Section B [48 marks]

Answer **four** questions in this section.

Each question in this section carries 12 marks.

7 A, B, C, D and E are five different shaped blocks of ice stored in a refrigerated room.

(a) At 11 p.m. on Monday the cooling system failed, and the blocks started to melt.
At the end of each 24 hour period, the volume of each block was 12% less than its volume at the start of that period.

(i) Block A had a volume of 7500 cm^3 at 11 p.m. on Monday.

Calculate its volume at 11 p.m. on Wednesday. [2]

(ii) Block B had a volume of 6490 cm^3 at 11 p.m. on Tuesday.

Calculate its volume at 11 p.m. on the previous day. [2]

(iii) **Showing your working clearly**, find on which day the volume of Block C was half its volume at 11 p.m. on Monday. [2]

(b) **[The volume of a sphere is $\frac{4}{3}\pi r^3$.]**
[The surface area of a sphere is $4\pi r^2$.]

At 11 p.m. on Monday Block D was a **hemisphere** with radius 18 cm.

Calculate

(i) its volume, [2]

(ii) its **total** surface area. [2]

(c) As Block E melted, its shape was always **geometrically similar** to its original shape.
It had a volume of 5000 cm^3 when its height was 12 cm.

Calculate its height when its volume was 1080 cm^3. [2]

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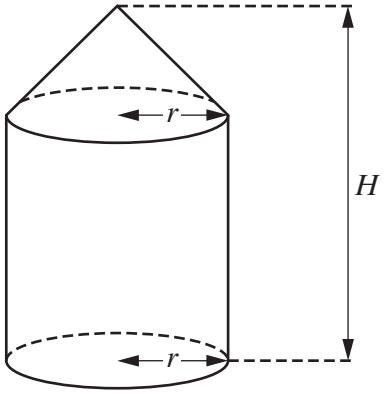
11 **[Volume of a cone = $\frac{1}{3}\pi r^2 h$]**



The solid above consists of a cone with base radius r centimetres on top of a cylinder of radius r centimetres.
The height of the cylinder is twice the height of the cone.
The total height of the solid is H centimetres.

(a) Find an expression, in terms of π, r and H, for the volume of the solid.
Give your answer in its simplest form.

Answer ..... [3]

(b) It is given that $r = 10$ and the height of the **cone** is 15 cm.

(i) Show that the slant height of the cone is 18.0 cm, correct to one decimal place.

[2]

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(ii) Find the circumference of the base of the cone.

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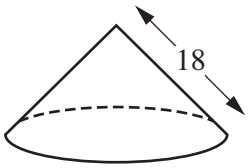
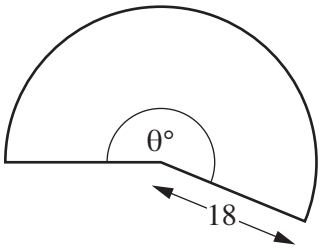
Answer .....cm [2]

(iii) The curved surface area of the cone can be made into the shape of a sector of a circle with angle θ°.

Show that θ is 200, correct to the nearest integer.





[2]

(iv) Hence, or otherwise, find the **total** surface area of the solid.

Answer .....cm^2 [3]

10 The diagram shows a major segment of a circle with centre O and radius 15 cm. A and B are two points on the circumference such that $A\hat{O}B = 60°$.

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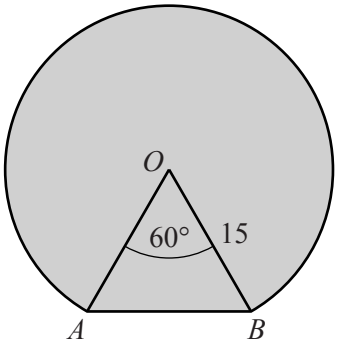

(a) Calculate

(i) the area of the major segment,

Answer ..... cm^2 [4]

(ii) the perimeter of the major segment.

Answer ..... cm [2]

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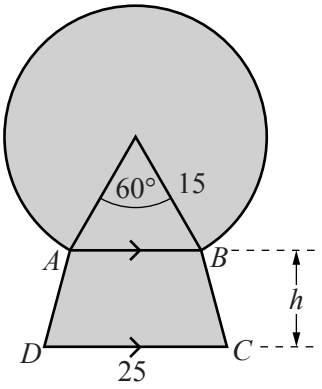
(b) **Shape I** is formed by joining this segment to a trapezium, $ABCD$, along AB.
AB is parallel to DC, $DC = 25$ cm and the perpendicular height of the trapezium is h cm.
The area of the trapezium is 248 cm^2.

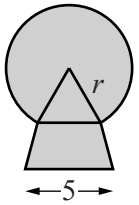
Calculate h.



Shape I

Answer ..... [2]

(c) **Shape II** is geometrically similar to **Shape I**.
The longest side of the trapezium in **Shape II** is 5 cm.



Shape II

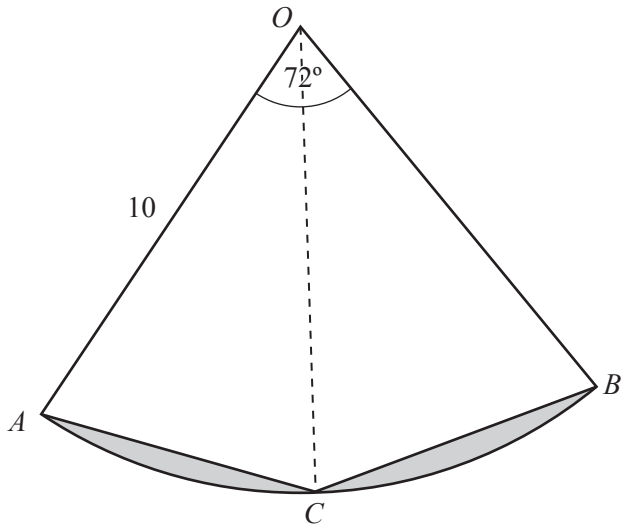
(i) Find the radius, r, of the segment in **Shape II**.

Answer ..... cm [1]

(ii) Find the **total** area of **Shape II**.

Answer ..... cm^2 [3]

12



OAB is a sector of a circle, centre O, and radius 10 cm.
$A\hat{O}B = 72°$ and C is the point on the arc AB such that OC bisects $A\hat{O}B$.

(a) Calculate the perimeter of sector OAB.

Answer ..... cm [3]

(b) (i) Calculate the area of sector OAB.

Answer ..... cm^2 [2]

(ii) Calculate the total shaded area.

Answer ..... cm^2 [3]

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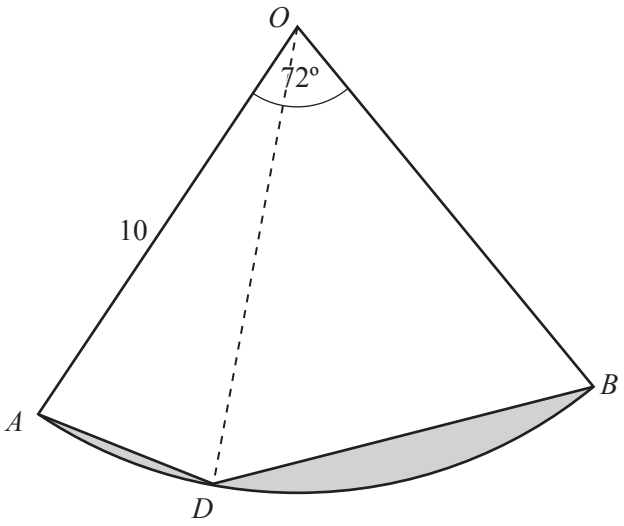
(c)



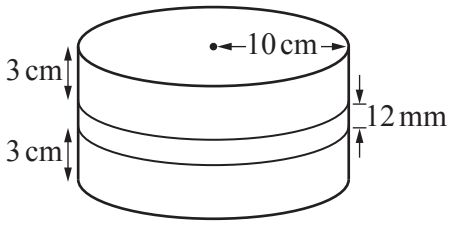
D is the point on the arc AB such that $A\hat{O}D : D\hat{O}B = 1 : 2$.
Gavin says that the shaded area on this diagram is the same as the shaded area calculated in part **(b)(ii)**.

Is he correct? Show your working.

Answer

[4]

8 A birthday cake is in the shape of a cylinder.
There are two layers of cake and one layer of icing.



Each layer of cake has radius 10 cm and height 3 cm.
The icing, between the two layers of cake, has radius 10 cm and height 12 mm.

(a) Calculate the volume of **icing** in the birthday cake.
Give your answer in cm^3.

..... cm^3 [2]

(b) The top and curved surface of the birthday cake are now covered with chocolate.

Calculate the area of the birthday cake that is covered with chocolate.

..... cm^2 [3]

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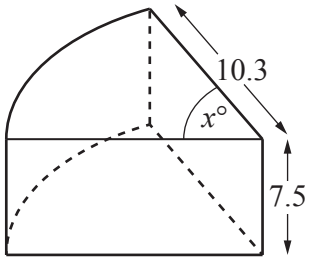
(c) Anil has a slice of this chocolate-covered birthday cake.



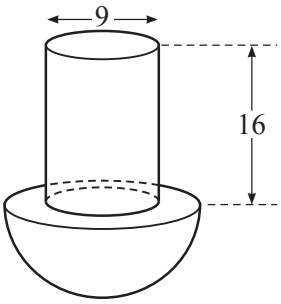
His slice is a prism of height 7.5 cm.
The top of the cake is a sector, radius 10.3 cm and angle $x°$.
The volume of his slice is 200 cm^3.

Calculate the value of x.

$x =$ ..... [3]

4 (a) **[Volume of a sphere $= \frac{4}{3}\pi r^3$]**

[Surface area of a sphere $= 4\pi r^2$]



The diagram shows a solid formed by joining a cylinder to a hemisphere.
The diameter of the cylinder is 9 cm and its height is 16 cm.

(i) The volume of the hemisphere is equal to the volume of the cylinder.

Show that the radius of the hemisphere is 7.86 cm, correct to 2 decimal places.

[4]

(ii) Calculate the total surface area of the solid.

..... cm^2 [3]

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(b) A different solid is in the shape of a cuboid.
The cuboid measures 8 cm by 4 cm by 6 cm.
These measurements are given correct to the nearest centimetre.

Calculate the lower bound of the volume of the cuboid.

..... cm^3 [2]

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