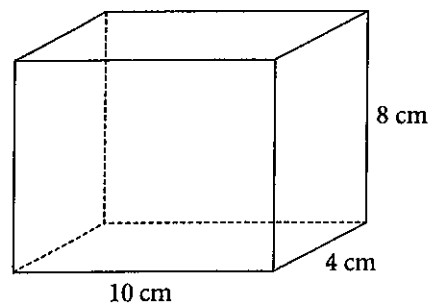
The area of the base is 40 cm^2 .

The height of the prism is 8 cm.

Use the formula $V = Ah$.

$$\begin{aligned} V &= 40 \times 8 \\ &= 320 \end{aligned}$$

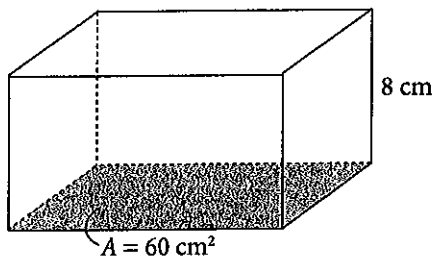
The volume of the prism is 320 cm^3 .



Practice

1. The area of the base and the height are shown on each rectangular prism. Determine the volume of each prism.

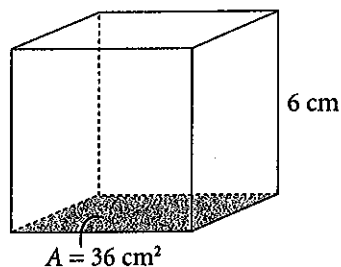
a)



$$\begin{aligned} V &= Ah \\ &= \underline{\quad 60 \times 8 \quad} \\ &= \underline{\quad 480 \quad} \end{aligned}$$

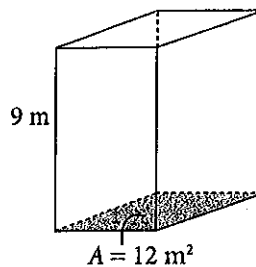
The volume is 480 cm^3 .

b)



The volume is 216 cm^3 .

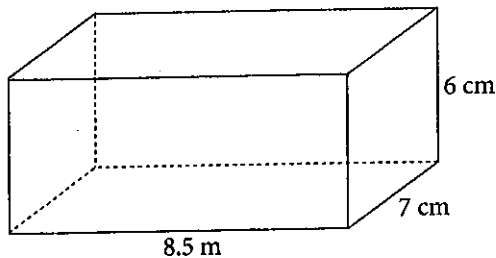
c)



The volume is 108 m^3 .

2. Determine the volume of each prism.

a)



$$A = \frac{8.5}{\quad} \times \frac{7}{\quad}$$

$$= \frac{59.5}{\quad}$$

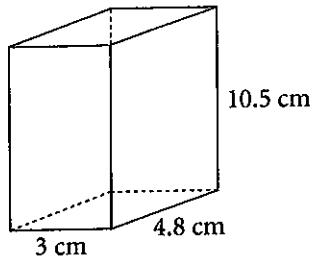
$$V = Ah$$

$$= \frac{59.5}{\quad} \times \frac{6}{\quad}$$

$$= \frac{480}{\quad}$$

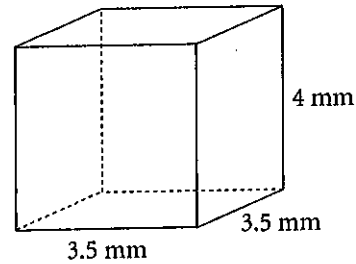
The volume is 357 m³.

b)



The volume is 151.2 cm³.

c)



The volume is 49 mm³.

3. A right rectangular prism has length 16 cm, width 12 cm, and height 5 cm.

a) What is the volume of the prism?

The volume is 960 cm³.

b) If the length is halved and the height is doubled, what is the new volume?

The new length is 8 cm and the new height is 10 cm.

The new volume is 960 cm³.

4. Which right rectangular prism has the greater volume?

A length 6 m, width 4.5 m, height 3.6 m

The volume is 97.2 m³.

B a cube with edge 4.6 m

The volume is 97.336 m³.

The volume of prism B is greater.

5. A fish pond in the shape of a rectangular prism is 4 m long, 3 m wide, and 2 m deep.

a) What is the volume of the empty pond?

The volume is 24 m³.

b) If the pond is filled to a depth of 1.5 m, what is the volume of water in the pond, in litres? Remember that 1000 cm³ = 1 L.

The height for this calculation is 1.5 m.

Convert the dimensions to centimetres. The length is 400 cm, the width is 300 cm, and the height is 150 cm.

The volume is 18 000 000 cm³. This is the same as 18 000 L.



Quick Review

- To determine the volume of this triangular prism:

The base of the triangle is $b = 9$.
 The height of the triangle is $h = 5$.
 The length of the prism is $l = 12$.
 Use the formula $V = A\ell$.

First find A .

$$A = \frac{1}{2}bh$$

Substitute $b = 9$ and $h = 5$.

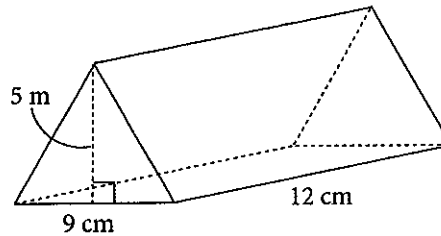
$$\begin{aligned} A &= \frac{1}{2} \times 9 \times 5 \\ &= 22.5 \end{aligned}$$

Now find V .

Substitute $A = 22.5$ and $l = 12$ into $V = A\ell$.

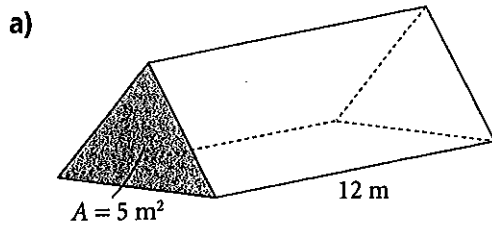
$$\begin{aligned} V &= 22.5 \times 12 \\ &= 270 \end{aligned}$$

The volume of the prism is 270 cm^3 .



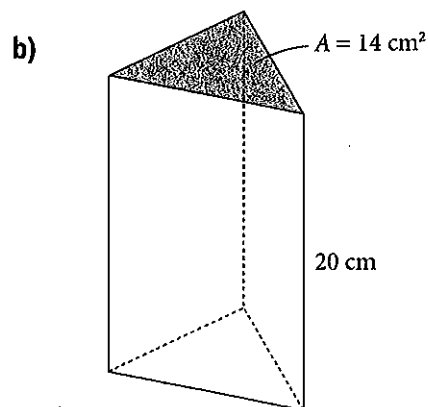
Practice

1. The area of the base and the length of each prism are shown. Calculate the volume of each prism.



$$\begin{aligned} V &= A\ell \\ &= \underline{5} \times \underline{12} \\ &= \underline{60} \end{aligned}$$

The volume is 60 cm³.



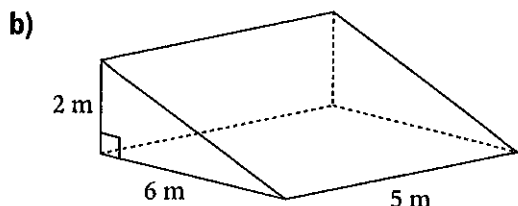
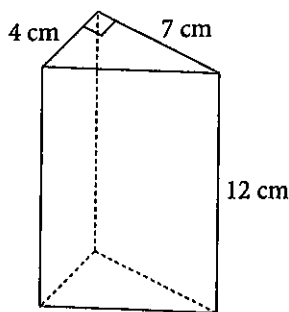
The volume is 280 cm³.

2. Determine the volume of each prism.

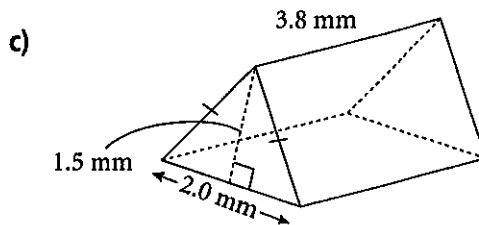
$$\begin{aligned} \text{a) } A &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 4 \times 7 \\ &= \underline{14} \end{aligned}$$

$$\begin{aligned} V &= A\ell \\ &= \underline{14} \times \underline{12} \\ &= \underline{168} \end{aligned}$$

The volume is 168 cm³.



The volume is 30 m³.



The volume is 5.7 mm³.

3. The volume of a right triangular prism is 27.8 cm³. The length of the prism is 5 cm. What is the area of each triangular face?

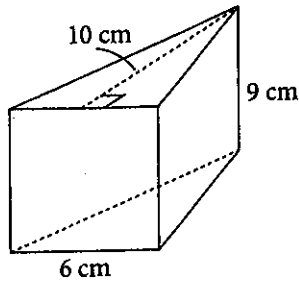
$$V = A\ell, \text{ so } A = \frac{V}{\ell}.$$

The area of each triangular face is 5.56 cm².

4. The volume of a right triangular prism is 6 cm³. Determine the possible whole-number values for A and ℓ . How many different solutions can you find? Use a table to organize your solutions.

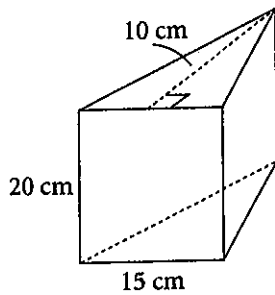
A	ℓ
1 cm ²	6 cm
2 cm ²	3 cm
3 cm ²	2 cm
6 cm ²	1 cm

5. Determine the volume of the prism.



The volume is 270 cm³.

6. a) Determine the volume of the prism.



The volume is 1500 cm³.

- b) Suppose the prism contains 1200 mL of water. What is the depth of the water?

Let ℓ represent the depth. Remember that $1 \text{ cm}^3 = 1 \text{ mL}$.

$$V = 1200 \text{ mL} = \underline{1200} \text{ cm}^3$$

$$A = \frac{1}{2} \times \underline{10} \times \underline{15}$$
$$= \underline{75}$$

$$V = A\ell$$

$$\underline{1200} = \underline{75} \times \ell$$

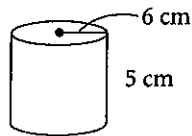
$$\ell = \underline{16}$$

The depth of the water is 16 cm.

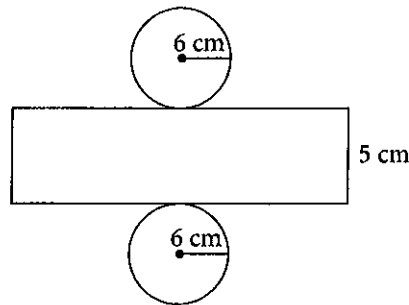


Quick Review

► To find the surface area of this cylinder:



Sketch the net.



Surface area = $2 \times$ area of one circle + area of the rectangle

The area of the circle is $A = \pi r^2$

Substitute $r = 6$.

$$A = \pi \times 6^2 \\ \doteq 113.10$$

The area of the rectangle = circumference \times height
 $= 2\pi r \times h$

Substitute $r = 6$ and $h = 5$.

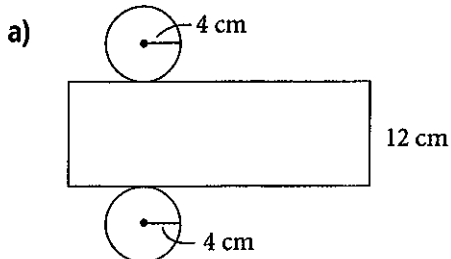
$$\text{The area of the rectangle} = 2\pi \times 6 \times 5 \\ \doteq 188.50$$

$$\text{Surface area} \doteq 2 \times 113.10 + 188.50 \\ = 414.70$$

The surface area of the cylinder is about 415 cm^2 .

Practice

1. Determine the area of each net, to the nearest square centimetre.

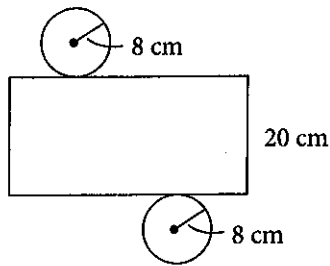


Area of net = $2 \times$ area of one circle
 + area of the rectangle

$$= 2 \times \pi r^2 + 2\pi r \times h \\ = 2 \times \pi \times \underline{4}^2 + 2 \times \pi \times \underline{4} \times \underline{12} \\ \doteq \underline{402.1}$$

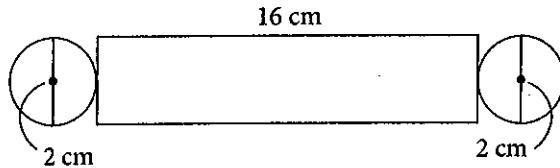
The area of the net is 402 cm², to the nearest square centimetre.

b)



The area of the net is 107 cm², to the nearest square centimetre.

c)



The diameter of each circle is 2 cm, so the radius of each circle is 1 cm.
The area of the net is 1407 cm², to the nearest square centimetre.

2. Calculate the surface area of each cylinder, to the nearest square unit.

a) radius 8 cm, height 12 cm

$$\begin{aligned} \text{Surface area of cylinder} &= 2 \times \text{area of one circle} + \text{area of the rectangle} \\ &= 2 \times \pi r^2 + 2\pi r \times h \\ &= 2 \times \pi \times \underline{8}^2 + 2 \times \pi \times \underline{8} \times \underline{12} \\ &\doteq \underline{1005.3} \end{aligned}$$

The surface area is 1005 cm², to the nearest square centimetre.

b) diameter 9 m, height 6.8 m

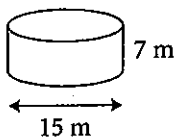
The diameter of each circle is 9 m, so the radius of each circle is 4.5 m.
The surface area is 319 m², to the nearest square metre.

c) diameter 7.2 cm, height 9.3 cm

The surface area is 292 cm², to the nearest square centimetre.

3. Calculate the outside surface area each cylinder, to one decimal place. The cylinders are open at one end.

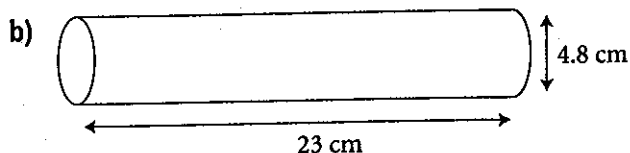
a)



The diameter is 15 m, so the radius is 7.5 m.

$$\begin{aligned} \text{Surface area of cylinder} &= \text{area of circle} + \text{area of the rectangle} \\ &= \pi r^2 + 2\pi r \times h \\ &= \pi \times \underline{7.5}^2 + 2 \times \pi \times \underline{7.5} \times \underline{12} \\ &\doteq \underline{506.6} \end{aligned}$$

The surface area of the cylinder is 506.6 m², to one decimal place.



The diameter is 4.8 cm, so the radius is 2.4 cm.

The surface area of the cylinder is 364.9 cm², to one decimal place.

4. Cylindrical rollers are used in a steel mill. One roller has diameter 1.8 m and length 2.6 m. What is the area of the curved surface of the roller?

The diameter is 1.8 m, so the radius is 0.9 m

Curved surface area of roller = area of the rectangle

$$= 2\pi r \times h$$

$$= 2 \times \pi \times \underline{1.8} \times \underline{2.6}$$

$$\doteq \underline{29.4}$$

The area of the curved surface of the roller is 29.4 m², to one decimal place.

5. A cylinder with no top and no bottom has an outside surface area of 377 cm². The height of the cylinder is 10 cm.

- a) What is the circumference of the base of the cylinder?

Curved surface area of cylinder = circumference \times height

$$\underline{377} = \text{circumference} \times \underline{10}$$

$$\underline{37.7} = \text{circumference}$$

The circumference of the base is 37.7 cm.

- b) What is the radius of the base of the cylinder?

Circumference of base = $2\pi \times r$

$$\underline{37.7} = 2\pi \times r$$

$$r = \frac{37.7}{2\pi}$$

$$r \doteq \underline{6.00}$$

The radius of the base is 6 cm.



Quick Review

- Calculate the volume of a cylinder with base area 312 m^2 and height 9 m .

$$\begin{aligned} \text{Volume of a cylinder} &= \text{base area} \times \text{height} \\ &= 312 \times 9 \\ &= 2808 \end{aligned}$$

The volume of the cylinder is 2808 m^3 .

- Calculate the volume of a cylinder with diameter 18 cm and height 15 cm .

Use the formula for the volume of a cylinder:

$$V = \pi r^2 h$$

The diameter is 18 cm , so the radius is 9 cm .

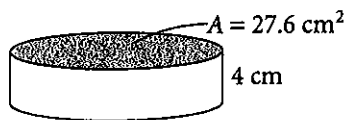
Substitute $r = 9$ and $h = 15$.

$$\begin{aligned} V &= \pi \times 9^2 \times 15 \\ &\approx 3817 \end{aligned}$$

The volume of the cylinder is 3817 cm^3 .

1. The base area and height of each cylinder are given. Calculate the volume, to the nearest cubic unit.

a)

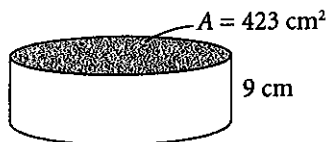


Volume of a cylinder = base area \times height

$$\begin{aligned} &= \underline{27.6} \times \underline{4} \\ &= \underline{110.4} \end{aligned}$$

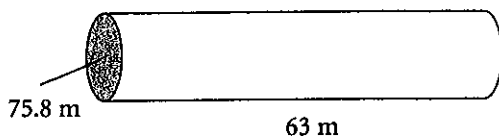
The volume of the cylinder is 110 cm^3 , to the nearest cubic centimetre.

b)



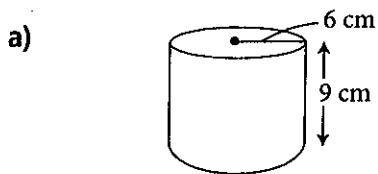
The volume of the cylinder is 3807 cm^3 , to the nearest cubic centimetre.

c)



The volume of the cylinder is 4775 m^3 , to the nearest cubic metre.

2. Calculate the volume of each cylinder, to the nearest cubic unit.

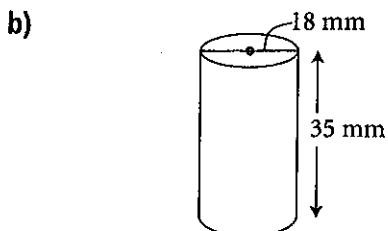


$$V = \pi r^2 h$$

$$= \pi \times 3^2 \times 9$$

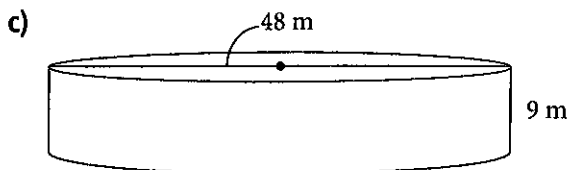
$$\doteq 254.47$$

The volume of the cylinder is 254 cm³, to the nearest cubic centimetre.



The diameter is 18 mm, so the radius is 9 mm

The volume of the cylinder is 8906 mm³, to the nearest cubic millimetre.



The diameter is 48 m, so the radius is 24 m.

The volume of the cylinder is 16 286 m³, to the nearest cubic metre.

3. Calculate the volume of each cylinder, to one decimal place.

a) radius 12 cm, height 12 cm

The volume of the cylinder is 5428.7 cm³, to one decimal place.

b) diameter 16.8 m, height 5.4 m

The diameter is 16.8 m, so the radius is 8.4 m.

The volume of the cylinder is 1197.0 m³, to one decimal place.

4. Which of the following cylinders has the greater volume? By how much?

A a cylinder with radius 6.4 cm, height 3.2 cm

B a cylinder with radius 4.3 cm, height 7.2 cm

Cylinder A has volume 411.8 cm³ and cylinder B has volume 418.2 cm³, so cylinder B has the greater volume by 6.4 cm³.

5. a) Calculate the volume of a cylinder with radius 5 cm and height 10 cm, to one decimal place.

The volume is 785.4 cm³.

b) What happens to the volume of the cylinder in part a) if the radius is doubled?

Double the radius is 10 cm.

The new volume is 3141.6 cm³, which is 4 times the original volume.

c) What happens to the volume of the cylinder in part a) if the height is doubled?

Double the height is 20 cm.

The new volume is 1570.8 cm³, which is 2 times the original volume.

In Your Words

Here are some of the important mathematical words of this unit.
Build your own glossary by recording definitions and examples here. The first one is done for you.

net *a pattern that can
be folded to make a solid*

polyhedron *an object whose
faces are polygons*

regular prism *an object with
2 congruent faces that are regular
polygons, and with remaining faces that
are rectangles*

regular pyramid *an object
whose base is a regular polygon and
whose other faces are triangles*

surface area *the total area of
the surface of an object*

volume *the amount of space
occupied by an object*

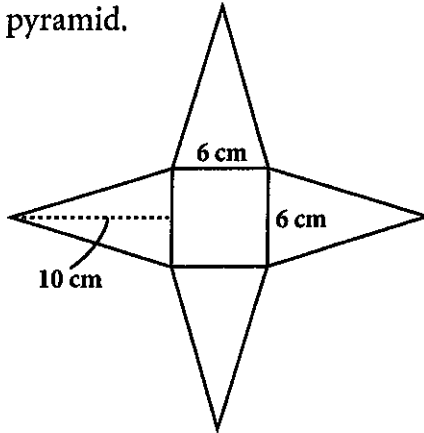
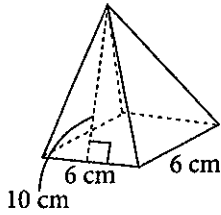
List other mathematical words you need to know.

Sample Answers: regular dodecagon, capacity

Unit Review

LESSON

1. Sketch a net of the square pyramid.



2. Which of the following is **not** the net of a cube?

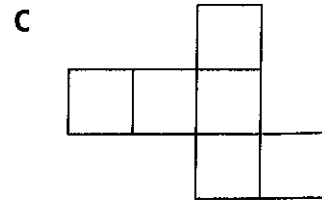
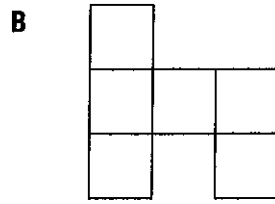
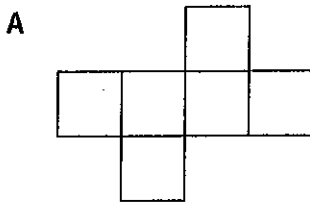
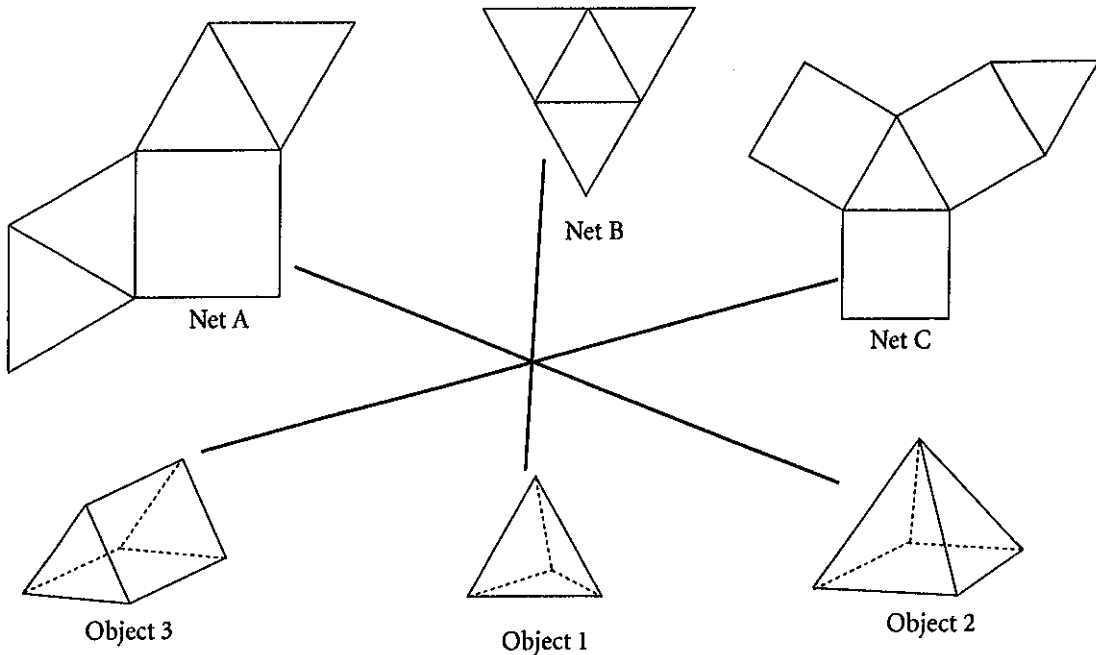


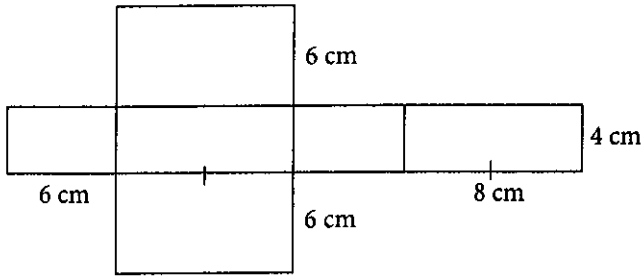
Figure **B** is not the net of a cube.

3. Match each net with the corresponding object.



LESSON

4. Calculate the area of the net of the right rectangular prism.



The area of the net is 208 cm².

5. A cube has a surface area of 384 cm².

- a) What is the length of one edge of the cube?

The area of one face of the cube is $384 \text{ cm}^2 \div 6 = 64 \text{ cm}^2$.

Thus, the length of one edge of the cube is 8 cm.

- b) What is the volume of the cube?

The volume of the cube is 512 cm³.

6. a) Sketch all possible right rectangular prisms with volume 8 cm³, where each edge length must be a whole number of centimetres. State the dimensions of each.

Record your results in this table.

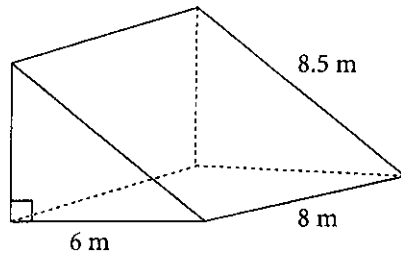
Length	Width	Height	Sketch
8	1	1	
4	2	1	
2	2	2	

- b) Calculate the surface area of each prism in the table.

34 cm², 28 cm², 24 cm²

LESSON

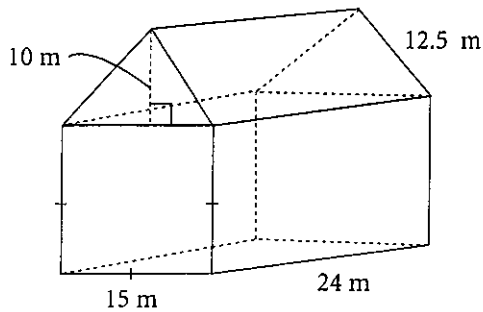
- 4.4 7. Calculate the surface area of the prism.



The surface area is 200 m².

- 4.5 8. Calculate the volume of the object.

4.6



The volume of the triangular prism is 1800 m³.

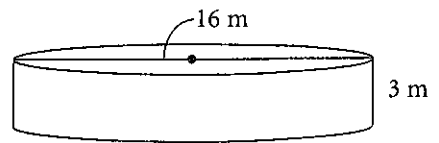
The volume of the rectangular prism is 5400 m³.

The total volume is 7200 m³.

4.7

- 4.8 9. A cylindrical water tank is open at the top.

- a) Calculate the volume of the tank, to the nearest cubic metre.



The diameter is 16 m, so the radius is 8 m.

The volume of the tank is 603 m³, to the nearest cubic metre.

- b) If the inside of the tank is to be painted, including the floor, what is the area to be painted, to the nearest square metre?

The area to be painted is 352 m², to the nearest square metre.