Student Name

Mathematics Stage 5 Core

VOLUME A

Book 1 Solve problems involving composite solids consisting of right prisms and cylinders

Version: 260207

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OVERVIEW

SYLLABUS CONTENT

MA5-VOL-C-01 solves problems involving the volume of composite solids consisting of right prisms and cylinders

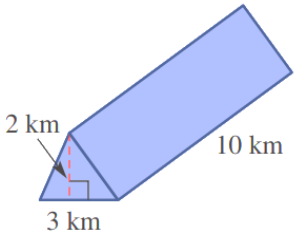
Solve problems involving composite solids consisting of right prisms and cylinders

- Find the volumes of composite right prisms with uniform cross-sections that may be dissected into triangles and quadrilaterals
- Find the volumes of right prisms that have uniform cross-sections in the form of sectors, semicircles and quadrants
- Calculate volumes of composite solids consisting of right prisms and cylinders
- Solve practical problems related to the volumes and capacities of composite solids

REVIEW OF PRIOR KNOWLEDGE

1 Calculate the volume of these solids using $V = Ah$.

a



Area of base:

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

$=$

$=$

Volume:

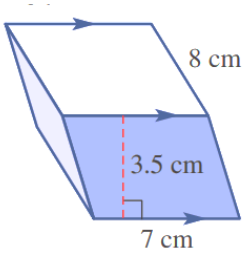
$V = Ah$

$=$

$=$

30 km³

b



Area of base:

$A = bh$

$=$

$=$

Volume:

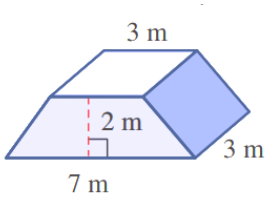
$V = Ah$

$=$

$=$

196 cm³

c



Area of base:

$A = \frac{h(a+b)}{2}$

$=$

$=$

Volume:

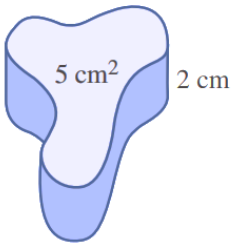
$V = Ah$

$=$

$=$

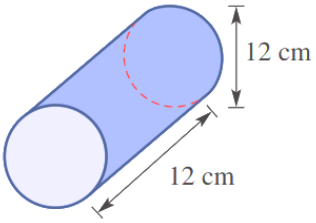
30 m³

d



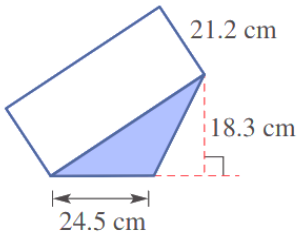
10 cm³

e



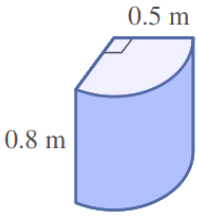
1357.2 cm³

f



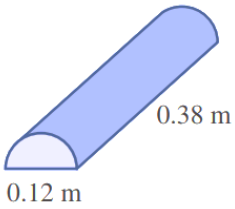
4752.5 cm³

g



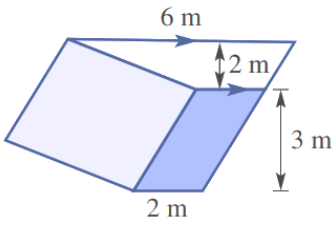
0.157 m³

h



0.00215 m³

i



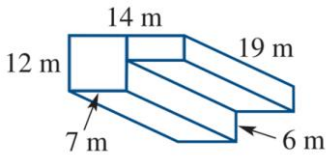
24 m³

VOLUME OF COMPOSITE SOLIDS

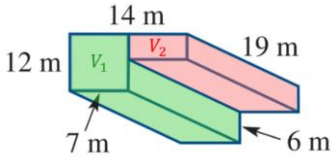
- A **composite solid** is made up of multiple simple solids.
- To find the volume of composite figures, add or subtract the volumes of simple solids.
  1. Split the composite solid into simple solids.
  2. Calculate the volume of each simple solid.
  3. Add or subtract the volumes.

Example Calculate volume of composite prisms.

Calculate the volume of these prisms. Round your answer to 2 d.p.

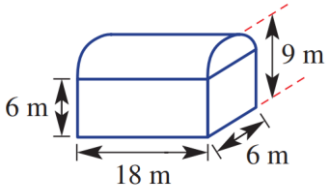


$V_1 = Ah$
$= (12 \times 7) \times 19$
$= 1596$

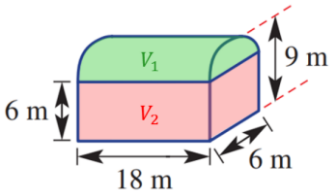


$V_2 = Ah$
$= (6 \times 7) \times 19$
$= 798$

$V_{\text{tot}} = V_1 + V_2$
$= 2394 \text{ m}^3$



$V_1 = Ah$
$= \left(\frac{1}{2}\pi(3)^2\right) \times 18$
$= 254.46900 \ldots$

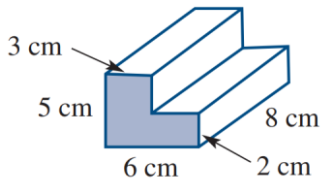


$V_2 = Ah$
$= (6 \times 6) \times 18$
$= 648$

$V_{\text{tot}} = V_1 + V_2$
$= 902.47 \text{ m}^3$

Calculate the volume of these composite prisms.

a



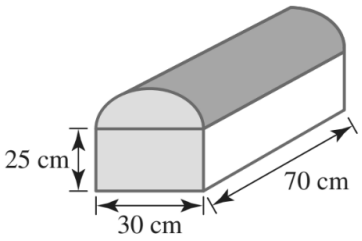
$V_1 =$

$V_2 =$

$V_{\text{tot}} =$

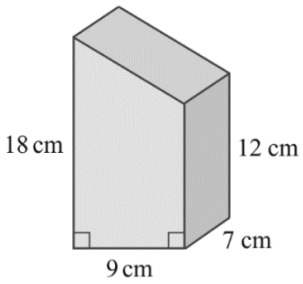
168 cm³

b



77240 cm³

c



945 cm³

1 Calculate the volume of these solids by adding the volumes of the two solids it is made from. The measurements are in centimetres. Round your answers to 1 d.p.

a

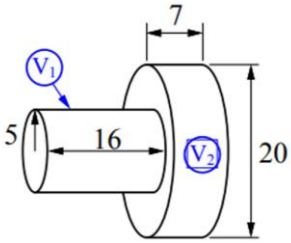
$V_1 = \pi r^2 h$

$=$

$V_2 = \pi r^2 h$

$=$

$V_{tot} =$ ..... $+$ ..... $=$ .....



3455.8 cm³

b

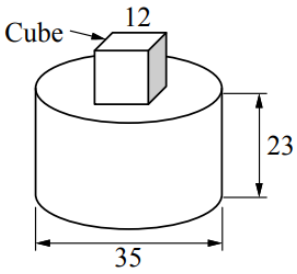
$V_1 = l^3$

$=$

$V_2 = \pi r^2 h$

$=$

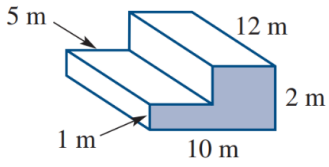
$V_{tot} =$ ..... $+$ ..... $=$ .....



23 856.6 cm³

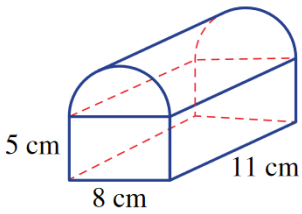
2 Calculate the volume of these prisms by addition. Round to 1 d.p. where appropriate.

a



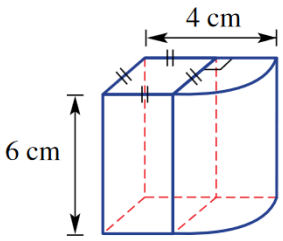
180 m³

b



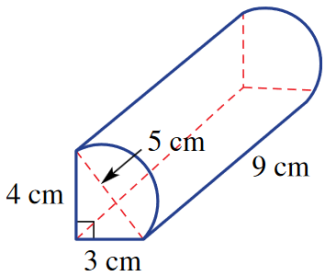
716 cm³

c



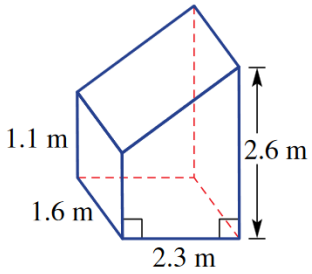
43 cm³

d



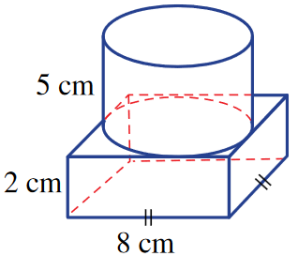
142 cm³

e



6.8 m³

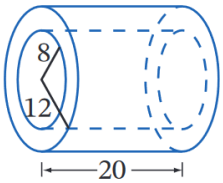
f



379.3 cm³

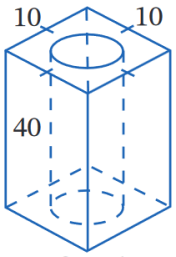
3 Calculate the volume of these solids. If units are not shown, they are in cm. Round to 1 d.p.

a



5026.6 cm^3

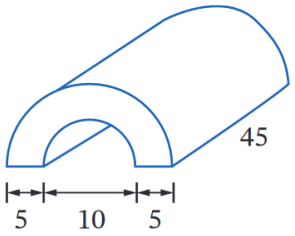
b



radius of circle = 4 cm

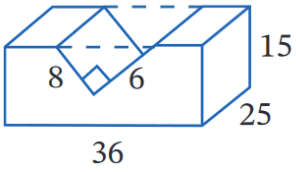
1989.4 cm^3

c



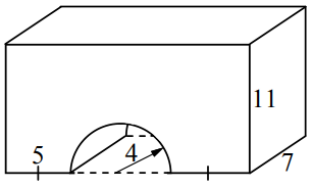
5301.4 cm^3

d



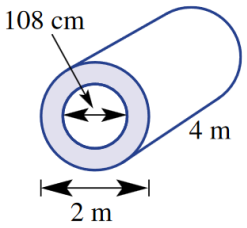
12 900.0 cm^3

e



1210.1 cm^3

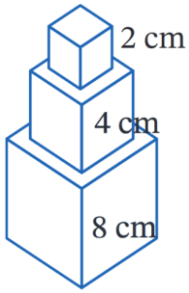
f



8.9 m^3

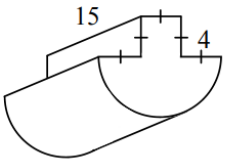
4 Calculate the volumes of these shapes. All lengths are in cm. Round answers to 1 d.p.

a A stack of 3 cubes



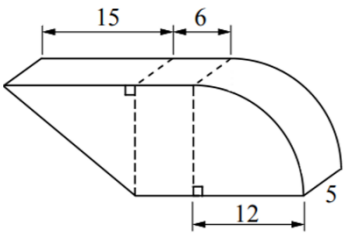
584.0 cm^3

b



1088.2 cm^3

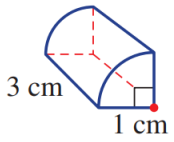
c



1375.5 cm^3

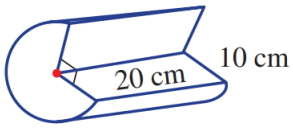
5 Calculate the volume of these solids. Answer to 1 d.p.

a



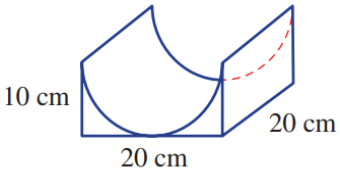
2.4 cm^3

b



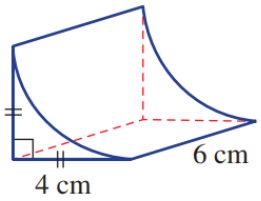
4712.4 cm^3

c



858.4 cm^3

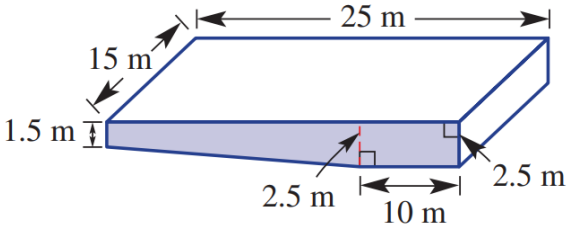
d



20.6 cm^3

6 The given diagram is a sketch of a new 25 m swimming pool to be installed in a sports complex.

a Find the area of one side of the pool (shaded).



55 m^2

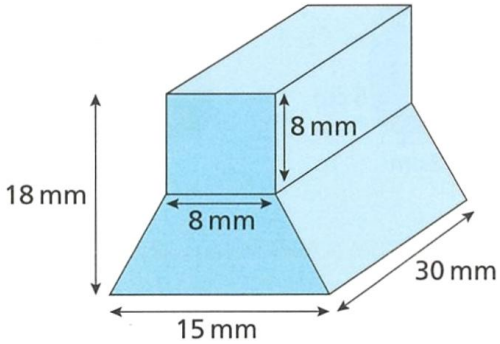
b Find the volume of the pool in cubic metres.

825 m^3

c Find the capacity of the pool in litres, if 1 m^3 = 1000 L

825 000 L

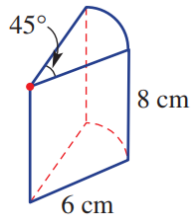
7 Calculate the volume of this prism.



5370 mm^3

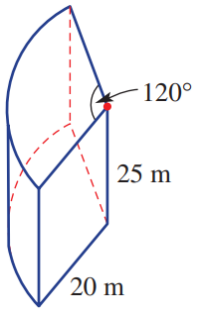
8 Using the area of a sector $A = \frac{\theta}{360} \times \pi r^2$, calculate the volume of these solids to 1 d.p.

a



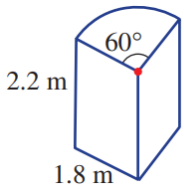
113.1 cm³

b



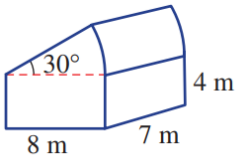
10 472.0 m³

c



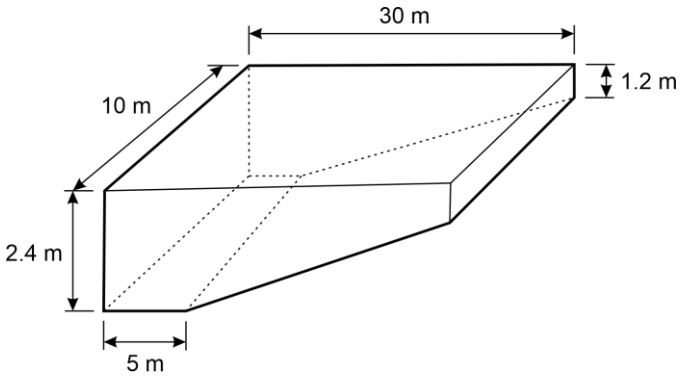
3.7 m³

d



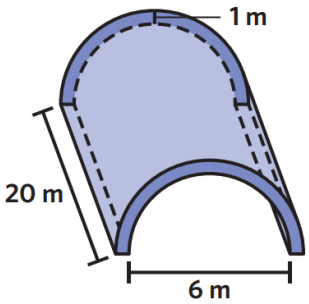
341.3 m³

9 Calculate the volume of earth that must be excavated so that the pool shell below fits exactly into the hole.



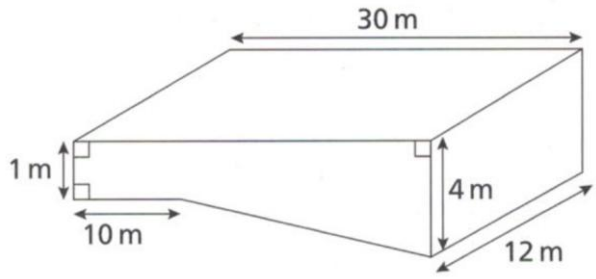
570 m³

10 Enzo is building a 20 m long tunnel that has a 6 m wide semicircle for a cross section.
The tunnel is to be built using concrete that needs to be 1 m thick.
How many cubic metres of concrete does Enzo need to build the tunnel, correct to 3 d.p.?



219.911 m³

11 The diagram shows an empty swimming pool.
Water flows into the pool at a rate of 600 litres per minute.
How long, in hours and minutes, will it take to fill the pool? (Hint: 1000 L = 1 m^3)

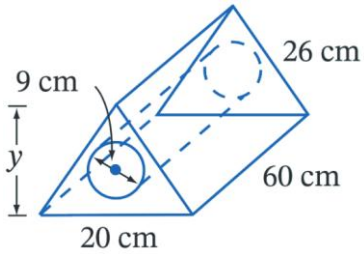


20 hours

12 Consider this isosceles triangular prism with a hole through the middle.

a Calculate y using Pythagoras' theorem.

b Hence, show the volume is approximately 10 583 cm^3



13 A concrete support column is made up of a cylindrical base and a square prism.
The cylindrical base is 1 m in diameter and 1 m high,
and the square prism is 10 m long and sits on the cylindrical base.

a Find the exact side length of the square base of the prism.

b Hence show that the volume is approximately 5.8 m^3