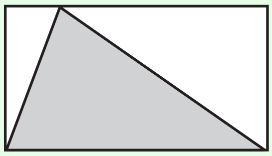
# Area & Volume (Q 1, Paper 2)

## 2006

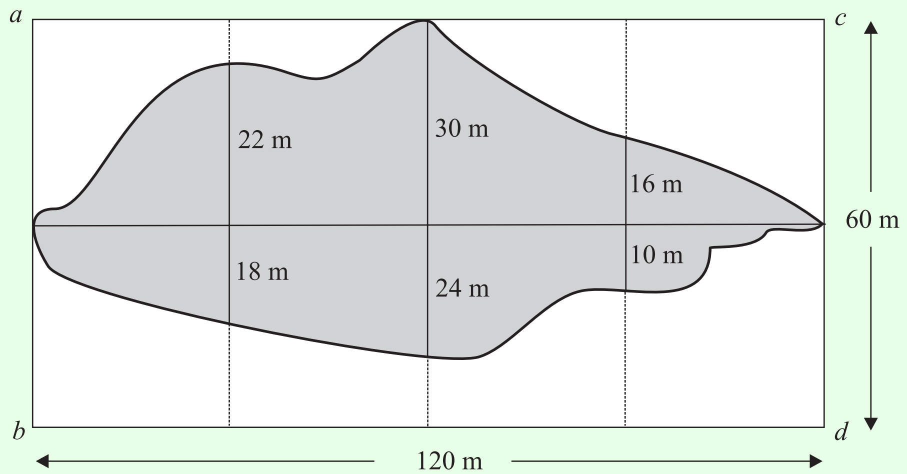
1 (a) The diagram shows a rectangle of length 42 cm.
The area of the rectangle is 966 $cm^2$.




(i) Find the height of the rectangle.

(ii) Find the area of the shaded triangle.

(b) Archaeologists excavating a rectangular plot *abcd* measuring 120 m by 60 m divided the plot into eight square sections as shown on the diagram. At the end of the first phase of the work the shaded area had been excavated. To estimate the area excavated, perpendicular measurements were made to the edge of the excavated area, as shown.




(i) Use Simpson's Rule to estimate the area excavated.

(ii) Express the excavated area as a percentage of the total area, correct to the nearest whole number.

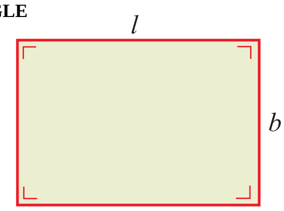
(c) (i) The volume of a hemisphere is $486\pi$ $cm^3$.
Find the radius of the hemisphere.

(ii) Find the volume of the smallest rectangular box that the hemisphere will fit into.

## SOLUTION

**1 (a) (i)**

1. RECTANGLE




$l$: Length
$b$: Breadth

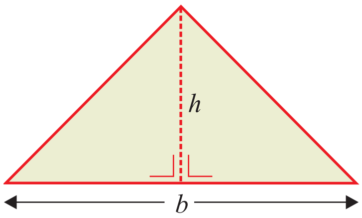
$A = l \times b$
$P = 2l + 2b = 2(l + b)$ ....... 1

$A = 966\text{ cm}^2$
$l = 42\text{ cm}$
$b = ?$

$$A = l \times b \Rightarrow b = \frac{A}{l} = \frac{966}{42} = 23\text{ cm}$$

**1 (a) (ii)**

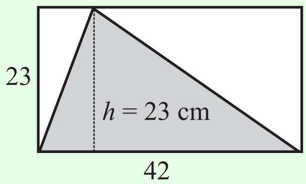
4. NON RIGHT-ANGLED TRIANGLES



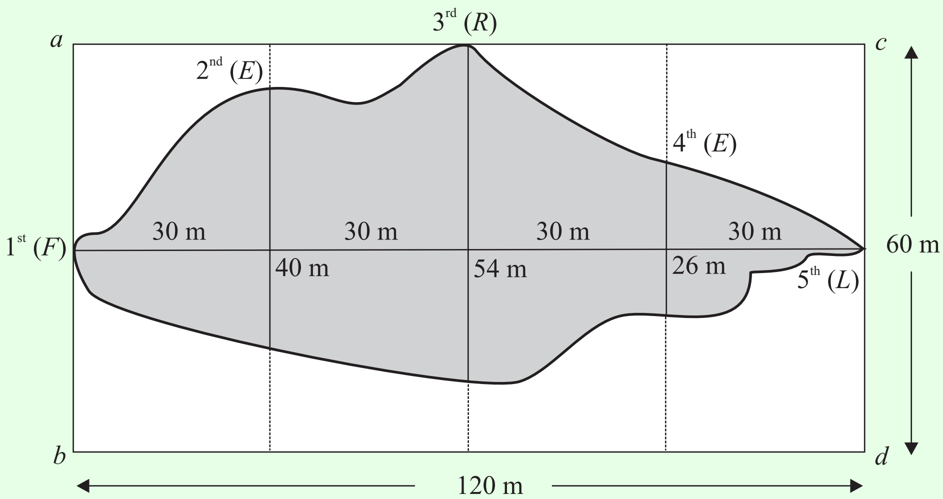

$b$: Base
$h$: Height

$A = \frac{1}{2}bh$ ....... 4

$$A = \tfrac{1}{2}bh = \tfrac{1}{2}(42)(23) = 483\text{ cm}^2$$




**1 (b) (i)**




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

$h = 120 \div 4 = 30 \text{ m}$

$A = \frac{30}{3}[(0+0) + 4(40+26) + 2(54)]$

$\Rightarrow A = 10[0 + 4(66) + 108]$

$\Rightarrow A = 10[264 + 108]$

$\therefore A = 10[372] = 3720 \text{ cm}^2$

**1 (b) (ii)**

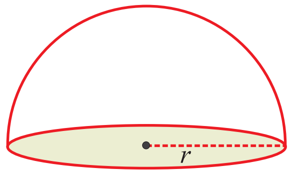
Total Area $= 120 \times 60 = 7200 \text{ m}^2$

Excavated Area = $3720 \text{ m}^2$

$\therefore \frac{\text{Excavated Area}}{\text{Total Area}} \times 100\% = \frac{3720}{7200} \times 100\% = 52\%$

**1 (c) (i)**

**Hemisphere**




$V = \frac{2}{3}\pi r^3$

Curved SA: $A = 2\pi r^2$

Total SA: $A = 3\pi r^2$

....... 16

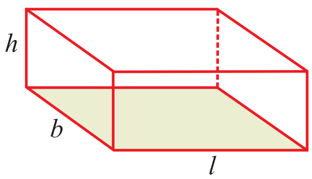
$V = 486\pi$

$V = \frac{2}{3}\pi r^3 \Rightarrow 486\pi = \frac{2}{3}\pi r^3$

$\Rightarrow r^3 = \frac{3 \times 486}{2} = 729$

$\therefore r = \sqrt[3]{729} = 9 \text{ cm}$

**Rectangular Solid**




$l$: Length
$b$: Breadth
$h$: Height

$V = l \times b \times h$

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

....... 12

**1 (c) (ii)**

You can see from the diagram the dimensions of the rectangular box into which the hemisphere will fit.

$V = l \times b \times h = 18 \times 18 \times 9 = 2916 \text{ cm}^3$