St. Mary's Catholic High School, Muhaisnah

Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

Lesson Objectives:

Developing students will be able to calculate areas of 2D shapes.

Secure students will be able to calculate volumes of prisms.

Excelling students will be able to calculate surface areas of prisms.

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KEYWORDS:

Surface area, height, width, length, depth, slant height, radius, diameter, total cube, cuboid, volume

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Surface area, height, width, length, depth, slant height, radius, diameter, total, cube, cuboid, volume

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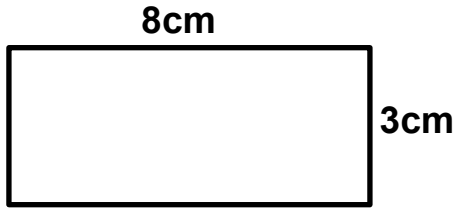
TASK

Calculate the area for each of the shapes below:

1)

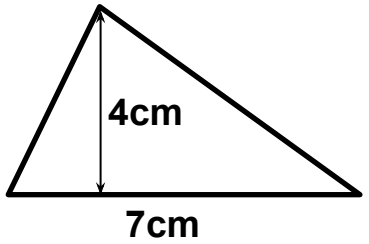


Area of rectangle = length x width

Area of rectangle = 8cm x 3cm

Area of rectangle = $24cm^2$

2)

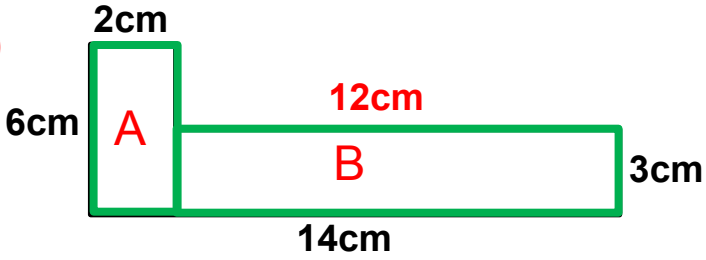


$$\text{Area} = \frac{\text{base x vertical height}}{2}$$

$$\text{Area} = \frac{7cm \times 4cm}{2}$$

Area = $14cm^2$

3)



Area of A = 6cm x 2cm = $12cm^2$

Area of B = 12cm x 3cm = $36cm^2$

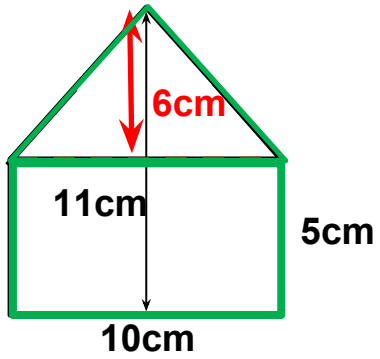
Total Area = $12cm^2 + 36cm^2$

Total Area = $48cm^2$

EXTENSION

Calculate the area of the compound shape below:

1)



Area of rectangle = 10cm x 5cm = $50cm^2$

$$\text{Area of triangle} = \frac{\text{base x vertical height}}{2}$$

$$\text{Area of triangle} = \frac{10cm \times 6cm}{2}$$

Area of triangle = $30cm^2$

Total Area = $50cm^2 + 30cm^2$

Total Area = $80cm^2$

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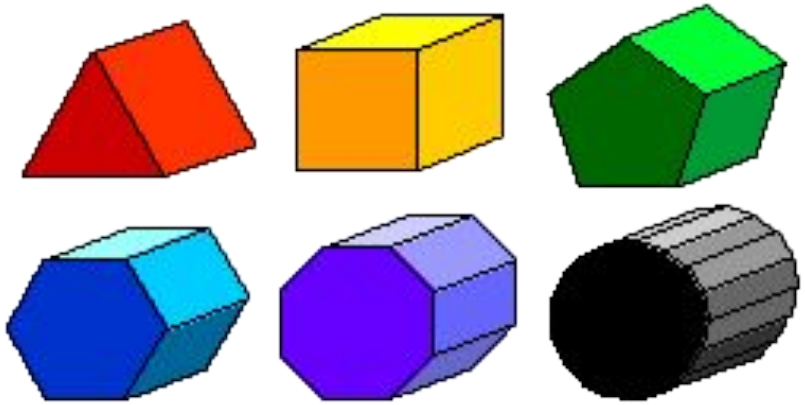
A prism is a 3D shape with two identical 2D shapes facing each other.

These identical shapes are called the cross-section.

The bases can be a triangle, square, rectangle or any other polygon.



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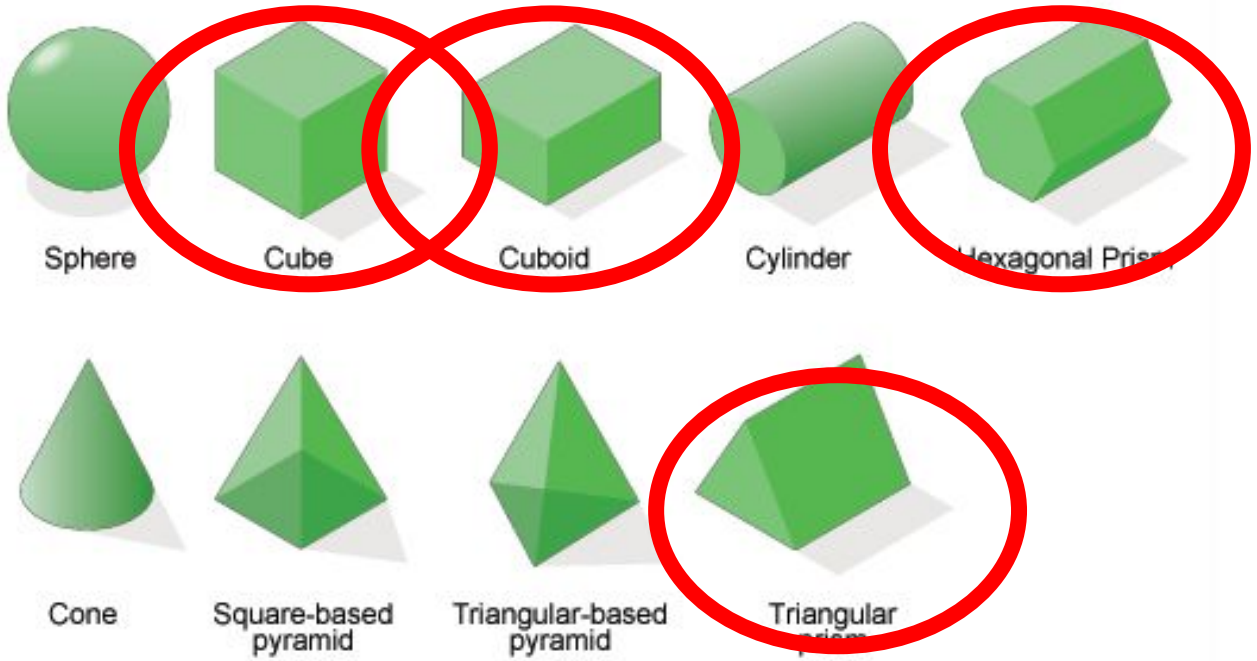
Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

Think – Pair – Share

Identify the prisms



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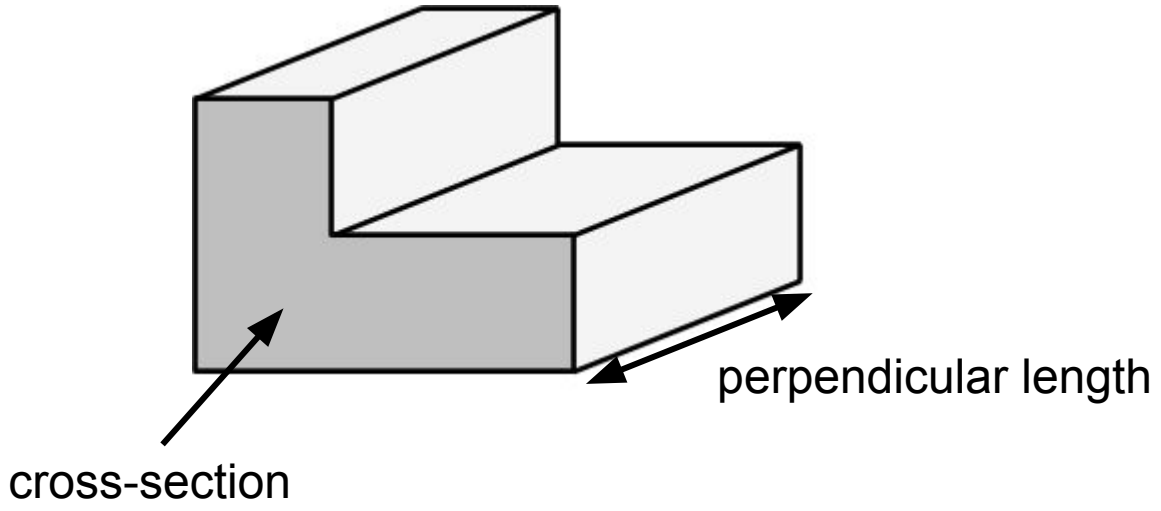
Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

Volume of prism:
area of cross-section × perpendicular length



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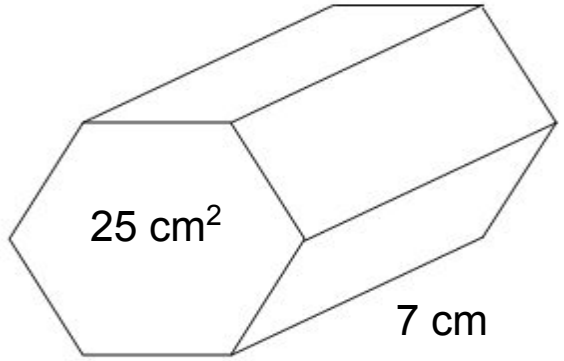
Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

Volume of prism:
area of cross-section × perpendicular length

Example

Find the volume of this prism:



$25 \times 7 = 175\ cm^3$

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Volume and Surface areas of prisms

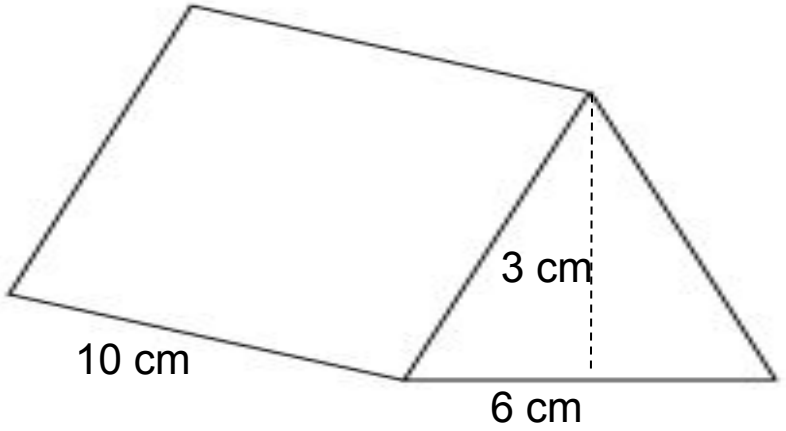
LO: To calculate volume and surface areas of prisms

MY TURN

Volume of prism:
area of cross-section × perpendicular length

Example

Find the volume of this prism:



Area of cross-section $= \frac{1}{2} \times 6 \times 3$

$= 9$ **cm²**

Volume $= 9 \times 10 \quad = 90$ **cm³**

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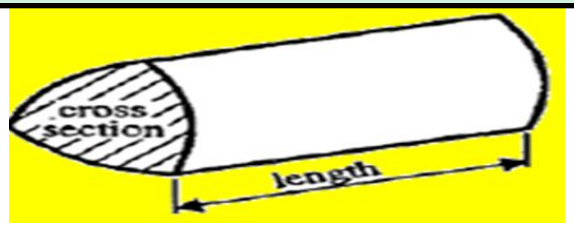
Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

VOLUME OF A PRISM = AREA OF CROSS SECTION X LENGTH

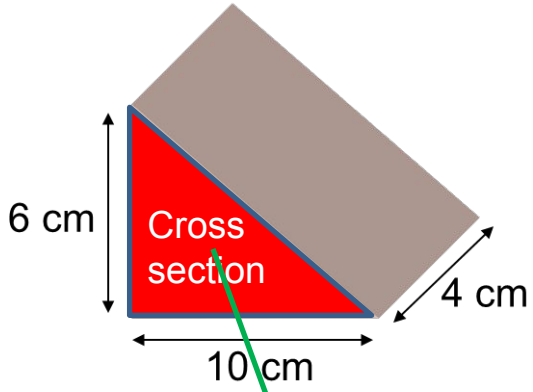


YOUR TURN

EXAMPLES

Find the volume of the prisms below:

1)



Volume = area of cross section x length

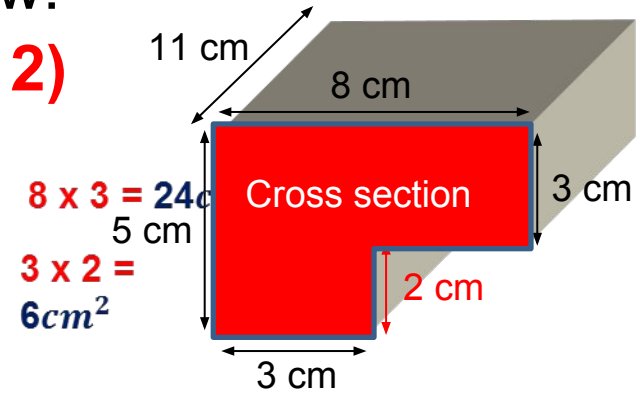
Volume = area of triangle x length

Volume = $\frac{base \times height}{2}$ x length

Volume = $\frac{10 \times 6}{2}$ x 4

Volume = 30 x 4

2)



Volume = area of cross section x length

Volume = 30 x 11

Volume = $330cm^3$

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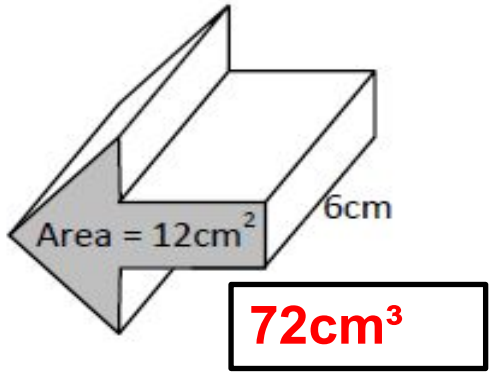
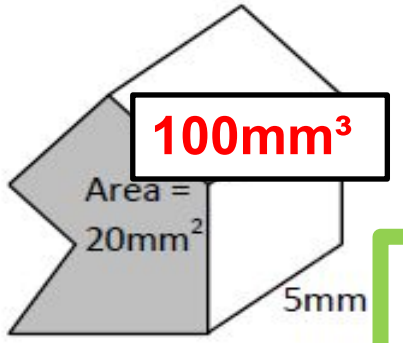
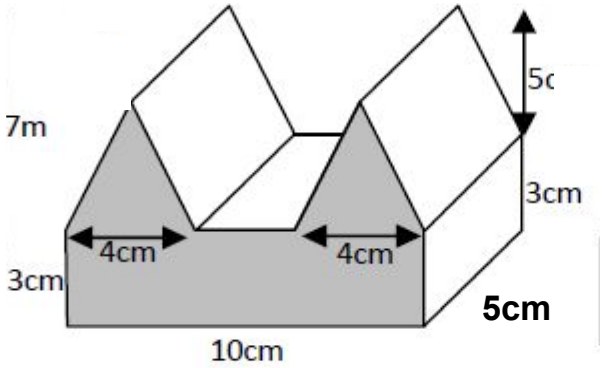
Think-Pair-Share



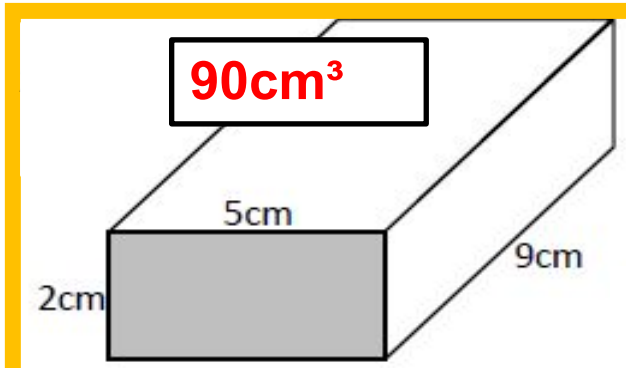
72cm³



100mm³

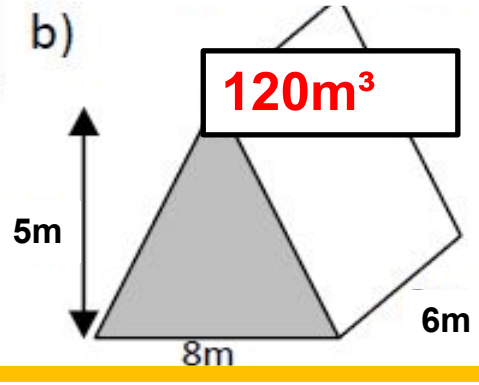


250cm³



90cm³

b)



120m³

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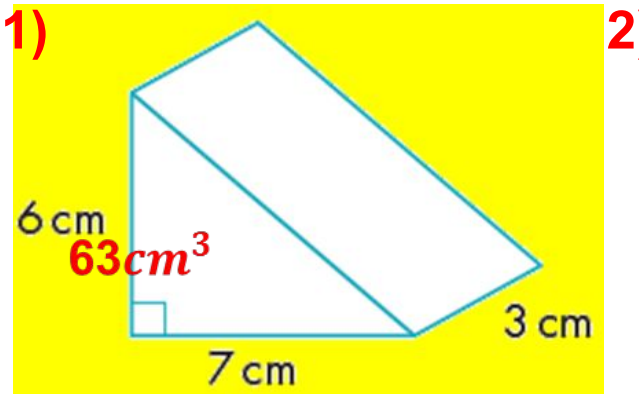
TASK (GRADE C)

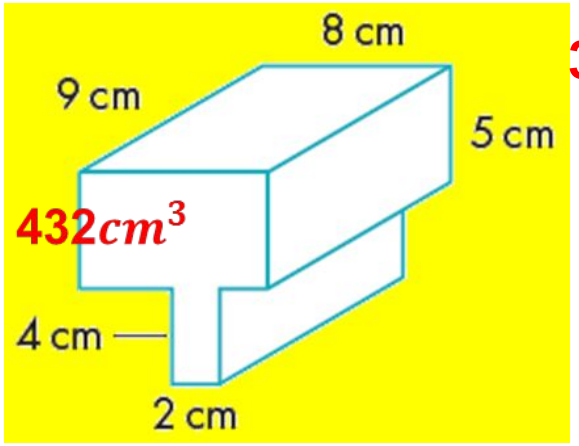
Calculate the volume for each of the prisms below:

1)



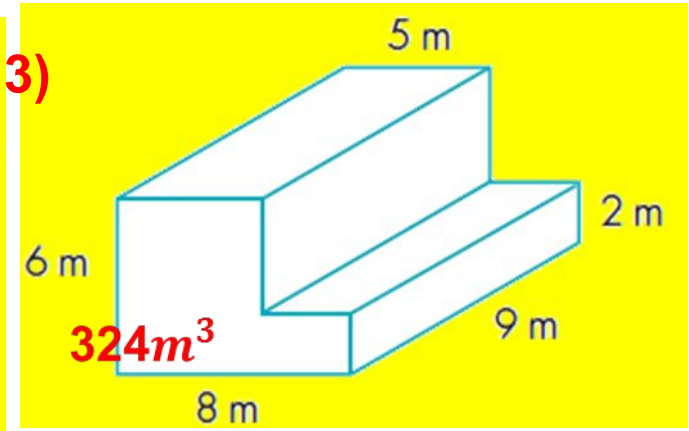
$63cm^3$

2)



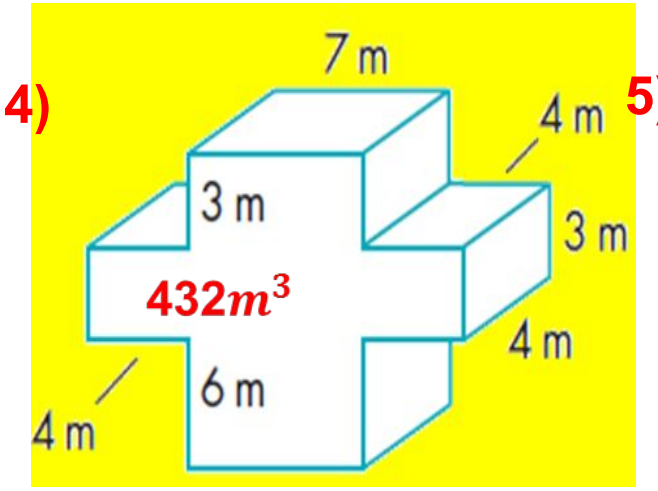
$432cm^3$

3)



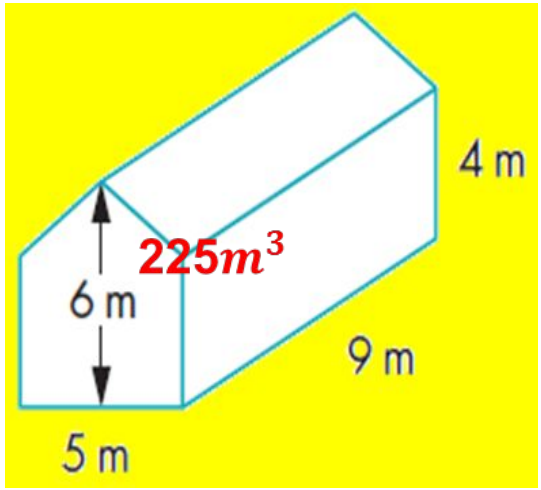
$324m^3$

4)



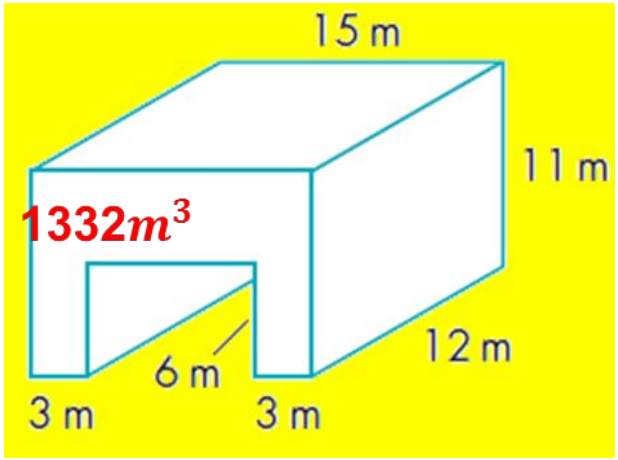
$432m^3$

5)



$225m^3$

6)



$1332m^3$

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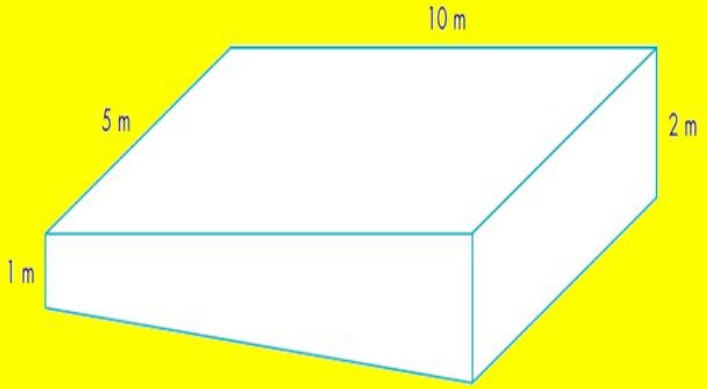
EXTENSION (GRADE C)

1) Sandra had a swimming pool in her garden. The shallow end is 1 m deep and the deep end 2 m deep, as shown in the diagram.



a What is the volume of the pool? $75m^3$

b How many litres of water will it take to fill the pool? **75000 litres**

2) Kira needs to find the weight of a metal lintel above a door.

Multiply the volume by the weight of 1cm^3 of the metal, then convert to kg.

She has calculated the volume of the lintel to be 22 500 cm^3.

She knows the weight of 1 cm^3 of this metal.

Explain how she can find the approximate weight of the lintel while it is still in place above the door.

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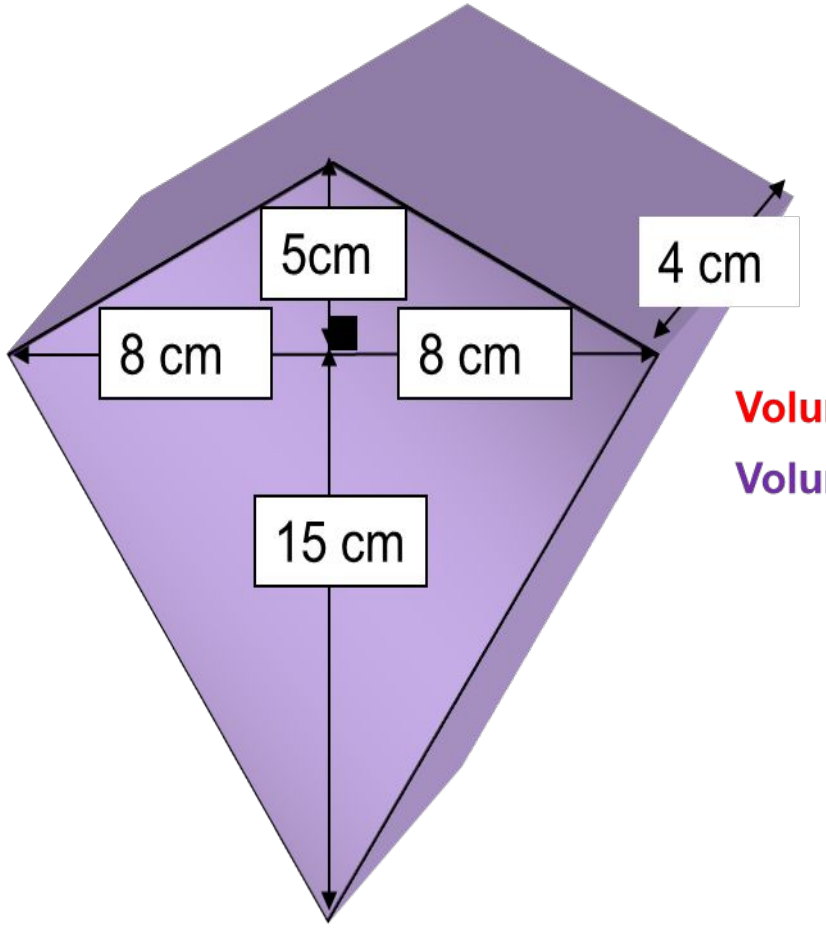
PLENARY

Work out the volume of the shape below:



Volume = area of cross section x length

Volume = area of kite x length

Volume = half product of diagonals x length

Volume = $\frac{1}{2}$ x 16 x 20 x 4

Volume = $640cm^3$

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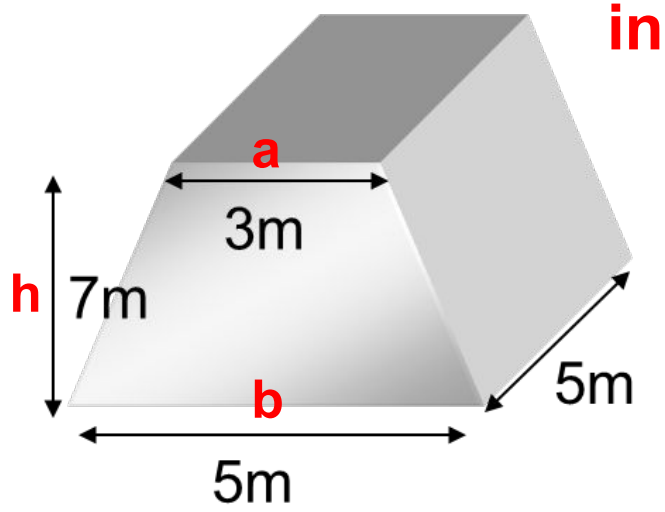
STARTER

LO: To calculate volume and surface areas of prisms

Work out the volume of the trapezoidal prism below. Write your answer in litres



Volume = area of cross section x length

Volume = area of trapezium x length

Volume = $\frac{(a+b)h}{2}$ x length

Volume = $\frac{(3+5)7}{2}$ x 5

Volume = 28 x 5

Volume = $140m^3$

1 m^3 = 1000 litres

Volume = $140000m^3$

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Volume and Surface areas of prisms

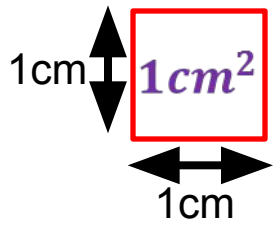
LO: To calculate volume and surface areas of prisms

INTRODUCTION

SURFACE AREA → TOTAL AREA OF ALL THE FACES OF A SOLID (3D SHAPE)

USUALLY MEASURED IN SQUARE CENTIMETRES (cm^2)

SQUARE CENTIMETRE → SQUARE WHICH MEASURES 1CM IN ALL DIRECTIONS.



$1cm = 10mm$

$1cm \times 1cm = 10mm \times 10mm$

$1cm^2 = 100mm^2$

$1m = 100cm$

$1m \times 1m = 100cm \times 100cm$

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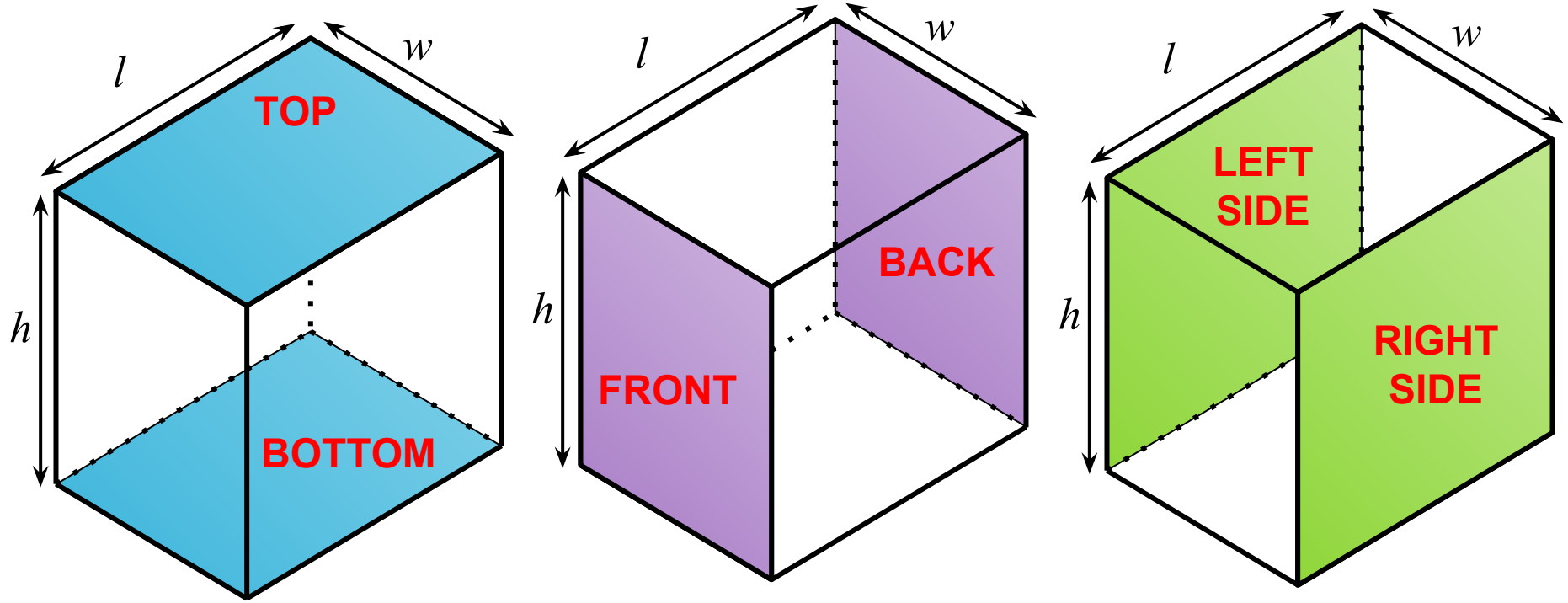
Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

INTRODUCTION

To find the surface area you have to work out the area of every face



Area of top $= l \times w = lw$
Area of bottom $= l \times w = lw$
Area of top and bottom $= 2lw$

Area of front $= h \times w = hw$
Area of back $= h \times w = hw$
Area of top and bottom $= 2hw$

Area of left $= l \times h = lh$
Area of right $= l \times h = lh$
Area of left and right $= 2lh$

Surface area of a cuboid = $2lw + 2hw + 2lh$

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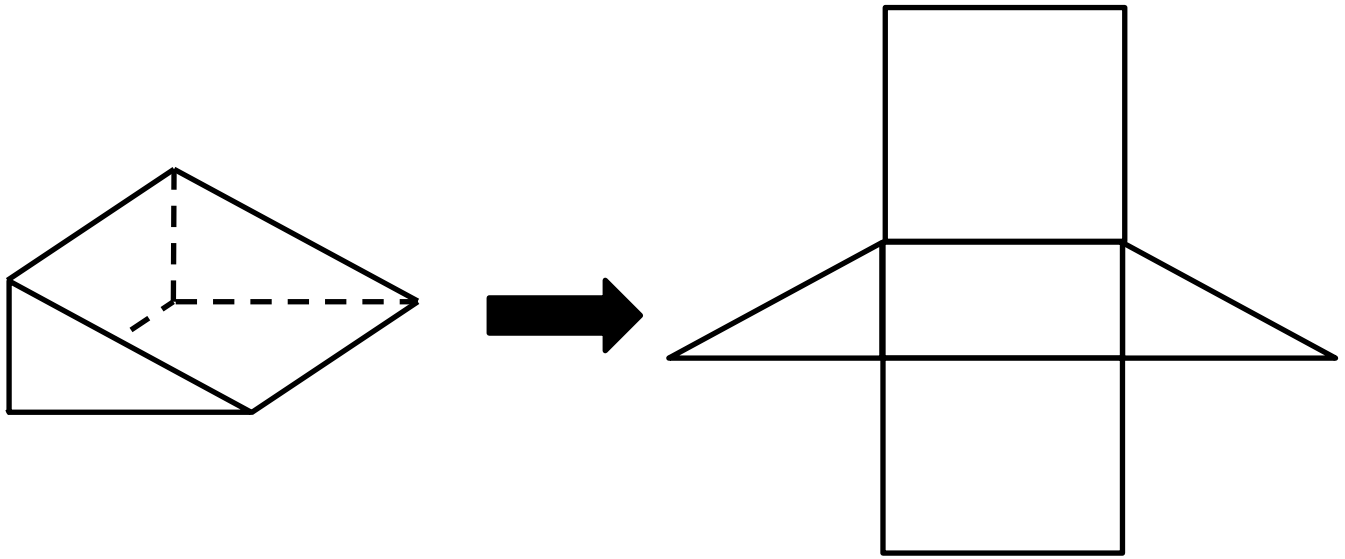
The surface area of a shape is the total area of all of its faces.

To calculate the total surface area, work out the areas of every face and add them together.



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Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

Example

Calculate the surface area of the triangular prism.

Front: $\frac{1}{2} \times 3 \times 4 = 6$ cm^2

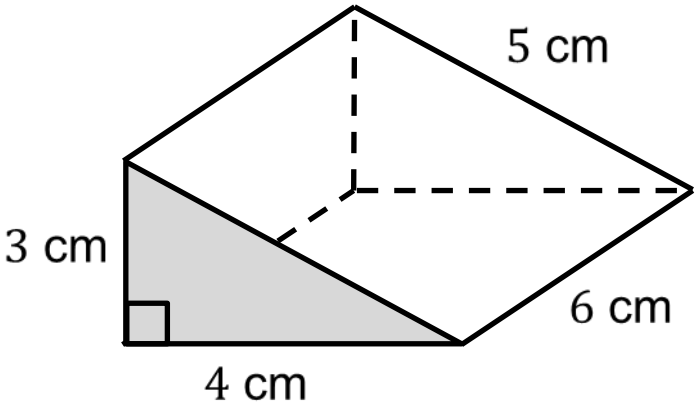
Back: $\frac{1}{2} \times 3 \times 4 = 6$ cm^2

Left: $3 \times 6 = 18$ cm^2

Slant: $6 \times 5 = 30$ cm^2

Bottom: $4 \times 6 = 24$ cm^2 +

Total: 84 cm^2



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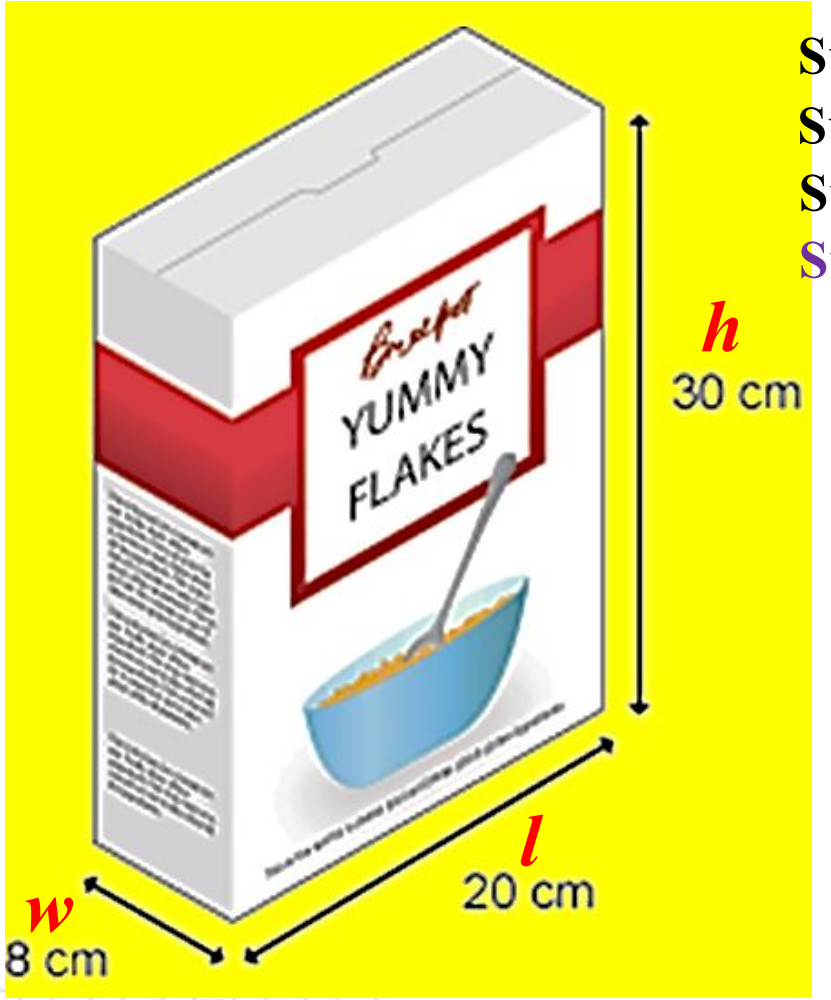
LO: To calculate volume and surface areas of prisms

MINI-PLENARY

Work out the surface area for the item shown:



$$\text{Surface Area} = 2lw + 2hw + 2lh$$

$$\text{Surface Area} = 2 \times 20 \times 8 + 2 \times 30 \times 8 + 2 \times 20 \times 30$$

$$\text{Surface Area} = 320 + 480 + 1200$$

$$\text{Surface Area} = 2000 cm^2$$

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How **confident** do you feel with this topic?

Write red, amber or green in your book!

Complete the corresponding activity ☺

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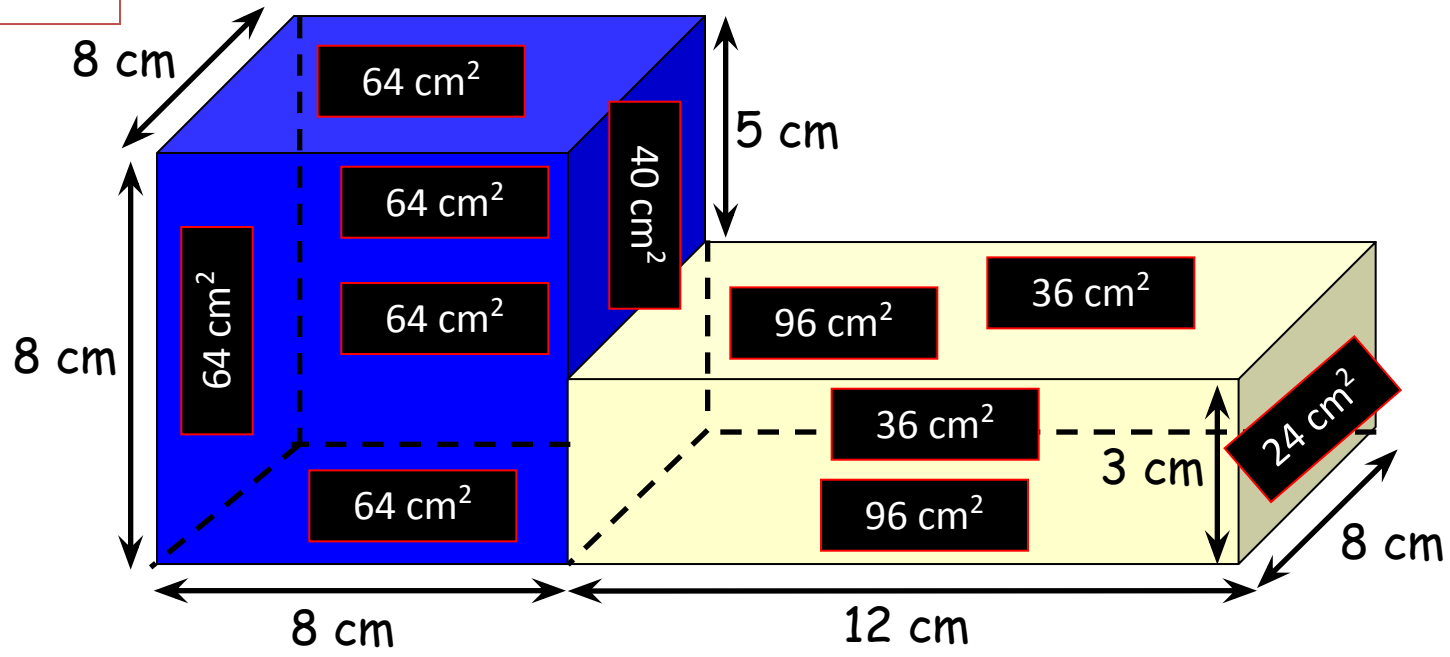
Volume and Surface areas of prisms

LO: To calculate volume and surface areas of prisms

Not to scale

Work out the surface area of the compound shape below:

Extension



SA = 64 + 64 + 64 + 64 + 64 + 40 + 96 + 96 + 24 + 36 + 36 = 648cm²

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LO: To calculate volume and surface areas of prisms

Answers

36 cm²

240 cm²

352 cm²

372 cm²

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