3.2 Geometry of 3D Shapes

Question Paper
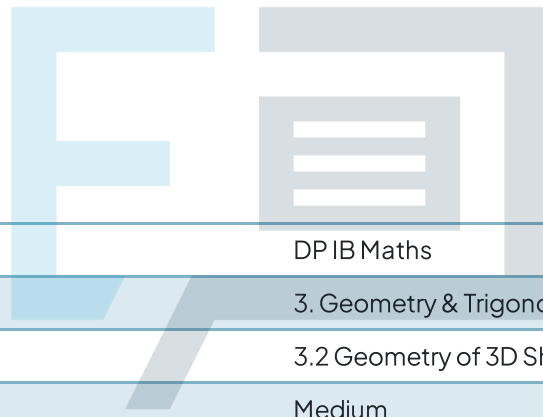
Course	DP IB Maths
Section	3. Geometry & Trigonometry
Topic	3.2 Geometry of 3D Shapes
Difficulty	Medium

To be used by all students preparing for DP IB Maths AI SL
Students of other boards may also find this useful

Question 1a

The height of a regulation basketball is 2286 mm. Assuming the surface of the basketball is a sphere:

Calculate the circumference of the basketball.

[2 marks]

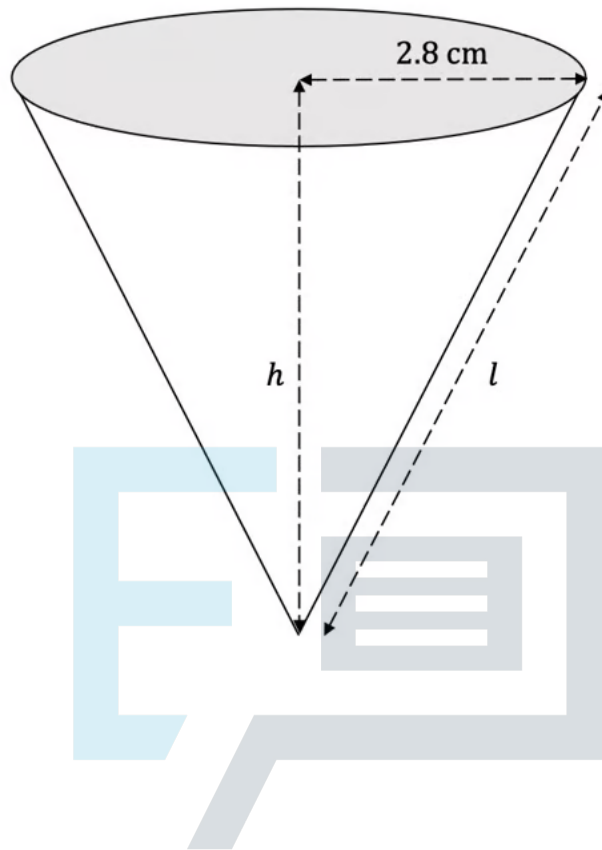## Question 1b

Calculate the surface area of the basketball.

[3 marks]

Question 1c

Calculate the volume of the basketball.

[3 marks]

Question 2a

A waffle ice cream cone forms a right circular cone that has a volume of 120 cm^3 and a radius of 2.8 cm.

Find the height, h, of the cone.

[2 marks]

Question 2b

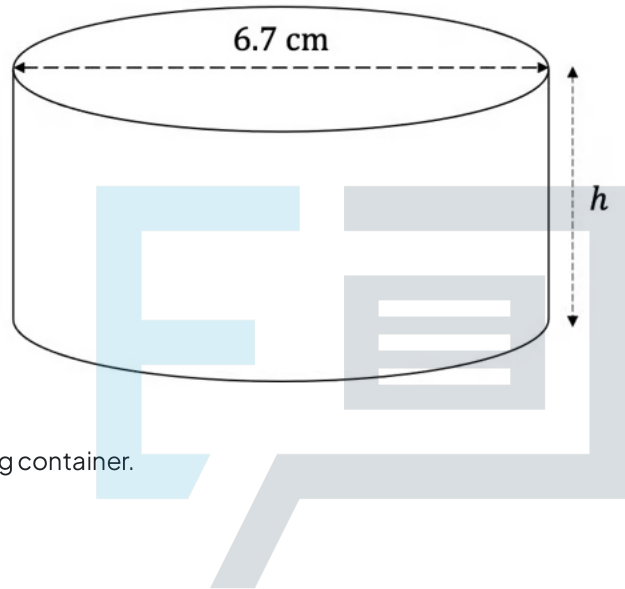Find the slant height, l, of the cone.

[2 marks]

Question 2c

Calculate the curved surface area of the cone.

[2 marks]

Question 3a

A baking container has the shape of a cylinder, as shown in the diagram below. The diameter of the baking container is 6.7 cm and its volume, V, is 80 cm^3.
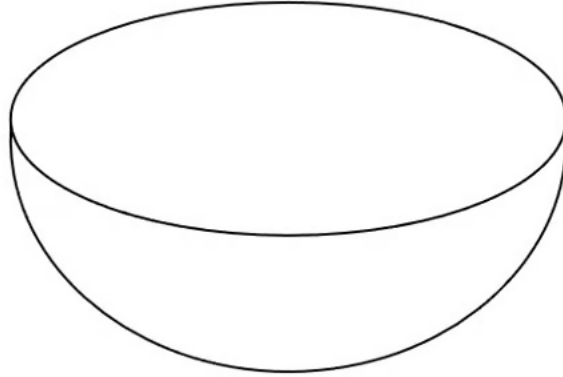

Find the height, h, of the baking container.

[2 marks]

Question 3b

A bowl full of cake batter has the shape of a hemisphere, as shown in the diagram below. The cake batter is poured into the baking container and fills a quarter of the container.

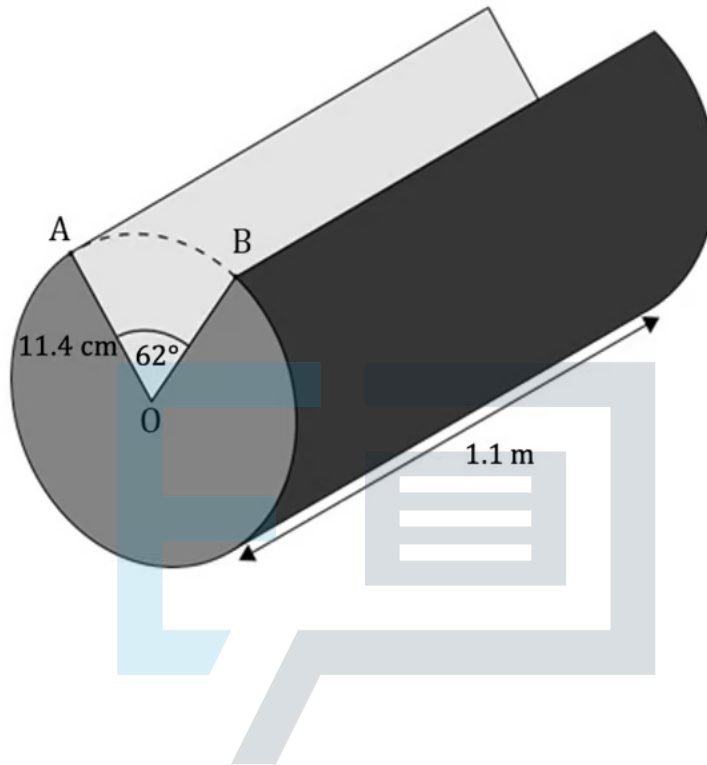Find the radius, r, of the bowl.

[4 marks]

Question 4a

Hamish is building a tree hut using cylindrical logs of length $1.1\,$m and radius 11.4cm.

A wedge is cut from the logs as shown.

Find the length, in cm, of the

(i)
minor arc AB

(ii)
major arc AB.

[3 marks]

Question 4b

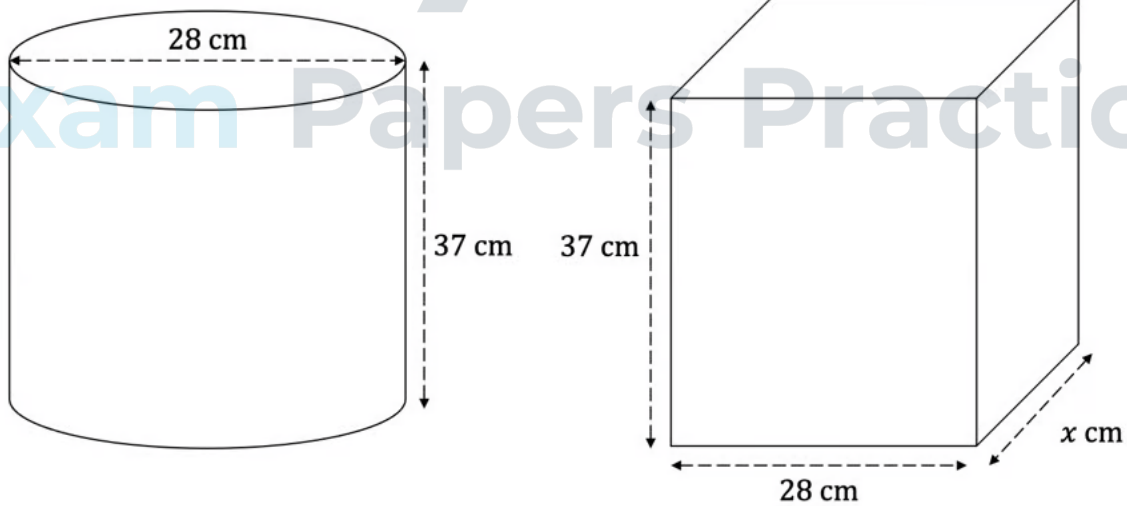Find the area of the empty sector OAB.

[2 marks]

Question 4c

Find the volume of each log. Give your answer in cm^3.

[3 marks]

Question 5a

Vivian has two containers. The first container is in the shape of a cylinder with diameter $28\ cm$ and height $37\ cm$. The second container is in the shape of a cuboid with width $28\ cm$, height $37\ cm$ and length x cm.

Calculate the surface area of the first container.

[3 marks]

Question 5b

Both containers have the same surface area.

Find the value of x.

[4 marks]

Question 6a

A stone is in the shape of a sphere with radius 1.84 m.

Calculate the volume of the stone.

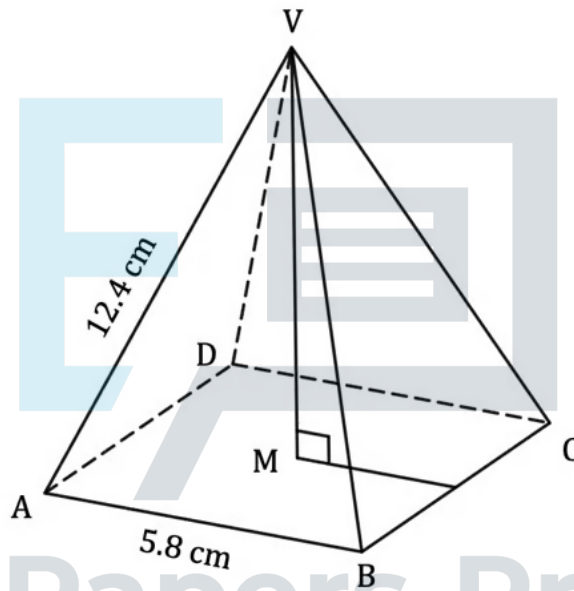**[2 marks]**

Question 6b

The stone is cooled and its volume decreases by 1%.

Calculate the radius of the stone following this decrease.

[3 marks]

Question 7a

A right pyramid has square base ABCD and apex V. The sides of the square base are 5.8 cm and the sloping edges are 12.4 cm.

Calculate the length of $\mathrm{VM}.$.

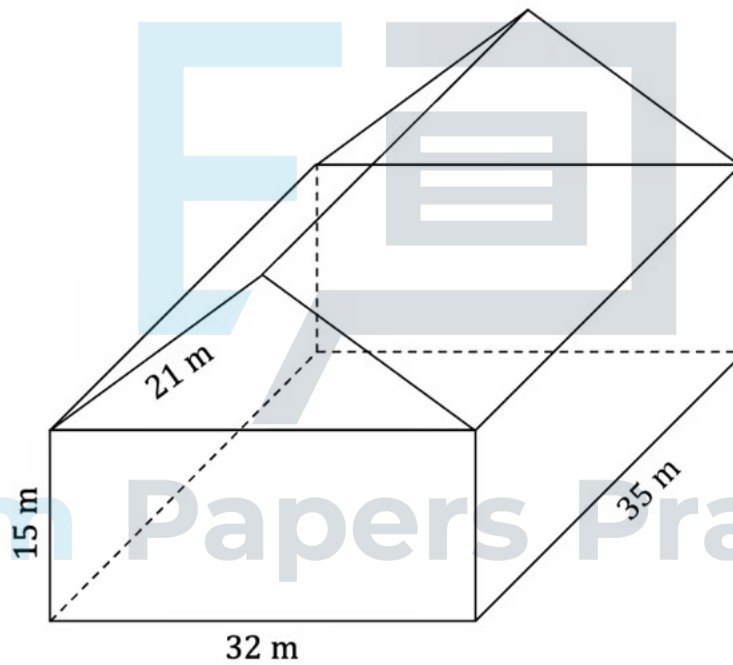**[3 marks]**

Question 7b

Calculate the volume of the pyramid.

[2 marks]

Question 8

A storage warehouse consists of a cuboid measuring $15 \text{ m} \times 32 \text{ m} \times 35 \text{ m}$ and a roof in the shape of an isosceles triangular prism with side lengths of 21 m, as shown in the diagram. The total exterior surface of the storage warehouse is to be painted.

Find the area to be painted. Give your answer to the nearest m^2.

[8 marks]

Question 9a

Two planes, A and B, are coming into land at Sharp airport. The locations of the planes and Sharp airport can be described by coordinates on an $x,\ y,\ z$ axes, where x and y represent the distance east and north of Sharp airport respectively and z represents the altitude of the planes. Plane A has coordinates $(11,14,4)$, plane B has coordinates $(4,17,3)$ and Sharp airport has coordinates $(0,0,0)$. All distances are in km.

Determine which plane is farthest away from Sharp airport.

[2 marks]

Question 9b

Calculate the distance between plane A and plane B.

[3 marks]

Question 9c

After an hour of flying, plane A has coordinates $(-8, 20, 5)$. Realizing the plane is low on fuel, the pilot decides to make an emergency landing at the closest airport. His two options are Sharp airport or Kit airport, located at $(-15, 1, 0)$.

State which airport the pilot land the plane.

[3 marks]