

Week 19

# IGCSE Mathematics

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Homework bundle for this week

本周作业合集

exercises.lol

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1. Convert  $3 \text{ m}^2$  to  $\text{cm}^2$ . ( $1 \text{ m}^2 = 10\,000 \text{ cm}^2$ )

\_\_\_\_\_

2. A trapezium has parallel sides 6 cm and 10 cm and height 4 cm. Find its area ( $\text{cm}^2$ ).

\_\_\_\_\_

3. A circle has radius 7 cm. Its area is  $k\pi \text{ cm}^2$ . What is  $k$ ?

\_\_\_\_\_

4. A cylinder has radius 5 cm and height 10 cm. Its volume is  $k\pi \text{ cm}^3$ . What is  $k$ ?

\_\_\_\_\_

5. To find the area of a rectangle with a semicircle on one end, you:

- ☐ add the rectangle area and the semicircle area
- ☐ multiply them
- ☐ subtract the semicircle from the rectangle
- ☐ take the larger one only

6. How many cm are there in 1 m?

\_\_\_\_\_

7. The volume of a hemisphere of radius  $r$  is:

- ☐  $(2/3)\pi r^3$
- ☐  $(4/3)\pi r^3$
- ☐  $(1/3)\pi r^3$
- ☐  $4\pi r^2$

8. The volume of a sphere of radius  $r$  is:

- ☐  $(4/3)\pi r^3$
- ☐  $4\pi r^2$
- ☐  $\pi r^2 h$
- ☐  $(1/3)\pi r^2 h$

9. A circle with diameter 10 cm has area  $100\pi \text{ cm}^2$ .

- ☐ True      ☐ False

10.  $1 \text{ m}^2 = 100 \text{ cm}^2$ .

☐ True

☐ False

1. **30000**

$$3 \times 10\,000 = 30\,000 \text{ cm}^2.$$

2. **32**

$$\frac{1}{2}(6 + 10) \times 4 = \frac{1}{2} \times 16 \times 4 = 32 \text{ cm}^2.$$

3. **49**

$$\text{Area} = \pi r^2 = \pi(7^2) = 49\pi, \text{ so } k = 49.$$

4. **250**

$$\text{Volume} = \pi r^2 h = \pi(25)(10) = 250\pi, \text{ so } k = 250.$$

5. **add the rectangle area and the semicircle area**

The shape is the rectangle plus the semicircle, so add the two areas.

6. **100**

$$1 \text{ m} = 100 \text{ cm}.$$

7.  **$(2/3)\pi r^3$** 

$$\text{Half of } (4/3)\pi r^3 \text{ is } (2/3)\pi r^3.$$

8.  **$(4/3)\pi r^3$** 

$$\text{Sphere volume} = (4/3)\pi r^3; 4\pi r^2 \text{ is its surface area.}$$

9. **False**

$$\text{Radius} = 5 \text{ cm, so area} = \pi(5^2) = 25\pi, \text{ not } 100\pi. \text{ You must halve the diameter first.}$$

10. **False**

$$1 \text{ m}^2 = 100^2 = 10\,000 \text{ cm}^2, \text{ not } 100 \text{ cm}^2. \text{ The conversion factor must be squared for area.}$$

# E5.3 Circles, arcs and sectors

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**Total: 12 marks****KEY WORDS** circle 圆 • radius 半径 • circumference 圆周 • sector area 扇形面积 • arc length 弧长

## Objective

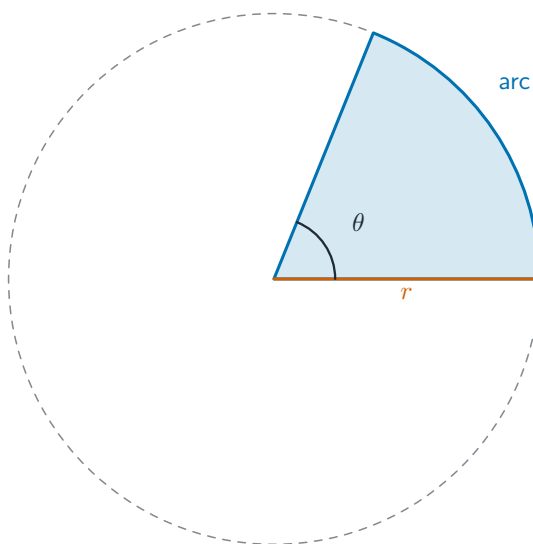
Build the skills to answer Extended exam questions on **circles, arcs and sectors** 圆、弧和扇形 — **circumference and area** 周长和面积, and the **arc length** 弧长 and **sector area** 扇形面积.

**You must be able to:**

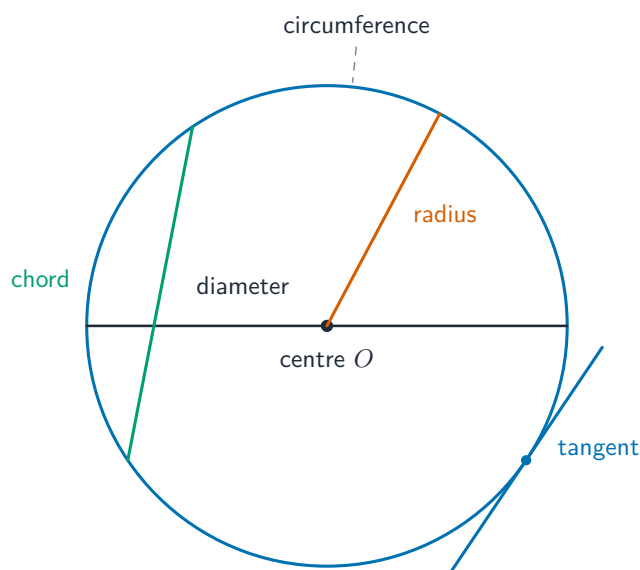
- find the circumference and area of a circle
- find an arc length and a sector area
- find the perimeter of a sector

## 1 Worked examples

### ■ Arcs and sectors



Take the fraction  $\frac{\theta}{360}$  of the whole circle



*The named parts of a circle used in arc and sector work*

$$\text{circumference} = 2\pi r \quad \text{area} = \pi r^2$$

$$\text{arc} = \frac{\theta}{360} \times 2\pi r \quad \text{sector area} = \frac{\theta}{360} \times \pi r^2$$

- **Worked** ( $\theta = 90^\circ$ ,  $r = 8$ ): fraction  $\frac{1}{4} \rightarrow \text{arc} = \frac{1}{4} \times 16\pi = 4\pi$  cm; sector area  $= \frac{1}{4} \times 64\pi = 16\pi$  cm<sup>2</sup>.

**Answer shapes:** **M1** a correct method, **A1** the correct answer.

## 2 Practice

**2.1** Find the circumference of a circle of radius 5 cm, in terms of  $\pi$ . [1]

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**2.2** Find the area of a circle of radius 6 cm, in terms of  $\pi$ . [2]

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**2.3** Find the arc length of a sector with angle  $90^\circ$  and radius 12 cm, in terms of  $\pi$ . [2]

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### 3 Exam-style questions

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**3.1** A sector has angle  $120^\circ$  and radius 9 cm.

(a) Find its area, in terms of  $\pi$ . [2]

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(b) Find its perimeter, in terms of  $\pi$ . [3]

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**3.2** A circle has area  $36\pi \text{ cm}^2$ . Find its radius. [2]

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## Solutions

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Marking: **M1** a correct method, **A1** the correct answer.

**2.1**  $2\pi \times 5 = 10\pi$  cm.

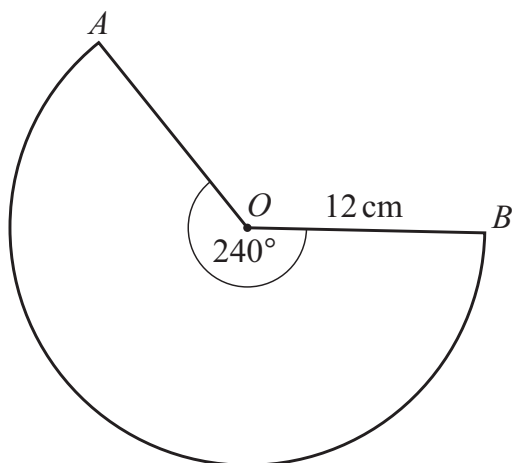
**2.2**  $\pi \times 6^2 = 36\pi$  cm<sup>2</sup>.

**2.3**  $\frac{90}{360} \times 2\pi \times 12 = \frac{1}{4} \times 24\pi = 6\pi$  cm.

**3.1** (a)  $\frac{120}{360} \times \pi \times 9^2 = \frac{1}{3} \times 81\pi = 27\pi$  cm<sup>2</sup>. (b) arc =  $\frac{1}{3} \times 2\pi \times 9 = 6\pi$ ; perimeter = arc +  $2r = 6\pi + 18$  cm.

**3.2**  $\pi r^2 = 36\pi \rightarrow r^2 = 36 \rightarrow r = 6$  cm.

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NOT TO  
SCALE

The diagram shows a major sector,  $AOB$ , of a circle.  
The sector angle is  $240^\circ$  and the radius is 12 cm.

- (a) Show that the length of the major arc  $AB$  is  $16\pi$  cm.

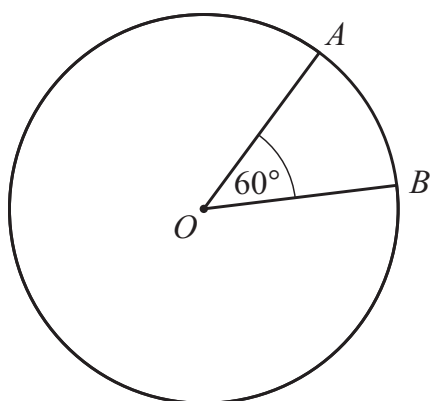
[1]

- (b)  $OA$  is joined to  $OB$  to form a cone.

Work out the volume of the cone.

Give your answer in the form  $\frac{(a\sqrt{b})\pi}{3}$  where  $a$  is an integer and  $b$  is a prime number.

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NOT TO  
SCALE

The diagram shows a circle, centre  $O$ , radius 12 cm.

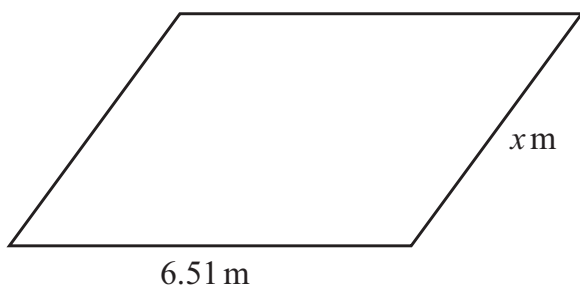
- (a) Work out the area of the **minor** sector  $AOB$ .  
Give your answer in terms of  $\pi$  in its simplest form.

.....  $\text{cm}^2$  [2]

- (b) Calculate the length of the **major** arc  $AB$ .  
Give your answer in terms of  $\pi$  in its simplest form.

..... cm [3]

- 7 The diagram shows a parallelogram.



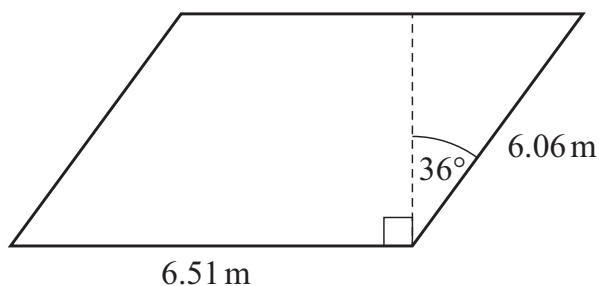
NOT TO  
SCALE

The parallelogram has the same perimeter as a circle with radius  $4 \text{ m}$ .

- (a) Show that  $x = 6.06 \text{ m}$ , correct to 2 decimal places.

[4]

- (b)



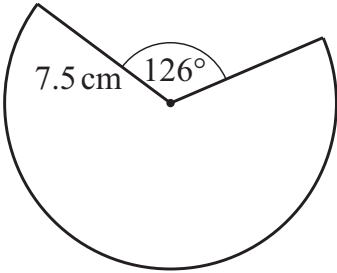
NOT TO  
SCALE

The floor of a room is in the shape of this parallelogram.  
It costs \$18 per square metre to tile the floor.

Calculate the total cost of tiling the floor.

\$ ..... [4]

19



NOT TO  
SCALE

The diagram shows a major sector of a circle with radius 7.5 cm.

Calculate the perimeter of the major sector.

..... cm [4]

# E5.4 Surface area and volume

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 12 marks

**KEY WORDS** cylinder 圆柱 • sphere 球 • surface area 表面积 • cuboid 长方体 • cone 圆锥

## Objective

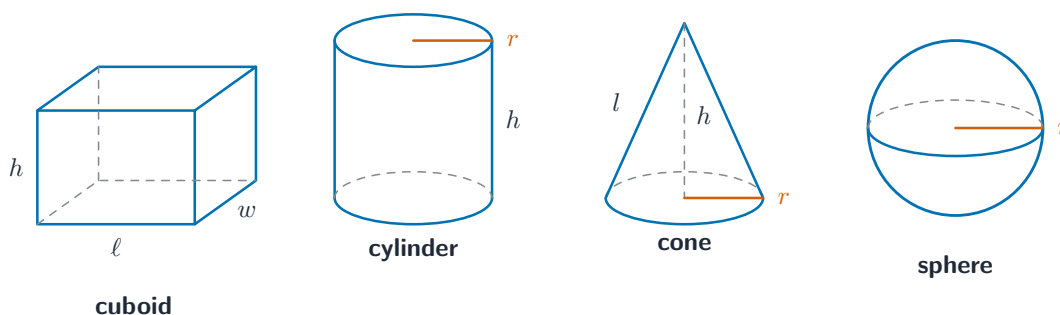
Build the skills to answer Extended exam questions on **surface area and volume** 表面积和体积 — the **cylinder**, **cone** and **sphere** 圆柱、圆锥和球, and parts of solids such as a **hemisphere** 半球.

**You must be able to:**

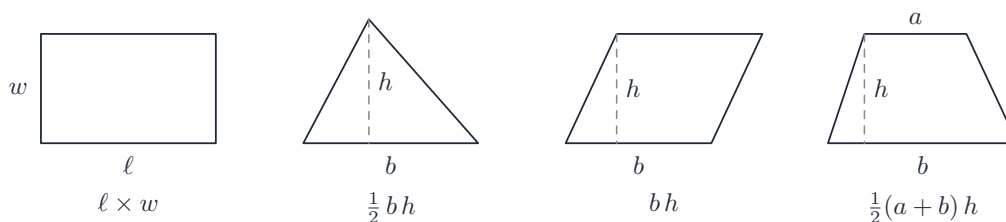
- find the volume of a cylinder, cone, sphere and pyramid
- find the surface area of a cylinder and cone
- work with parts of solids (hemispheres)

## 1 Worked examples

### ■ Volumes and surface areas



*Learn the key formulas — some are on the formula list*



*Face areas build up the surface area of a solid*

cylinder:  $V = \pi r^2 h$ ,  $SA = 2\pi r h + 2\pi r^2$       cone:  $V = \frac{1}{3}\pi r^2 h$

sphere:  $V = \frac{4}{3}\pi r^3$ ,  $SA = 4\pi r^2$       hemisphere:  $V = \frac{2}{3}\pi r^3$

- **Worked (cylinder  $r = 5$ ,  $h = 10$ ):**  $V = \pi(25)(10) = 250\pi$ ;  $SA = 100\pi + 50\pi = 150\pi \text{ cm}^2$ .

**Answer shapes:** **M1** a correct method, **A1** the correct answer.

## 2 Practice

**2.1** Find the volume of a cuboid 4 cm by 3 cm by 5 cm. [1]

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**2.2** Find the volume of a cylinder of radius 3 cm and height 10 cm, in terms of  $\pi$ . [2]

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**2.3** Find the volume of a sphere of radius 3 cm, in terms of  $\pi$ . [2]

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### 3 Exam-style questions

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**3.1** A cone has radius 6 cm and height 8 cm. Find its volume, in terms of  $\pi$ . [2]

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**3.2** Find the total surface area of a cylinder of radius 4 cm and height 9 cm, in terms of  $\pi$ . [3]

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**3.3** A solid hemisphere has radius 6 cm. Find its volume, in terms of  $\pi$ . [2]

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## Solutions

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Marking: **M1** a correct method, **A1** the correct answer.

**2.1**  $4 \times 3 \times 5 = 60 \text{ cm}^3$ .

**2.2**  $\pi \times 3^2 \times 10 = 90\pi \text{ cm}^3$ .

**2.3**  $\frac{4}{3}\pi \times 3^3 = \frac{4}{3}\pi \times 27 = 36\pi \text{ cm}^3$ .

**3.1**  $\frac{1}{3}\pi \times 6^2 \times 8 = \frac{1}{3}\pi \times 288 = 96\pi \text{ cm}^3$ .

**3.2**  $\text{SA} = 2\pi(4)(9) + 2\pi(4)^2 = 72\pi + 32\pi = 104\pi \text{ cm}^2$ .

**3.3**  $\frac{2}{3}\pi \times 6^3 = \frac{2}{3}\pi \times 216 = 144\pi \text{ cm}^3$ .

14 A cube contains a solid metal sphere.  
The sphere touches all the faces of the cube.  
The side length of the cube is 8 cm.

(a) Show that the volume of the sphere is  $\frac{256}{3}\pi \text{ cm}^3$ .

[1]

(b) Calculate the percentage of the cube that is **not** occupied by the sphere.

..... % [3]

(c) The density of the metal of the sphere is  $7.86 \text{ g/cm}^3$ .

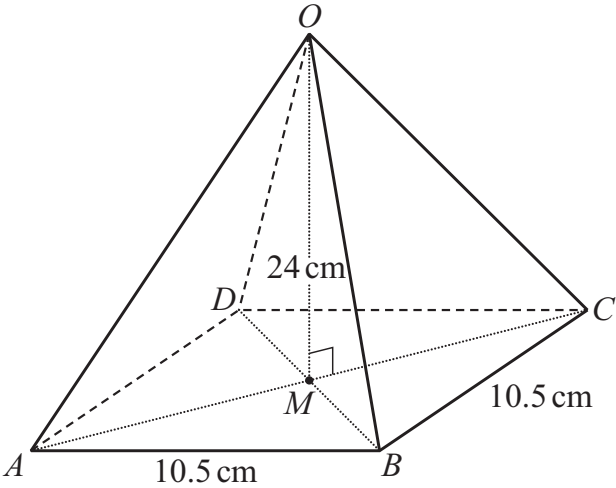
Calculate the mass of the sphere.  
Give your answer in kilograms.  
[Density = mass ÷ volume]

..... kg [2]

(d) The sphere is melted down and made into a solid cylinder with radius 3.1 cm.

Calculate the **total** surface area of the cylinder.

..... cm<sup>2</sup> [4]



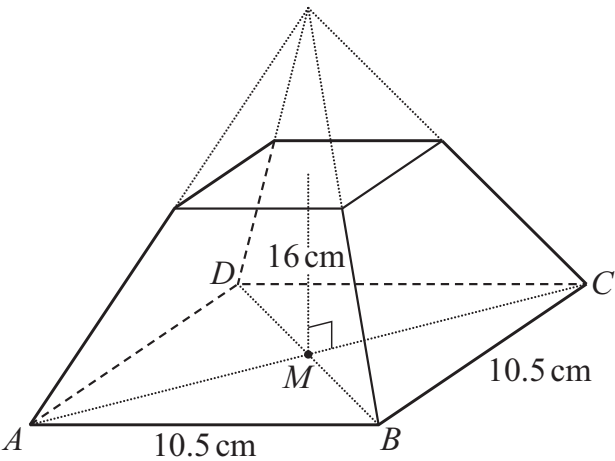
NOT TO  
SCALE

The diagram shows a pyramid  $OABCD$ .  
The pyramid has a square base,  $ABCD$ , with sides  $10.5\text{ cm}$ .  
The vertex  $O$  is vertically above the centre of the base,  $M$ .  
The height of the pyramid is  $24\text{ cm}$ .

- (a) Calculate the angle that  $OA$  makes with the base.

..... [4]

(b)



NOT TO  
SCALE

The diagram shows a frustum of the pyramid  $OABCD$ .  
The height of the frustum is 16 cm.

Calculate the volume of the frustum.

..... cm<sup>3</sup> [5]

Question 21 is on page 16.