

# 3D Shapes

## Volumes & Surface Areas

### Question Paper 12

|            |  |
|------------|--|
| Level      | IGCSE                                      |
| Subject    | Maths (0580)                               |
| Exam Board | Cambridge International Examinations (CIE) |
| Paper Type | Extended                                   |
| Topic      | Mensuration (Perimeters, Areas & Volumes)  |
| Sub-Topic  | 3D Shapes: Volumes & Surface Areas         |
| Booklet    | Question Paper 12                          |

**Time Allowed:** 63 minutes

**Score:** /52

**Percentage:** /100

**Grade Boundaries:**

| A*   | A   | B   | C   | D   | E   | U    |
|------|-----|-----|-----|-----|-----|------|
| >85% | 75% | 60% | 45% | 35% | 25% | <25% |

1

NOT TO SCALE

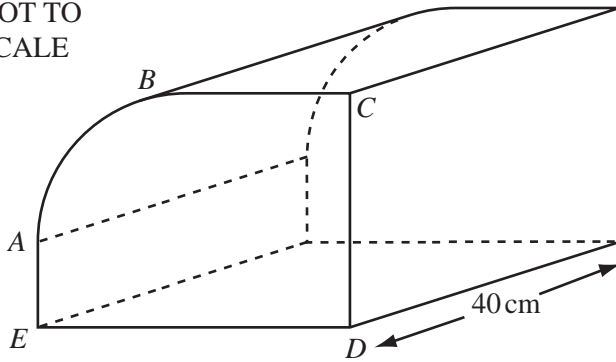


Diagram 1

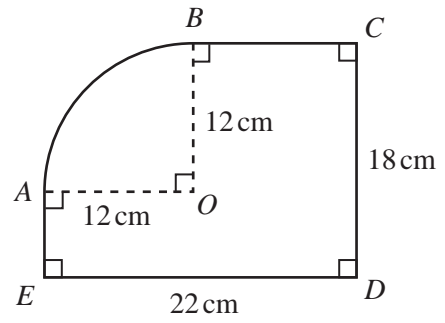


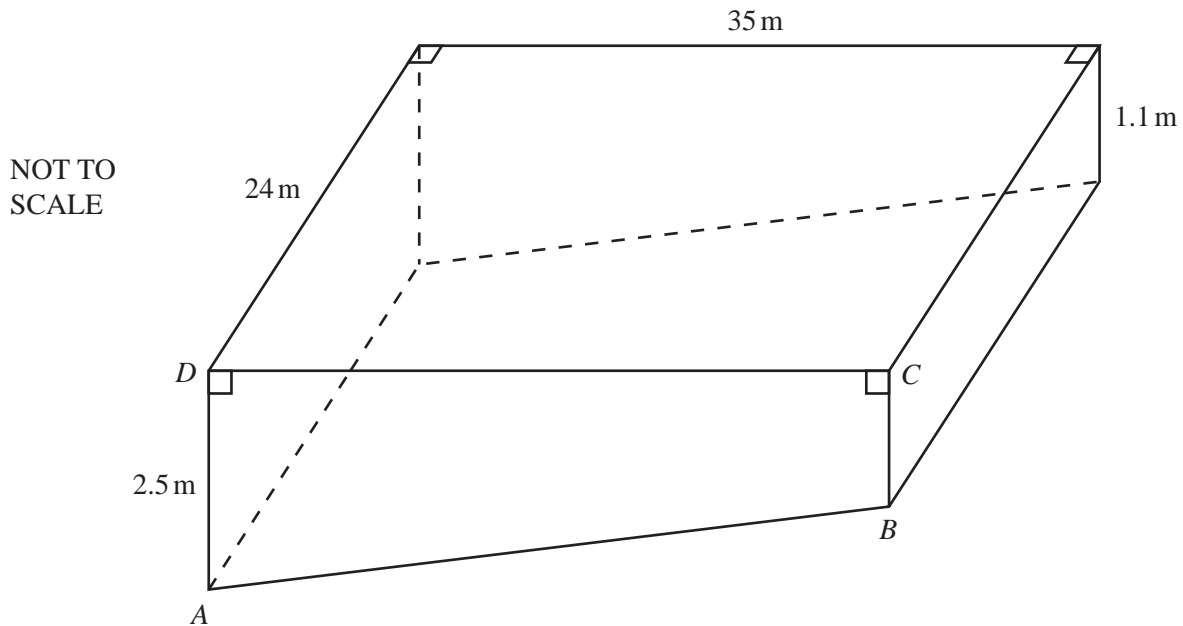
Diagram 2

Diagram 1 shows a closed box. The box is a prism of length 40 cm.  
 The cross-section of the box is shown in Diagram 2, with all the right-angles marked.  
 $AB$  is an arc of a circle, centre  $O$ , radius 12 cm.  
 $ED = 22$  cm and  $DC = 18$  cm.

Calculate

- (a) the perimeter of the cross-section, [3]
- (b) the area of the cross-section, [3]
- (c) the volume of the box, [1]
- (d) the **total** surface area of the box. [4]

2



The diagram shows a swimming pool of length 35 m and width 24 m.  
A cross-section of the pool,  $ABCD$ , is a trapezium with  $AD = 2.5$  m and  $BC = 1.1$  m.

(a) Calculate

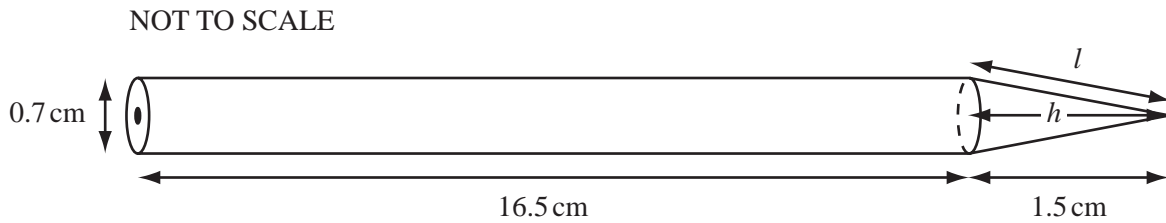
- (i) the area of the trapezium  $ABCD$ , [2]
- (ii) the volume of the pool, [2]
- (iii) the number of litres of water in the pool, when it is full. [1]

(b)  $AB = 35.03$  m correct to 2 decimal places.  
The sloping rectangular floor of the pool is painted.  
It costs \$2.25 to paint one square metre.

- (i) Calculate the cost of painting the floor of the pool. [2]
- (ii) Write your answer to **part (b)(i)** correct to the nearest hundred dollars. [1]

- (c) (i) Calculate the volume of a cylinder, radius 12.5 cm and height 14 cm. [2]
- (ii) When the pool is emptied, the water flows through a cylindrical pipe of radius 12.5 cm.  
The water flows along this pipe at a rate of 14 centimetres per second.  
Calculate the time taken to empty the pool.  
Give your answer in days and hours, correct to the nearest hour. [4]

3



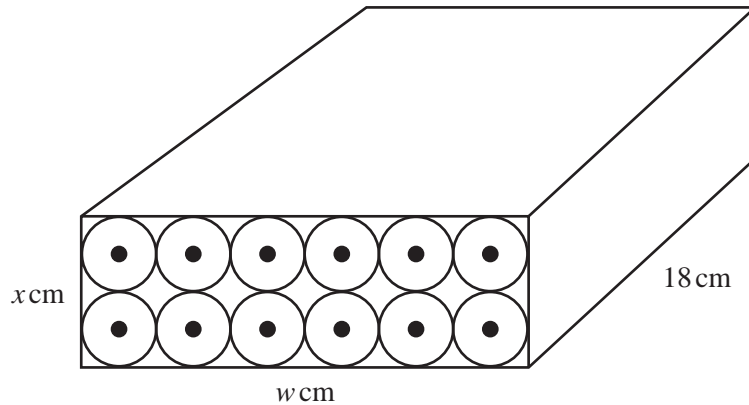
The diagram shows a pencil of length 18 cm.  
 It is made from a cylinder and a cone.  
 The cylinder has **diameter** 0.7 cm and length 16.5 cm.  
 The cone has **diameter** 0.7 cm and length 1.5 cm.

(a) Calculate the volume of the pencil.

[The volume,  $V$ , of a cone of radius  $r$  and height  $h$  is given by  $V = \frac{1}{3}\pi r^2 h$ .]

[

(b)



Twelve of these pencils just fit into a rectangular box of length 18 cm, width  $w$  cm and height  $x$  cm. The pencils are in 2 rows of 6 as shown in the diagram.

- (i) Write down the values of  $w$  and  $x$ . [2]
- (ii) Calculate the volume of the box. [2]
- (iii) Calculate the percentage of the volume of the box occupied by the pencils. [2]
- (c) Showing all your working, calculate
- (i) the slant height,  $l$ , of the cone, [2]
- (ii) the **total** surface area of **one** pencil, giving your answer correct to 3 significant figures.  
 [The curved surface area,  $A$ , of a cone of radius  $r$  and **slant** height  $l$  is given by  $A = \pi r l$ .] [

- 4 Water flows through a pipe into an empty cylindrical tank.  
The tank has a radius of 40 cm and a height of 110 cm.
- (a) Calculate the volume of the tank. [2]
- (b) The pipe has a cross-sectional area of  $1.6 \text{ cm}^2$ .  
The water comes out of the pipe at a speed of 14 cm/s.  
How long does it take to fill the tank?  
Give your answer in hours and minutes, correct to the nearest minute. [4]
- (c) All the water from the tank is added to a pond which has a surface area of  $70 \text{ m}^2$ .  
Work out the increase in the depth of water in the pond.  
Give your answer in millimetres, correct to the nearest millimetre. [4]