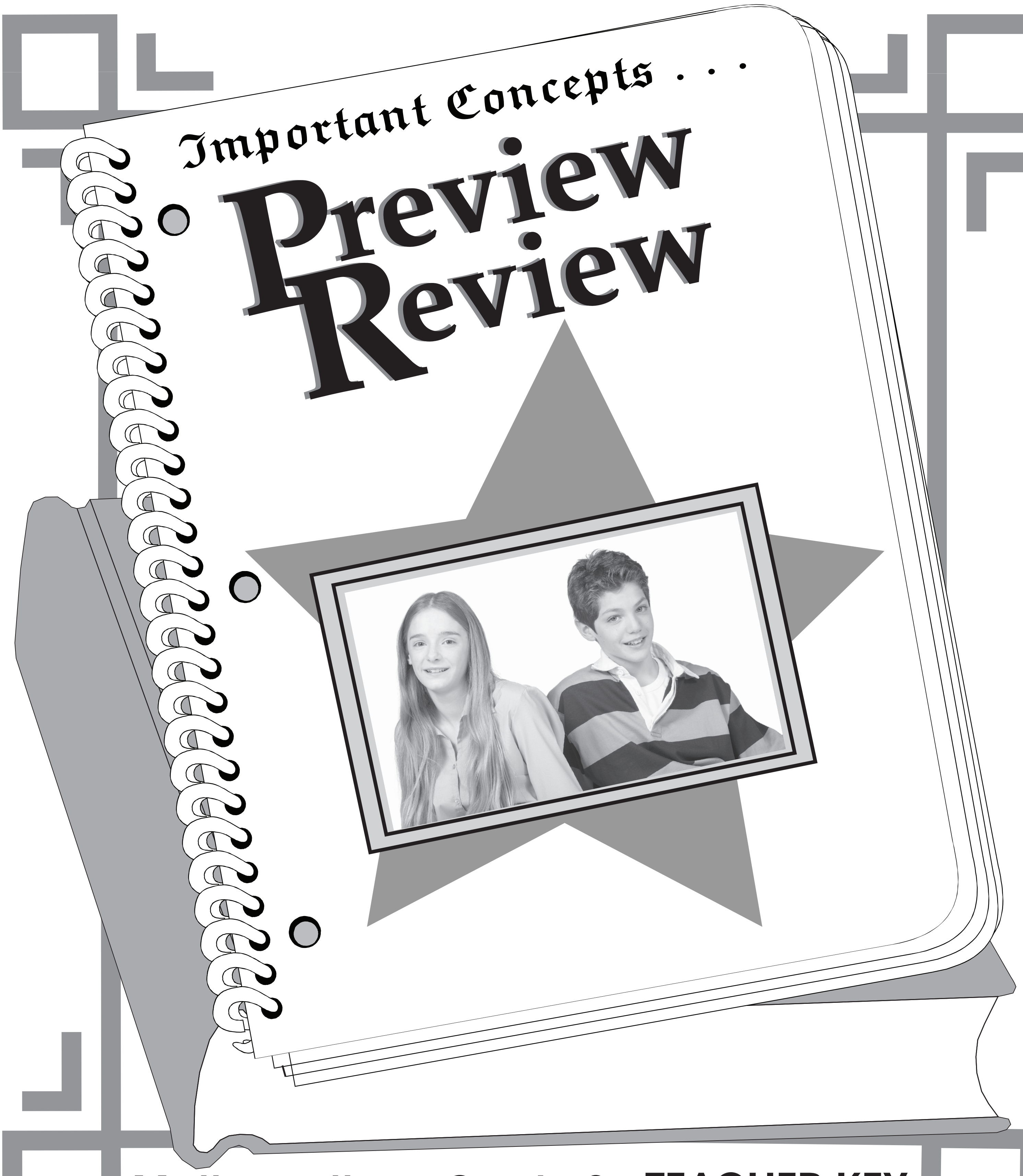

Mathematics **Grade 8** **TEACHER KEY**

W3 - Review

V6-10

Important Concepts of Grade 8 Mathematics

Materials Required

Protractor
Ruler
Calculator

No Textbook Required

This is a stand-alone course.

Mathematics Grade 8
Version 6
Preview/Review W3 - L1
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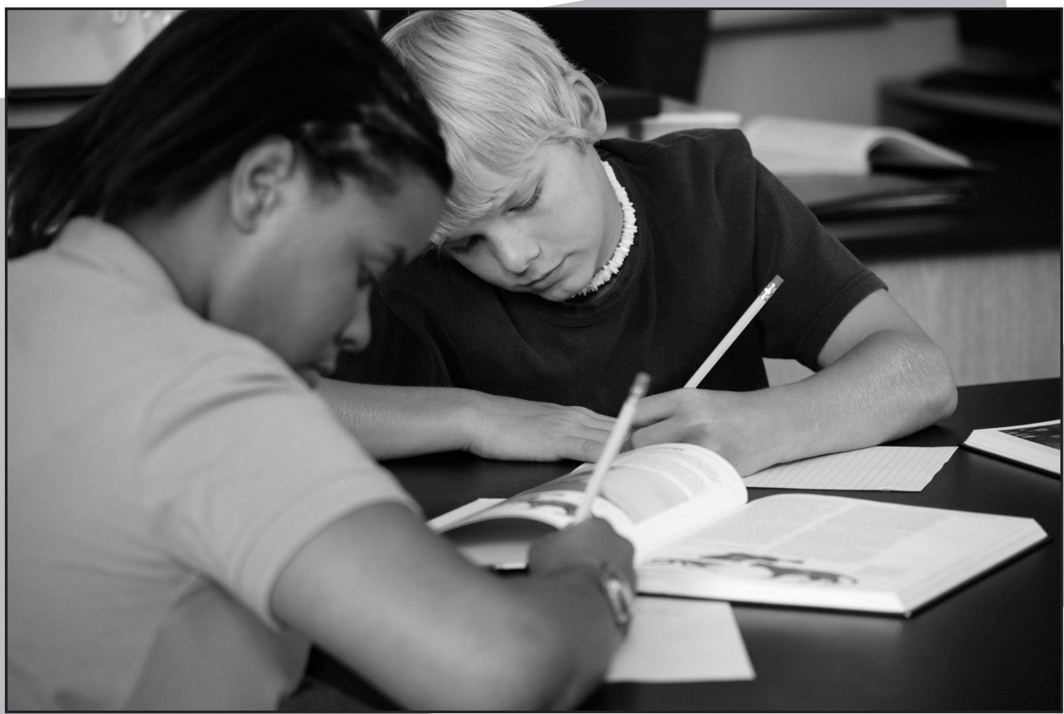
The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Preview/Review Concepts for Grade Eight Mathematics

Teacher Key



W3 – Review:

W3 – Review

Materials required:

- Paper, Pencil, Calculator, isometric dot paper, square dot paper, grid paper

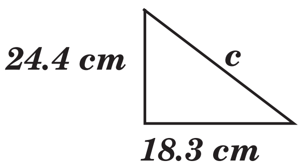
Part 1: The Pythagorean Theorem

The Pythagorean Theorem states that $a^2 + b^2 = c^2$, where a and b represent the sides of the right triangle and c represents the hypotenuse of the right triangle.

The Pythagorean Theorem is used when working with right angle triangles. If you know the lengths of two of the three sides of the triangle, you can solve for the unknown side.

Example 1

Calculate the length of the unknown side of the following right triangle. Round the result to the nearest tenth of a unit if necessary.



Apply the formula and substitute the value for the known sides.

$a^2 + b^2 = c^2$
$(24.2)^2 + (18.3)^2 = c^2$

Evaluate the exponents and add the value of a^2 to the value of b^2.

$(24.2)^2 + (18.3)^2 = c^2$
$595.36 + 334.89 = c^2$
$930.25 = c^2$

To determine the value of c, you must take the square root of both sides.

$930.25 = c^2$

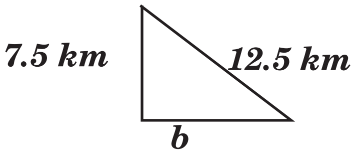
$\sqrt{930.25} = \sqrt{c^2}$

$30.5 = c$

The length of the unknown side is 30.5 cm.

Example 2

Calculate the length of the unknown side of the following right triangle. Round the result to the nearest tenth of a unit if necessary.



Apply the formula and substitute the value for the known sides.

$a^2 + b^2 = c^2$
$(7.5)^2 + b^2 = (12.5)^2$

Evaluate the exponents.

$(7.5)^2 + b^2 = (12.5)^2$
$56.25 + b^2 = 156.25$

Isolate b^2 by applying inverse operations to both sides of the equation.

$$56.25 - 56.25 + b^2 = 156.25-56.25$$
$$b^2 = 100$$

To determine the value of b, you must take the square root of both sides.

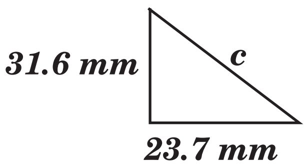
$$\boldsymbol{b^2 = 100}$$
$$\boldsymbol{\sqrt{b^2} = \sqrt{100}}$$
$$\boldsymbol{b = 10}$$

The length of the unknown side is 10 km.

Practice Questions

Calculate the length of the unknown sides of the following right triangles. Round the result to the nearest tenth of a unit if necessary.

1.

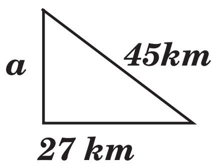


Answer:

$$a^2 + b^2 = c^2$$
$$(31.6)^2 + (23.7)^2 = c^2$$
$$998.56 + 561.69 = c^2$$
$$1560.25 = c^2$$
$$\sqrt{1560.25} = \sqrt{c^2}$$
$$39.5 = c$$

The length of the unknown side is 39.5 mm.

2.



Answer:

$$a^2 + b^2 = c^2$$
$$(31.6)^2 + (23.7)^2 = c^2$$
$$a^2 + (27)^2 = (45)^2$$
$$a^2 + 729 - 729 = 2025 - 729$$
$$a^2 = 1296$$
$$\sqrt{a^2} = \sqrt{1296}$$
$$a = 36$$

The length of the unknown side is 36 km.

Part 2: Calculating Surface Area

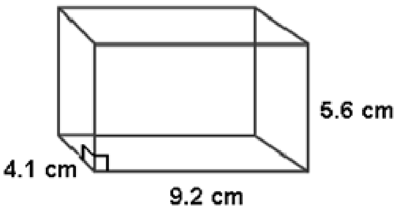
Surface area describes how much material is used to make the shell of a three-dimensional object.

Use the following formulas to calculate the surface area of 3-D objects:

3-D object	***Surface area formula***
Right Rectangular Prism	$SA = A_{\text{front \& back}} + A_{\text{both sides}} + A_{\text{top \& bottom}}$ $2(wh) + 2(lh) + 2(lw)$
Right Triangular Prism	$SA = A_{\text{front \& back}} + A_{\text{side1}} + A_{\text{side2}} + A_{\text{bottom}}$ $2\left(\frac{bh}{2}\right) + (lw)_{side\,1} + (lw)_{side\,2} + (lw)_{bottom}$
Right Cylinder	$SA = A_{top\&bottom} + A_{side}$ $= 2(\pi r^2) + (lh)$ $= 2(\pi r^2) + (\pi dh)$ $= 2(\pi r^2) + (2\pi rh)$

Example 1

Calculate the surface area of the following right rectangular prism.



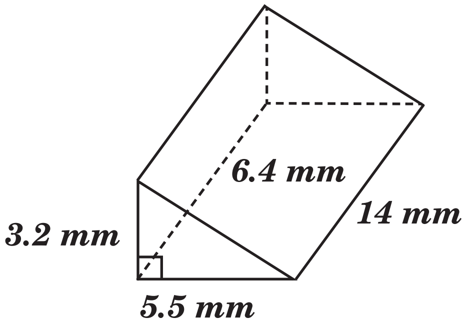
Answer:

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

$$\begin{aligned} SA &= A_{front\&back} + A_{sides} + A_{top\&bottom} \\ &= 2(wh) + 2(lh) + 2(lw) \\ &= 2(9.2)(5.6) + 2(4.1)(5.6) + 2(4.1)(9.2) \\ &= 103.04 + 45.92 + 75.44 \\ &= 224.4cm^2 \end{aligned}$$

Example 2

Calculate the surface area of the following right triangular prism.



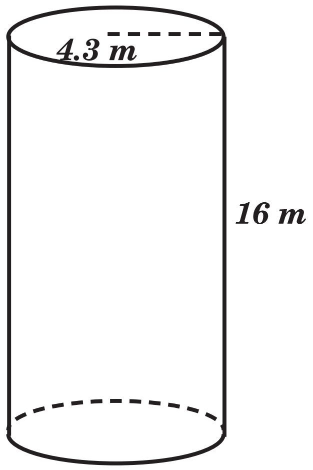
Answer:

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

$$
\begin{aligned}
SA &= A_{front\&back} + A_{side1} + A_{side2} + A_{bottom} \\
&= 2\left(\frac{bh}{2}\right) + (lw)_{side1} + (lw)_{side2} + (lw)_{bottom} \\
&= 2\left(\frac{(5.5)(3.2)}{2}\right) + (14)(6.4)_{side1} + (14)(3.2)_{side2} + (14)(5.5)_{bottom} \\
&= 17.6 + 89.6 + 44.8 + 77 \\
&= 229mm^2
\end{aligned}
$$

Example 3

Calculate the surface area of the following right cylinder.



Answer:

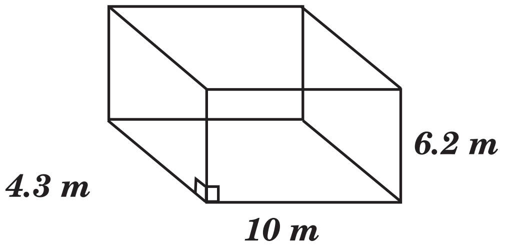
Use the surface area formula, substitute in the known values, and evaluate.

$$
\begin{aligned}
SA &= A_{top\&bottom} + A_{side} \\
&= 2(\pi r^2) + (\pi rh) \\
&= 2(\pi)(4.3)^2 + 2(\pi)(4.3)(16) \\
&= 2(3.14)(4.3)^2 + 2(3.14)(4.3)(16) \\
&= 116.12 + 432.06 \\
&= 548.18 m^2
\end{aligned}
$$

Practice Questions

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

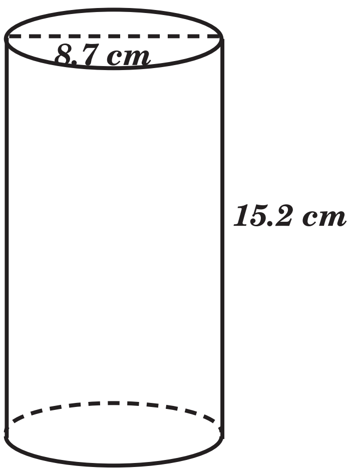
1.



Answer:

$$
\begin{aligned}
SA &= A_{front\,\&\,back} + A_{both\,sides} + A_{top\,\&\,bottom} \\
&= 2(wh) + 2(lh) + 2(lw) \\
&= 2(10)(6.2) + 2(4.3)(6.2) + 2(4.3)(10) \\
&= 124 + 53.32 + 86 \\
&= 263.32m^2
\end{aligned}
$$

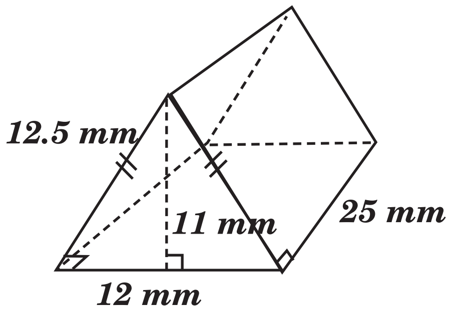
2.



Answer:

$$
\begin{aligned}
SA &= A_{top\,\&\,bottom} + A_{side} \\
&= 2(\pi r^2) + (\pi rh) \\
&= 2(\pi)(4.35)^2 + 2(\pi)(4.35)(15.2) \\
&= 2(3.14)(4.35)^2 + 2(3.14)(4.35)(15.2) \\
&= 118.83 + 415.23 \\
&= 534.06cm^2
\end{aligned}
$$

3.



Answer:

$$SA = A_{front\&back} + A_{sides} + A_{bottom}$$
$$= 2\left(\frac{bh}{2}\right) + 2(lw)_{sides} + (lw)_{bottom}$$
$$= 2\left(\frac{(6)(11)}{2}\right) + 2(25)(12.5)_{sides} + (25)(12)_{bottom}$$
$$= 66 + 625 + 300$$
$$= 991mm^2$$

Part 3: Calculating Volume

Volume is the amount of space a 3-D object occupies.

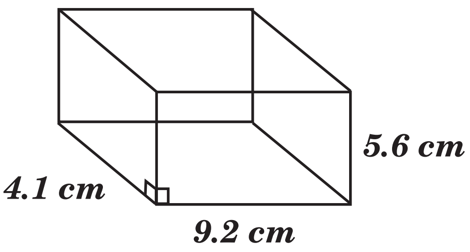
To calculate the volume of any right prism, calculate the area of its base and multiply by its length or height.

Use the following formulas to calculate the volume of 3-D objects:

3-D object	***Surface area formula***
Right Rectangular Prism	$V = A_{base} \times h$ $V = A_{rectangular\ prism} \times h$ $V = (lw) \times h$ $V = lwh$
Right Triangular Prism	$V = A_{base} \times h$ $V = A_{triangle} \times l$ $V = \left(\frac{bh}{2}\right) \times l$
Right Cylinder	$V = A_{base} \times h$ $V = A_{circle} \times h$ $V = \pi r^2 \times h$ $V = \pi r^2 h$

Example 1

Calculate the volume of the following right rectangular prism.



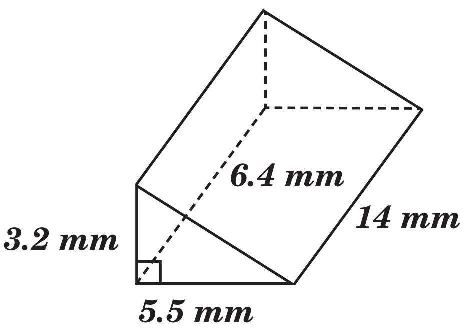
Answer:

Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= lwh \\ &= (4.1)(9.2)(5.6) \\ &= 211.23cm^2 \end{aligned}$$

Example 2

Calculate the volume of the given right triangular prism.

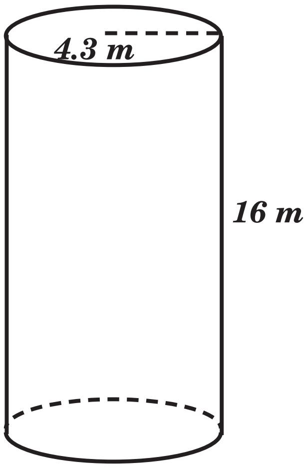


Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= \left(\frac{bh}{2}\right)\times l \\ &= \left(\frac{(5.5)(3.2)}{2}\right)\times(14) \\ &= 8.8\times 14 \\ &= 123.2mm^3 \end{aligned}$$

Example 3

Calculate the volume of the given right cylinder. Use $\pi = 3.14$.



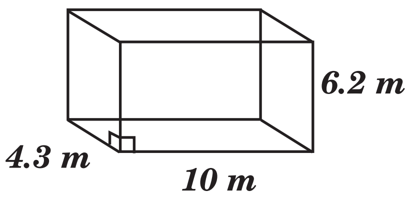
Use the volume formula, substitute in the known values, and evaluate.

$$\begin{aligned} V &= \pi r^2 h \\ &= (3.14)(4.3)^2(16) \\ &= 928.94 m^3 \end{aligned}$$

Practice Questions

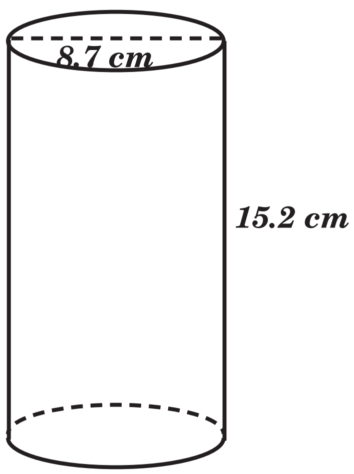
Calculate the volume of each of the following right prisms. Round the answers to the nearest hundredth of a unit.

1.



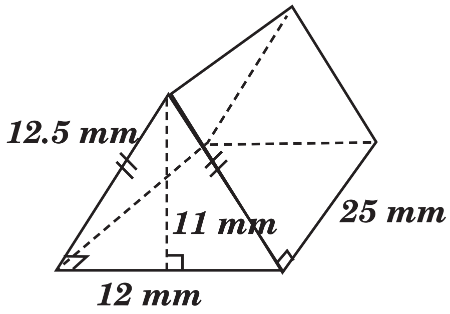
$$\begin{aligned} V &= lwh \\ &= (4.3)(10)(6.2) \\ &= 266.6m^2 \end{aligned}$$

2.



$$\begin{aligned} V &= \pi r^2 h \\ &= (3.14)(4.35)^2(15.2) \\ &= 903.13cm^3 \end{aligned}$$

3.



Answer:

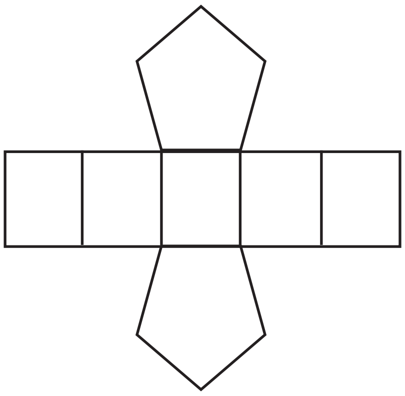
$$\begin{aligned}
V &= \left(\frac{bh}{2}\right) \times l \\
&= \left(\frac{(12)(11)}{2}\right) \times (25) \\
&= 66 \times 25 \\
&= 1650 mm^3
\end{aligned}$$

Part 4: Drawing 3-D Objects

Nets are diagrams that illustrate all the different shapes that make up a three-dimensional object. In other words, a net illustrates what an object would look like if it was laid out flat.

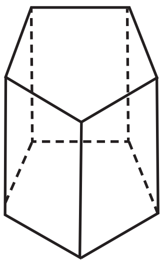
Example 1

Which 3-D object can be created from the given net?



The net has 5 congruent rectangles and 2 pentagonal bases.
When folded, the congruent rectangles will join the pentagonal bases.

This is a net of a pentagonal prism.



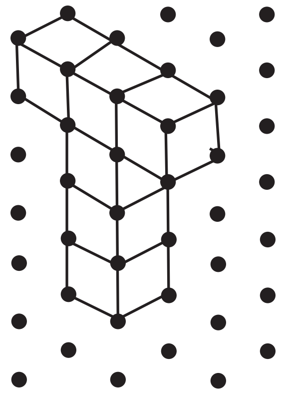
To draw a 3-D object, you must sketch it from three different views: the front, top and side views.

There is a special way to set up the drawings as you create them.

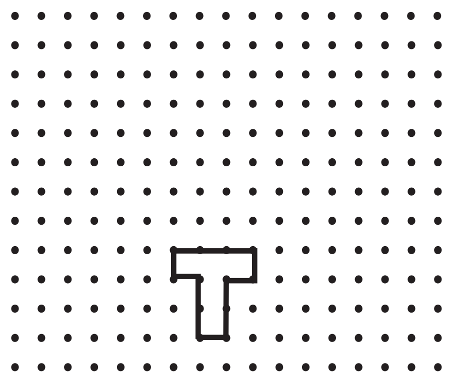
Step 1: Draw the front view.
Step 2: Draw the top view and place it above the front view.
Step 3: Draw the side views and place them beside the front view.
Step 4: Draw in the broken lines to show how the different views align.

Example 2

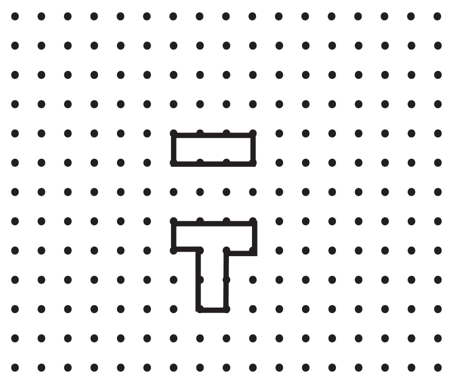
Draw the front, top, and side views of the following 3-D object.



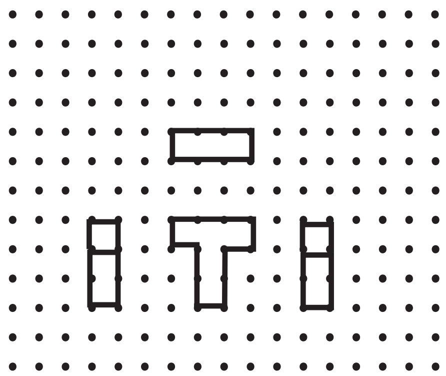
Step 1: Draw the front view.



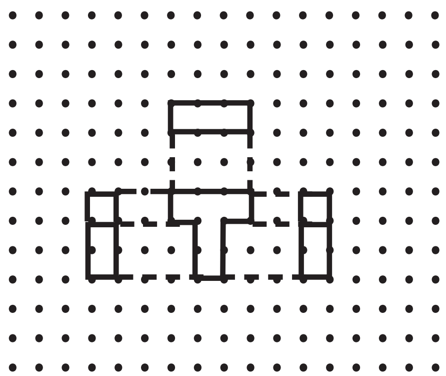
Step 2: Draw the top view and place it above the front view.



Step 3: Draw the side views and place them beside the front view.



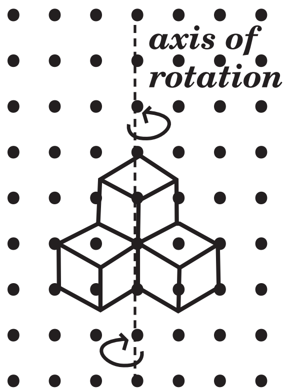
Step 4: Draw in the broken lines to show how the different views align.



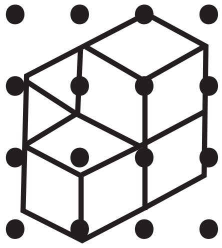
An object can be rotated horizontally around a vertical axis of rotation. The rotation can be clockwise or counterclockwise.

Horizontal Rotation

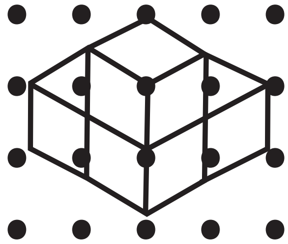
original position



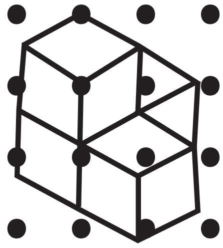
90° rotation clockwise



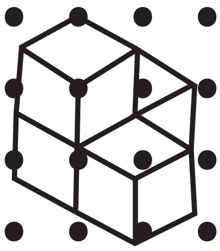
180° rotation clockwise



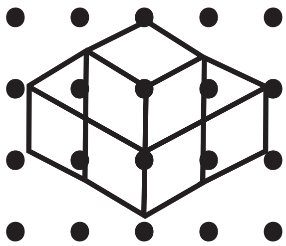
270° rotation clockwise



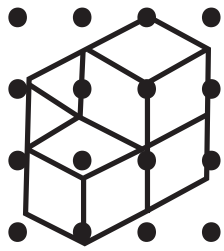
90° rotation counterclockwise



180° rotation counterclockwise



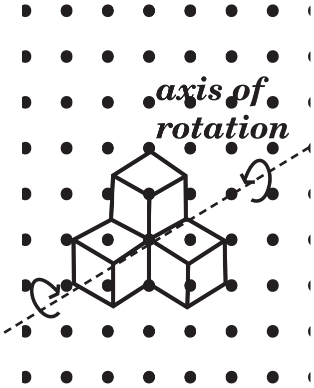
270° rotation counterclockwise



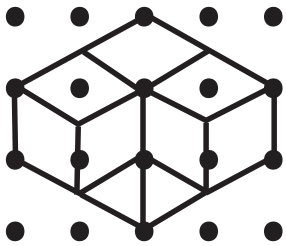
An object can also be rotated vertically around a horizontal axis of rotation. The rotation can be toward your or way from you.

Vertical Rotation

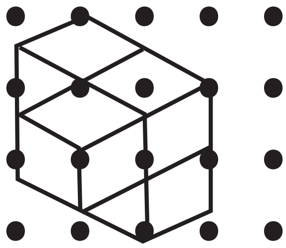
Original position



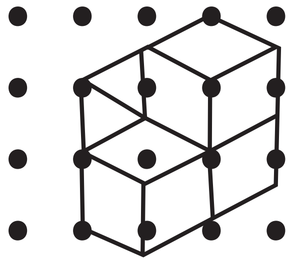
90° rotation
toward you



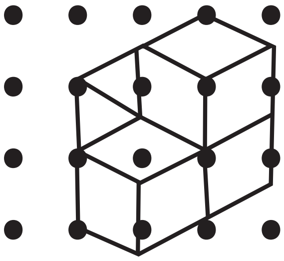
180° rotation
toward you



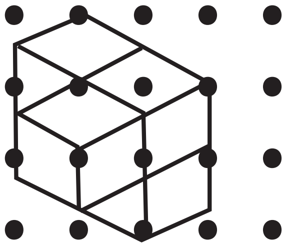
270° rotation
toward you



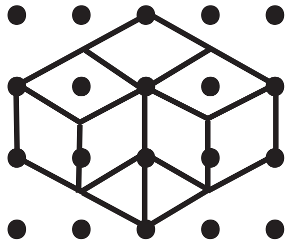
90° rotation away
from you



180° rotation away
from you

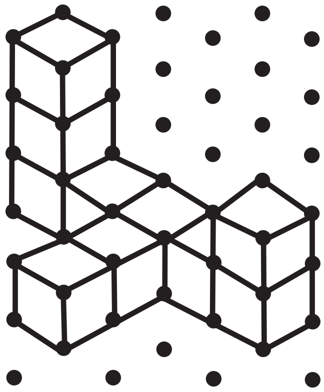


270° rotation away
from you

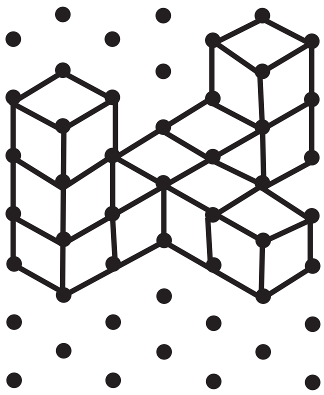


Example 1

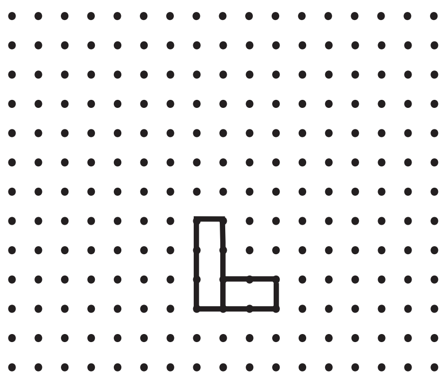
The following object is rotated 270° clockwise about the horizontal axis. Draw the front, top, and side views after the rotation is applied.



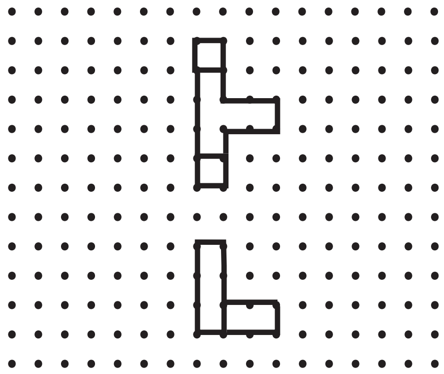
Step 1: Determine the image of the original object after the rotation is applied.



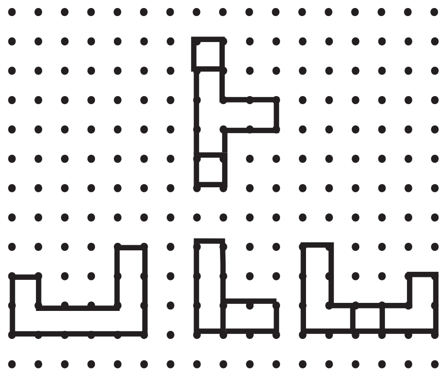
Step 2: Draw the front view.



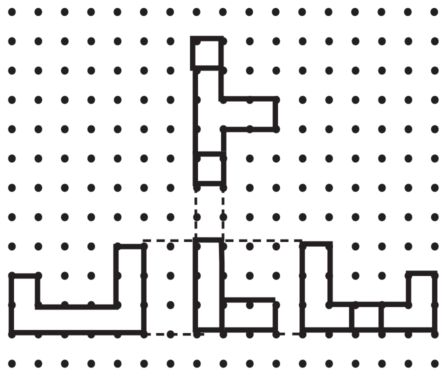
Step 3: Draw the top view and place it above the front view.



Step 4: Draw the side views and place them beside the front view.

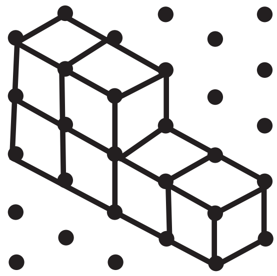


Step 5: Draw in the broken lines to show how the different views align.



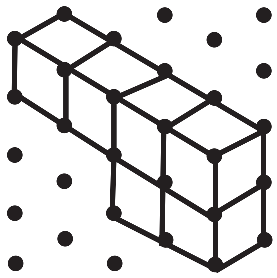
Practice Questions

1. The following object is rotated 180° towards you about the vertical axis. Draw the front, top, and side views after the rotation is applied.

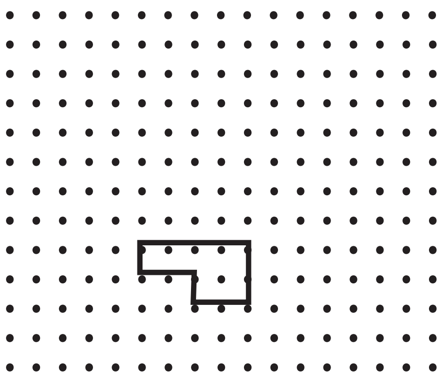


Answer:

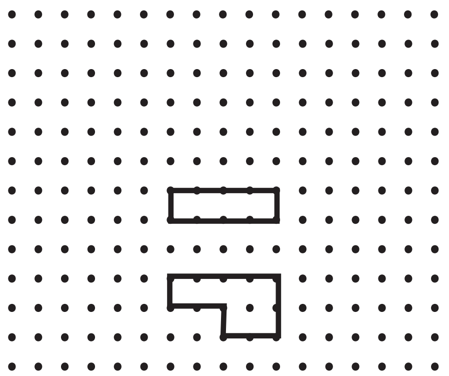
Step 1: Determine the image of the original object after the rotation is applied.



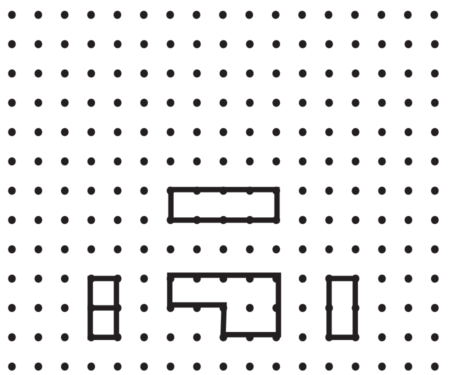
Step 2: Draw the front view.



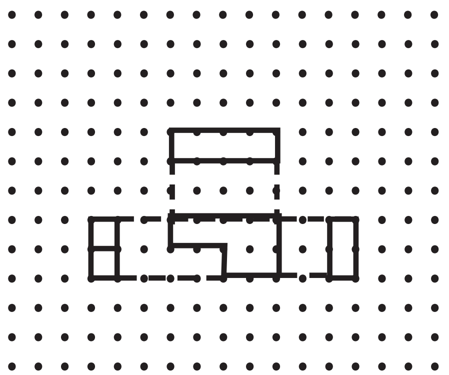
Step 3: Draw the top view and place it above the front view.



Step 4: Draw the side views and place them beside the front view.



Step 5: Draw in the broken lines to show how the different views align.



Part 5: Congruence of Polygons

Transformations: the act of moving a shape from one location to another location on the coordinate plane without changing its size or shape

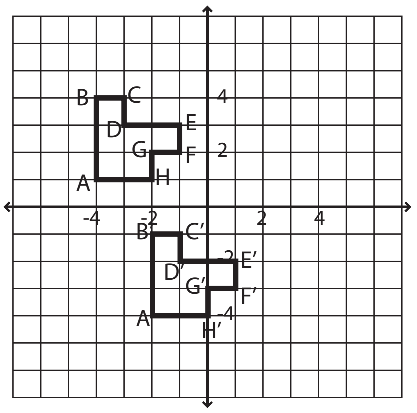
Translation: a move in a straight line to another position on the same flat surface

Reflection: a shape and its image in a line of reflection

Rotation: a shape turned about a fixed point

Example 1

Identify the transformation illustrated in the following diagram.



Step 1: Determine the coordinates of the original shape.

$A(-4,1), B(-4,4), C(-3,4), D(-3,3), E(-1,3), F(-1,2), G(-2,2), H(-2,1)$

Step 2: Determine the coordinates of the image.

$A'(-2,-4), B'(-2,-1), C'(-1,-1), D'(-1,-2), E'(1,-2), F'(1,-3), G'(0,-3), H'\ \ 0,-4$

Step 3: Determine the transformation.

The shape has moved 2 units to the right and 5 units down. This diagram illustrates a translation.

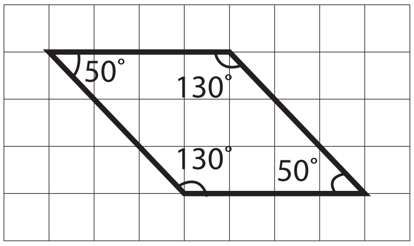
Tessellation: a design that consists of congruent copies of a shape with no overlaps or gaps; a tessellation can consist of one shape or a combination of shapes.

To make a tessellation, take the original shape and apply a series of translations, reflections, and rotations to it.

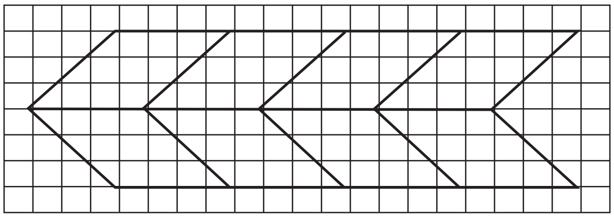
In order for a shape to tessellate, the point where the vertices of the original shape meet, the sum of the angles is 360°.

Practice Questions

1. Tessellate the following shape.

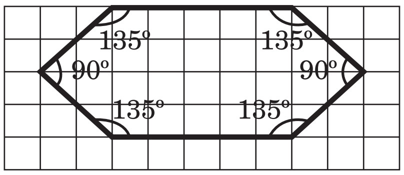


Answer:



Yes this shape will tessellate because when you arrange the shapes, the point of tessellation is **360°.**

2. Determine if the following shape will tessellate.



Answer:

No this shape will not tessellate because no matter how you arrange the shapes, the point of tessellation will never be **360°.**

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