AREA & VOLUME (Q 1, PAPER 2)
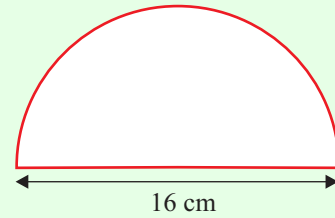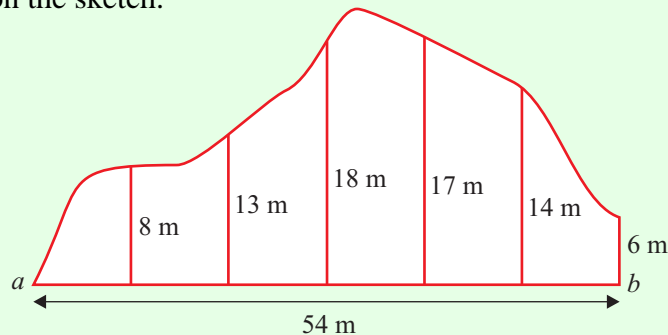
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1   (a)   The semicircular shape shown in the diagram has
           diameter 16 cm.

   (i)   Find the length of the perimeter of the shape,
         correct to the nearest centimetre.

   (ii) Find the area of the shape, correct to the
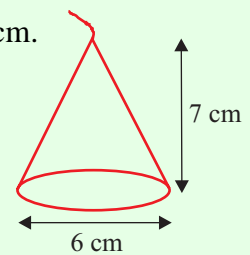   nearest square centimetre.

16 cm

   (b)   The sketch shows a piece of land which borders the side of a straight road [*ab*] .
         The length of [*ab*] is 54 m.
         At equal intervals along [*ab*], perpendicular measurements are made to the boundary,
         as shown on the sketch.

18 m   17 m
13 m
8 m   14 m
                 6 m
a   *b*
54 m

   (i)   Use Simpson's Rule to estimate the area of the piece of land.

   (ii) The land is valued at €480 000 per hectare. Find the value of the piece of land.
         Note: 1 hectare = 10 000 m^2.

   (c)   A wax candle is in the shape of a right circular cone.
         The height of the candle is 7 cm and the diameter of the base is 6 cm.

   (i)   Find the volume of the wax candle, correct to the nearest cm^3.

   (ii) A rectangular block of wax measuring 25 cm by 12 cm by
         12 cm is melted down and used to make a number of these
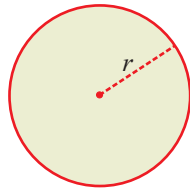   candles.

7 cm

6 cm

         Find the maximum number of candles that can be made from the block of wax
         if 4% of the wax is lost in the process.

SOLUTION

1 (a) (i)

6. **CIRCLE**

L: Length of Circumference
r: Radius

$L = 2\pi r$ **7**

$A = \pi r^2$ **8**

Diameter $d = 16$ cm
Radius $r = 8$ cm
Perimeter $P = ?$
$P = 16 + \pi r$
$\Rightarrow P = 16 + \pi(8) = 41$ cm

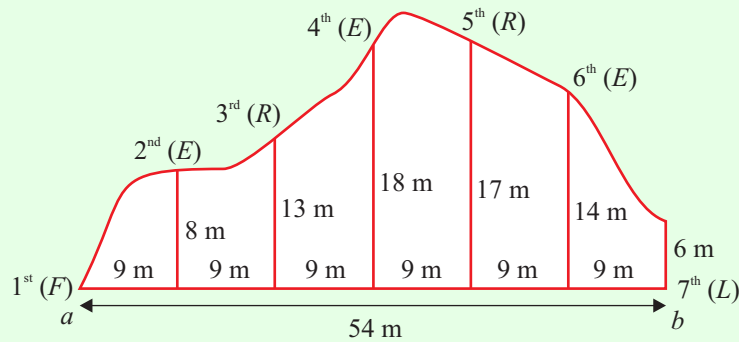**1 (a) (ii)**

$A = \frac{1}{2}\pi r^2$

$\Rightarrow A = \frac{1}{2}\pi(8)^2 = 32\pi = 101$ cm^2

1 (b) (i)

$A \approx \frac{h}{3}$ [(First + Last) + 4(Evens) + 2(Remaining Odds)] **11**

$h = 9$ m
First $= 0$
Last $= 6$ m

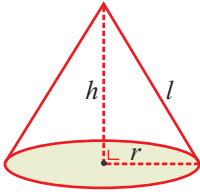$A \approx \frac{9}{3}[(0+6) + 4(8+18+14) + 2(13+17)] = 678$ m^2

1 (b) (ii)

1 hectare $= 10{,}000$ m^2

$\therefore 678$ m$^2 = \dfrac{678}{10000}$ hectare

$\therefore$ Value $= \dfrac{678}{10000} \times$ €480,000 = €32,544

1 (c) (i)

CONE

$$V = \tfrac{1}{3}\pi r^2 h$$

Curved SA: $A = \pi r l$

Total SA: $A = \pi r l + \pi r^2$

.... **17**

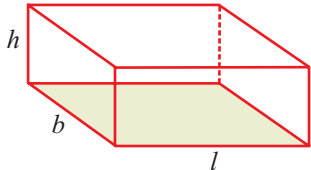You can use Pythagoras on the cone: $l^2 = r^2 + h^2$

$h = 7$ cm

$r = 3$ cm

$V = \tfrac{1}{3}\pi r^2 h = \tfrac{1}{3}\pi (3)^2 (7)$

$\therefore V = 21\pi = 66$ cm^3

1 (c) (ii)

RECTANGULAR SOLID

l: Length

b: Breadth

h: Height

$$V = l \times b \times h$$

Surface Area $A = 2(lb + bh + lh)$

.... **12**

Volume of rectangular block of wax: $V = 25 \times 12 \times 12 = 3600$ cm^3

Volume of wax remaining if 4% is lost: $V = 3600 \times 0.96 = 3456$ cm^3

Maximum number of candles $= \dfrac{3456 \text{ cm}^3}{66 \text{ cm}^3} = 52$