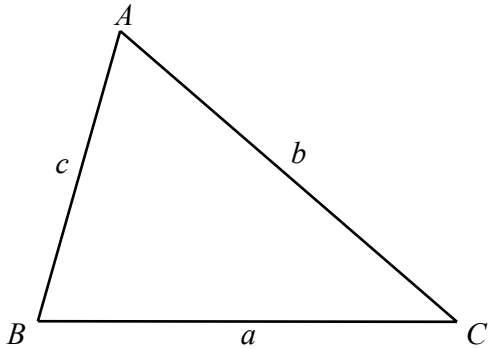
List of formulas

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle of radius r.	$A = \pi r^2$
Circumference, C, of circle of radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$
For the equation $ax^2 + bx + c = 0$, where $a \neq 0$,	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

For the triangle shown,



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}ab\sin C$$

1 Write down a factor of 28 that is a prime number.

..... [1]

2 Simplify.

$$4y^2 + 3y - y^2 + 2y$$

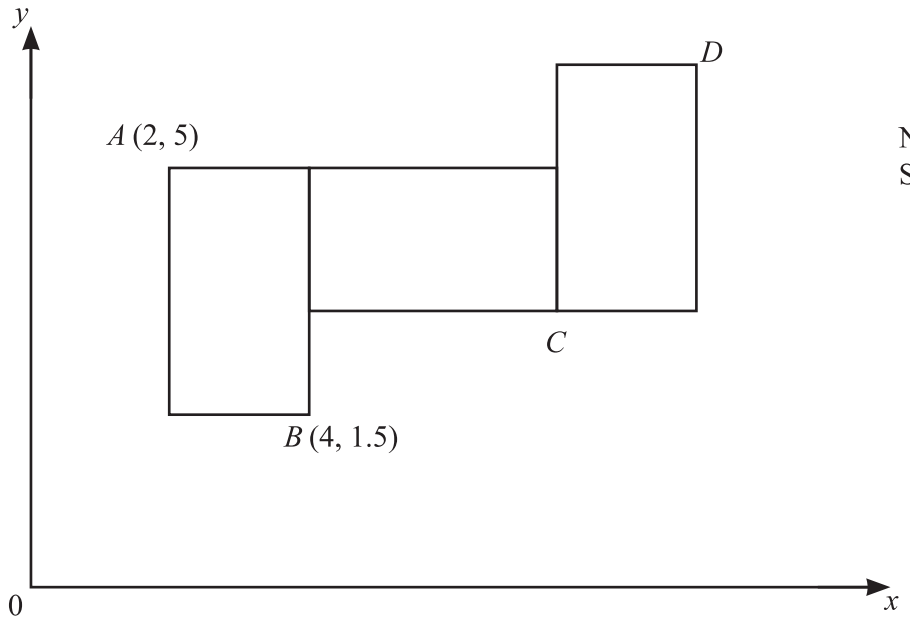
..... [2]

3 Calculate $\dfrac{20.24 - \sqrt[3]{30}}{6.5}$.

Give your answer correct to 1 decimal place.

..... [2]

4



A pattern is formed by 3 congruent rectangles.
Each rectangle is a rotation of 90° around one vertex of the rectangle next to it.
The point A has coordinates $(2, 5)$.
The point B has coordinates $(4, 1.5)$.

Work out the coordinates of point C and point D.

C (..... , ...)

D (..... , ...)

[3]

5 Each week Nisha is paid \$12 per hour for the first 40 hours that she works.
She is paid 30% more per hour for any extra hours that she works.
One week Nisha works for 45.5 hours.

Calculate how much she is paid that week.

\$ ..... [3]

6 Navin and Esther share some money in the ratio Navin : Esther = 5 : 7.

(a) Find Navin's share as a percentage of the total money.

.....% [1]

(b) Find Esther's share as a percentage of Navin's share.

.....% [1]

(c) Navin's share is \$160.

Work out Esther's share.

\$ ..... [2]

7 Simplify.

$$\frac{5p^2 - 20p}{2p^2 - 32}$$

..... [3]

8 **(a)** Talia invests \$1500 in a savings account for 4 years.
The account pays simple interest at a rate of $2\frac{1}{6}$% per year.

Calculate the total interest she receives at the end of 4 years.

\$ ..... [2]

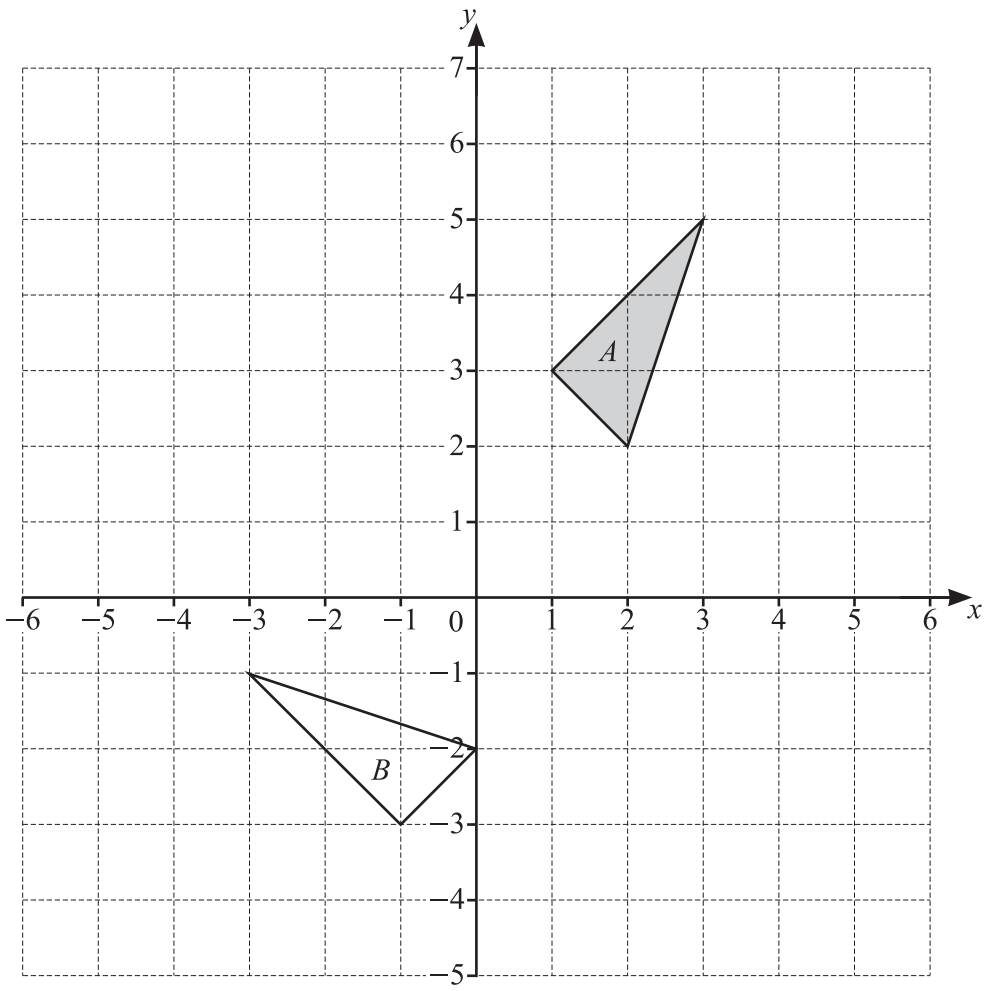
(b) Kylian invests \$1500 in a different savings account.
The account pays compound interest at a rate of r% per year.

At the end of 5 years, the value of the investment is \$1825.

Calculate the value of r.

r = ... [3]

9



(a) Draw the image of

(i) triangle A after a reflection in the line $y = 1$ [2]

(ii) triangle A after a translation by the vector $\begin{pmatrix} -6 \\ 1 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

10 The speed of each of 200 cars passing a building is measured.
The table shows the results.

Speed (v km/h)	$0 < v \leqslant 20$	$20 < v \leqslant 40$	$40 < v \leqslant 45$	$45 < v \leqslant 50$	$50 < v \leqslant 60$	$60 < v \leqslant 80$
Frequency	16	34	62	58	26	4

(a) Calculate an estimate of the mean.

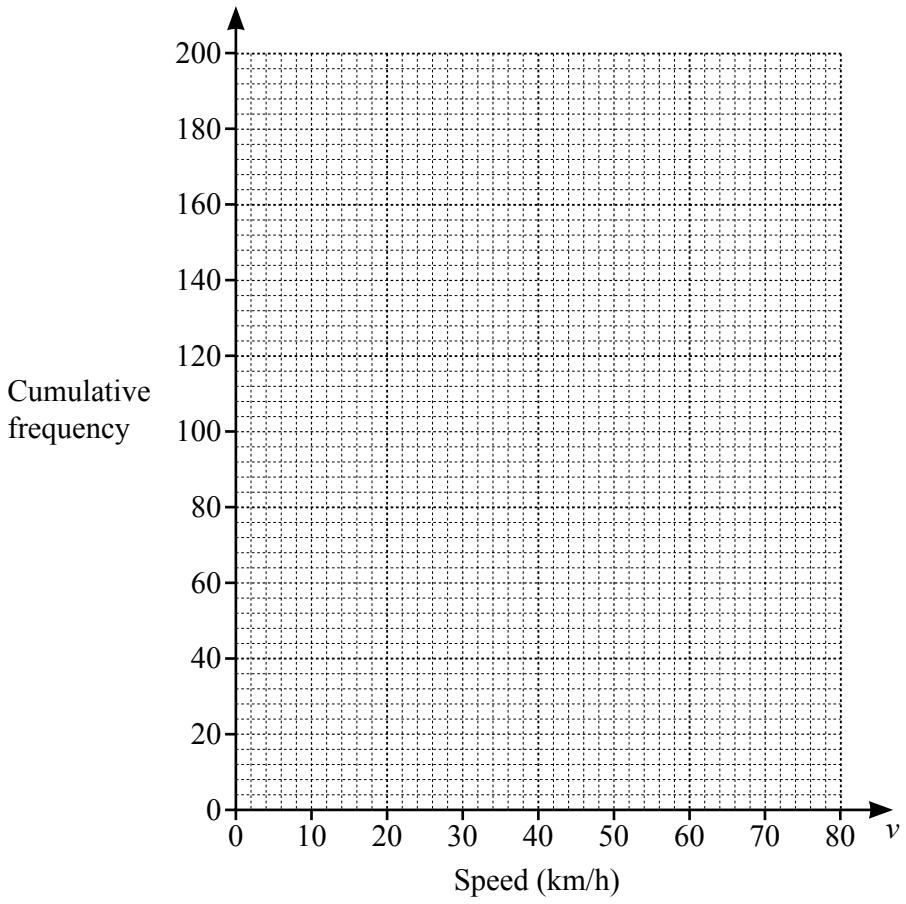
..... km/h [4]

(b) **(i)** Use the frequency table to complete the cumulative frequency table.

Speed (v km/h)	$v \leqslant 20$	$v \leqslant 40$	$v \leqslant 45$	$v \leqslant 50$	$v \leqslant 60$	$v \leqslant 80$
Cumulative frequency	16	50			196	200

[1]

(ii) On the grid, draw a cumulative frequency diagram.



[3]

(iii) Use your diagram to find an estimate of the upper quartile.

..... km/h [1]

(c) Two of the 200 cars are chosen at random.

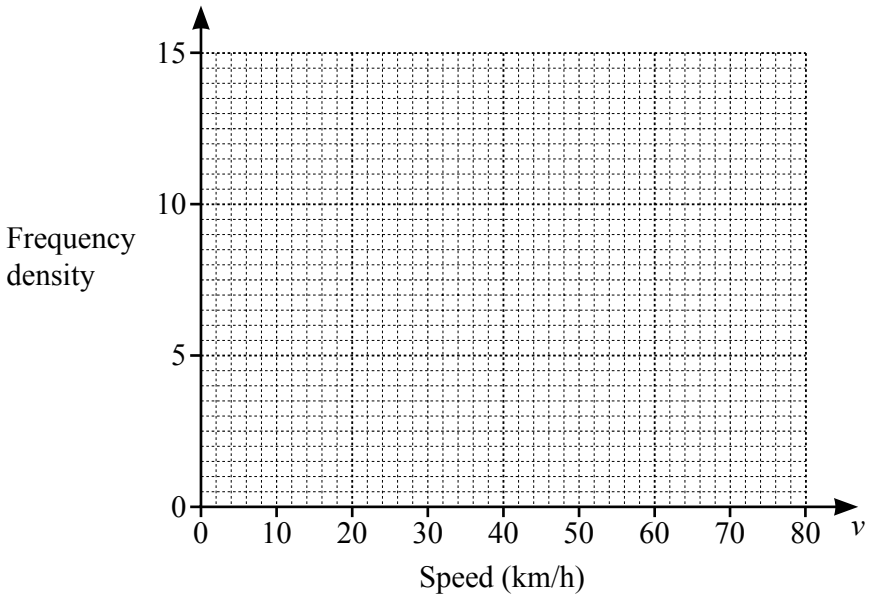
Find the probability that they both have a speed greater than 50 km/h.

..... [2]

(d) A new frequency table is made by combining intervals.

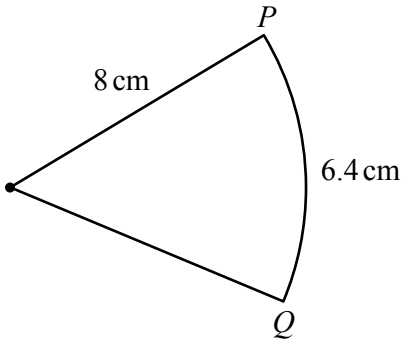
Speed (v km/h)	$0 < v \leqslant 40$	$40 < v \leqslant 50$	$50 < v \leqslant 80$
Frequency	50	120	30

On the grid, draw a histogram to show the information in this table.



[3]

11



NOT TO SCALE

The diagram shows a sector of a circle of radius 8 cm.
The length of the arc PQ is 6.4 cm.

Find the area of the sector.

..... cm^2 [4]

12 The table shows the first 5 terms of sequences A, B and C.

	1st term	2nd term	3rd term	4th term	5th term	nth term
Sequence A	5	12	31	68	129	
Sequence B	$\frac{10}{3}$	$\frac{9}{4}$	$\frac{8}{5}$	$\frac{7}{6}$	$\frac{6}{7}$	
Sequence C	4	8	16	32	64	

Complete the table to show the nth term of each sequence.

[6]

13 $\mathrm{f}(x) = 5 - 4x$

(a) Find $\mathrm{f}(-3)$.

..... [1]

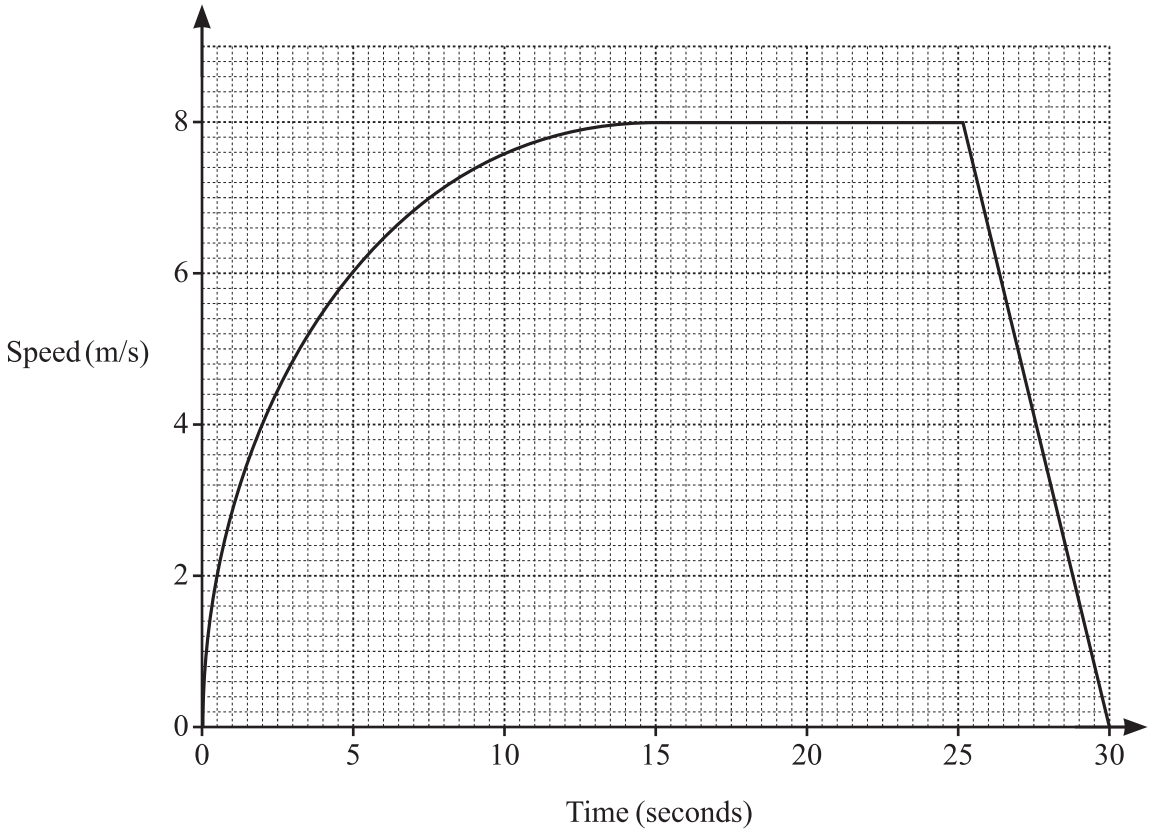
(b) Find $\mathrm{f}(3 - 2x)$.
Give your answer in its simplest form.

..... [2]

(c) Find $\mathrm{f}^{-1}(x)$.

$\mathrm{f}^{-1}(x) =$ ..... [2]

14 The graph shows the speed of a cyclist during a journey of 30 seconds.



(a) Write down the acceleration of the cyclist between 15 seconds and 25 seconds.

..... m/s^2 [1]

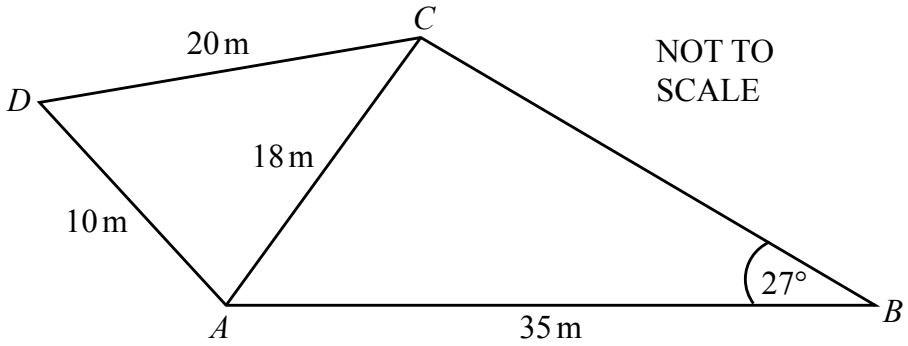
(b) By drawing a tangent, find an estimate for the acceleration of the cyclist at 7.5 seconds.

..... m/s^2 [2]

(c) Work out the average speed of the cyclist between 15 seconds and 30 seconds.

..... m/s [3]

15



The diagram shows the positions A, B, C and D on a football pitch.

(a) Show that angle $CAD = 86.2°$, correct to 1 decimal place.

[4]

(b) Calculate the **obtuse** angle ACB.

..... [4]

16 f is inversely proportional to the cube of g.
When $f = 0.5$, $g = 3$.

(a) Find f in terms of g.

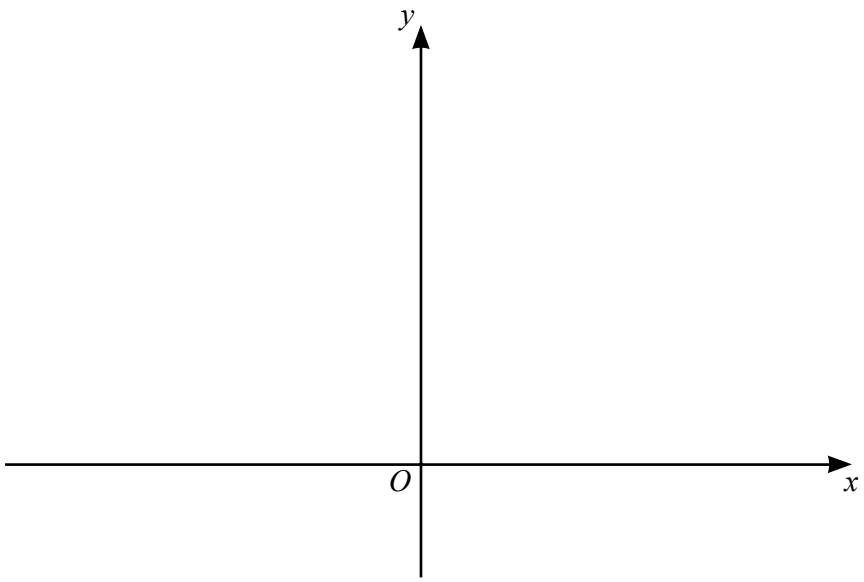
$f =$ ..... [2]

(b) g is increased by 100%.

Find the percentage change in f.

.....% [3]

17



(a) On the diagram,

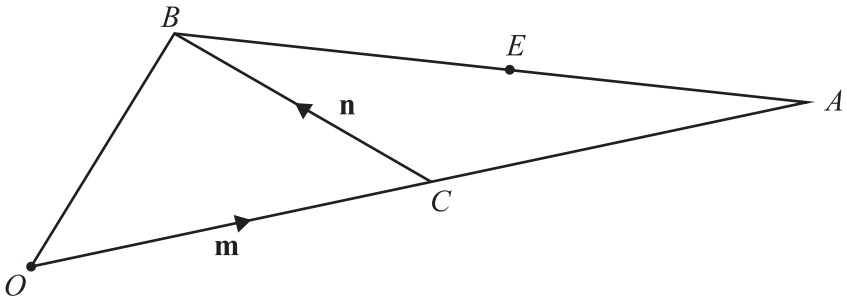
(i) sketch the graph of $y = (x - 1)^2$ [2]

18 A piece of metal has volume 1240 cm^3, correct to the nearest 20 cm^3.
The mass of the piece of metal is 7800 g, correct to the nearest 100 g.

Calculate the lower bound of the density of the metal.
[Density = mass ÷ volume.]

..... g/cm^3 [3]

19



NOT TO SCALE

OAB is a triangle.
C is the midpoint of OA.
$\overrightarrow{OC} = \mathbf{m}$ and $\overrightarrow{CB} = \mathbf{n}$.
E lies on AB and $AE : EB = 4 : 5$.

Find, in terms of **m** and **n**, the position vector of E.
Give your answer in its simplest form.

..... [4]

20 The line $y = 4x + 12$ intersects the curve $y = 2x^2 - x - 3$ at point P and point Q.

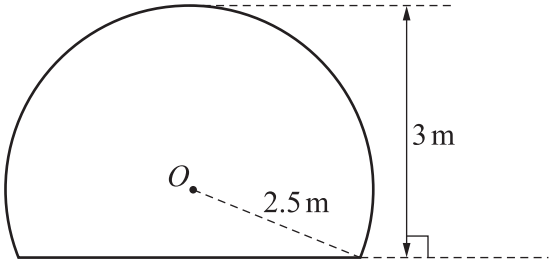
Find the coordinates of P and Q.
You must show all your working and give your answers correct to 2 decimal places.

(....., ...)

(....., ...)

[6]

21



NOT TO SCALE

The diagram shows the major segment of a circle, centre O, radius 2.5 m.
The segment is the cross section of a tunnel with height 3 m.
The length of the tunnel is 800 m and it has the same cross section throughout its length.

Calculate the volume of the tunnel.

..... m^3 [7]