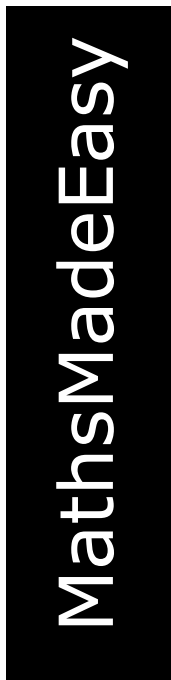


First Name	
Last Name	
Date	
Total Marks	/ 100 marks



GCSE Mathematics
Calculator
Higher Tier
Mock 3, paper 2
1 hour 45 minutes



Instructions

Write your name and other details in the boxes above.
Answer all the questions
Take π to be 3.142

Information

Marks are shown in brackets for each question (2)
Calculators may be used

Advice

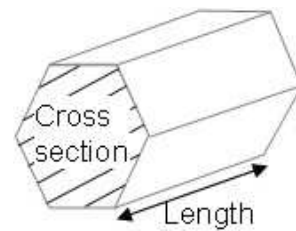
Don't spend too long on one question
Show all your working in calculations for full marks
You will get marks for method even if your answer is incorrect
Leave a question until later if you cannot answer it

Materials needed for examination

Ruler marked in centimetres and millimetres, calculator
protractor, compasses, pen, pencil, rubber
Tracing paper may be used

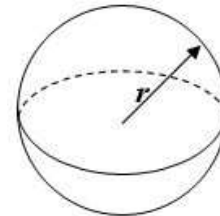
Formulae sheet — Higher tier

Volume of prism = area of cross-section \times length



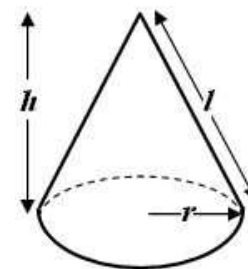
Volume of sphere = $\frac{4}{3} \pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3} \pi r^2 h$

Curved surface area of cone = $\pi r l$

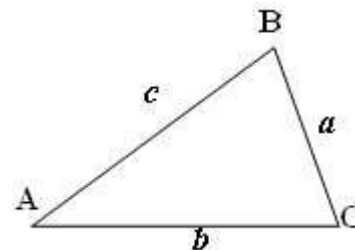


In any triangle ABC

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

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

Area of a triangle = $\frac{1}{2} ab \sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Authors Note

Every possible effort has been made to ensure that everything in this paper is accurate and the author cannot accept responsibility for any errors.

Apart from any fair dealing for the purposes of research or private study as permitted under the Copyright, Designs and Patents Act 1988, this paper may only be reproduced, stored or transmitted in any form or by any means with the prior permission in writing of the author, or in the case of reprographic reproduction in accordance with the terms and licence by the CLA. Enquiries concerning reproduction outside these terms should be sent to the author.

The right of David Weeks to be identified as the author of this work has been asserted by him in accordance with the Copyright, Designs and Patents Act 1988.

1. A baker sells cream buns and doughnuts. In one week the number of cream buns and the number of doughnuts were in the ratio 3:4.

The total cream buns and doughnuts sold in a week was 637.

What was the number of doughnuts sold.

.....

(2)

2. Below are the first four terms in an arithmetic sequence.

100 96 92 88

In terms of n , find an expression for the n th term of the sequence.

.....

(2)

3. Laura counted the number of sweets in each of 31 bags of sweets.

She put her results in a stem and leaf diagram.

0		8	8	9				
1		1	2	3	4	4	8	9
2		0	3	5	5	6	6	8
3		2	2	3	3	6	6	8
4		1	2	3	3	8	8	8

Key 4 | 1 stands for 41 sweets

a) What percentage of the bags have more than 38 sweets.
Give your answer to 1 decimal place

..... (2)

b) Write down the mode.

..... (1)

c) Work out the range.

..... (1)

d) Work out the median.

..... (1)

4.

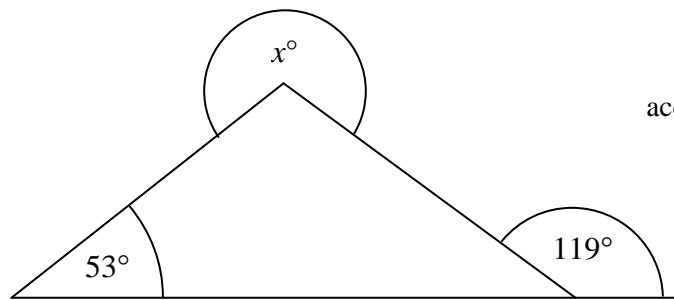


Diagram **NOT**
accurately drawn

Work out the value of x .

$x = \dots\dots\dots$

(3)

5. The equation

$$x^3 + 4x = 61$$

has a solution between 3 and 4

Find this solution using a trial and improvement method.

Give your answer correct to 1 decimal place.

You must show **all** your working.

$\dots\dots\dots$

(4)

6.

$$S = \sqrt{\frac{r + t \sin x^\circ}{r - t \sin x^\circ}}$$

$$r = 8.8$$

$$t = 7.2$$

$$x = 40$$

Calculate the value of S . Give your answer correct to 3 significant figures.

.....

(4)

7.



Luke wanted a TV with a diagonal screen of 72cm.

Harry thought that a TV with a screen of height 42 cm and width 56 cm would be OK.

Is Harry correct?

Show all your working.

(3)

8. Jess had just come back from Albania.
She wanted to change her Euros (€) back to £s

She changed €46 from Euros to £.
£1 = 1.32 Euros.(€)

What is € 46 in £

£..... (2)

9.a) Bacteria A multiplied by 25% every minute.
 The number of bacteria now is 9,000.
 How many bacteria were there 2 minutes ago?

..... (2)

9.b) Bacteria B multiplied at the rate of 10% compound every minute.
 The initial number of bacteria B was 100,000.

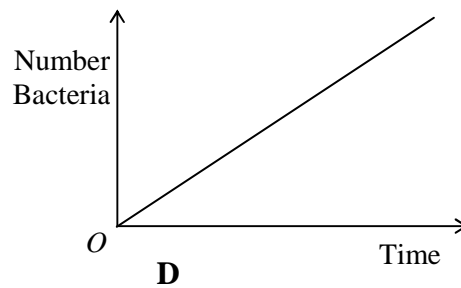
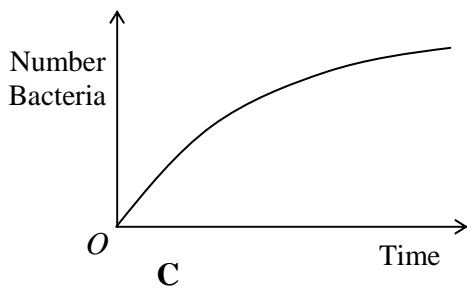
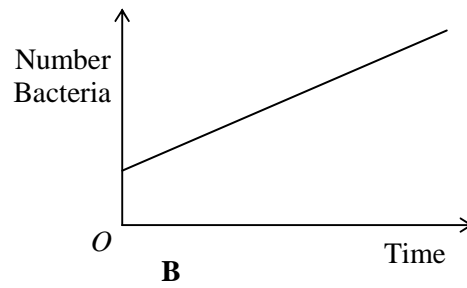
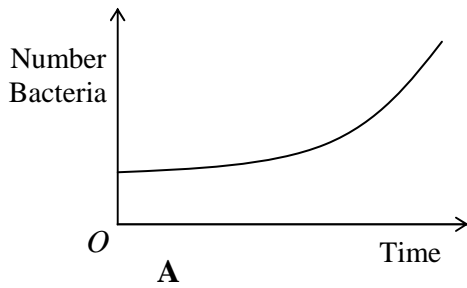
At the end of n minutes the number had increased to 161,051.

Work out the value of n

..... (2)

9.c) Write down the letter of the graph which best shows how Bacteria B multiplies with time.

..... (1)



10. The table below provides information about the time taken for 100 teachers to complete a numeracy test.

Time (t minutes)	Frequency
$10 < t \leq 15$	8
$15 < t \leq 20$	18
$20 < t \leq 25$	25
$25 < t \leq 30$	44
$30 < t \leq 35$	5

Calculate an estimate for the mean time taken by the teachers.

.....mins (4)

11. Lewis Hamilton drove 378 kilometres around a racing circuit

Using the conversion, 5miles = 8 kilometre, work out the distance in miles.

.....miles (2)

He completed the 378 kilometres in 2 hours 15 minutes.

Calculate his average speed in miles per hour.

.....mph (2)

- 12.** The mean of twelve numbers is 28
The mean of four of the numbers is 24.

What is the mean of the other eight numbers

.....

(3)

13. a) Solve

$$\begin{aligned}6x - 4y &= 6 \\3x + 12y &= 24\end{aligned}$$

$$\begin{aligned}x &= \dots\dots\dots \\y &= \dots\dots\dots\end{aligned} \quad (3)$$

b) Make p the subject of the formula

$$z + 8p = \pi p + 6q$$

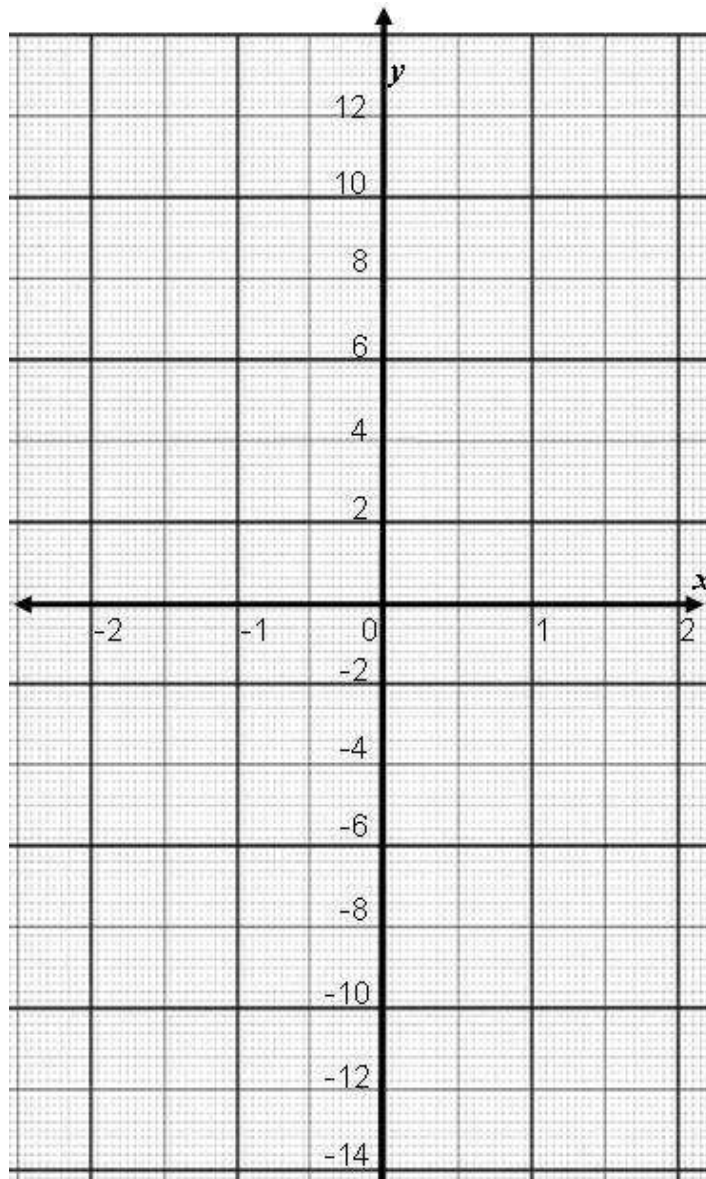
$$p = \dots\dots\dots \quad (2)$$

c) $y = 2x^2 - 5$

Work out the positive value of x when $y = 19$.
Give your answer exactly in the form $a\sqrt{3}$

$$x = \dots\dots\dots \quad (2)$$

14. a) Draw the graph for $y = -9x - 5$ on the grid below



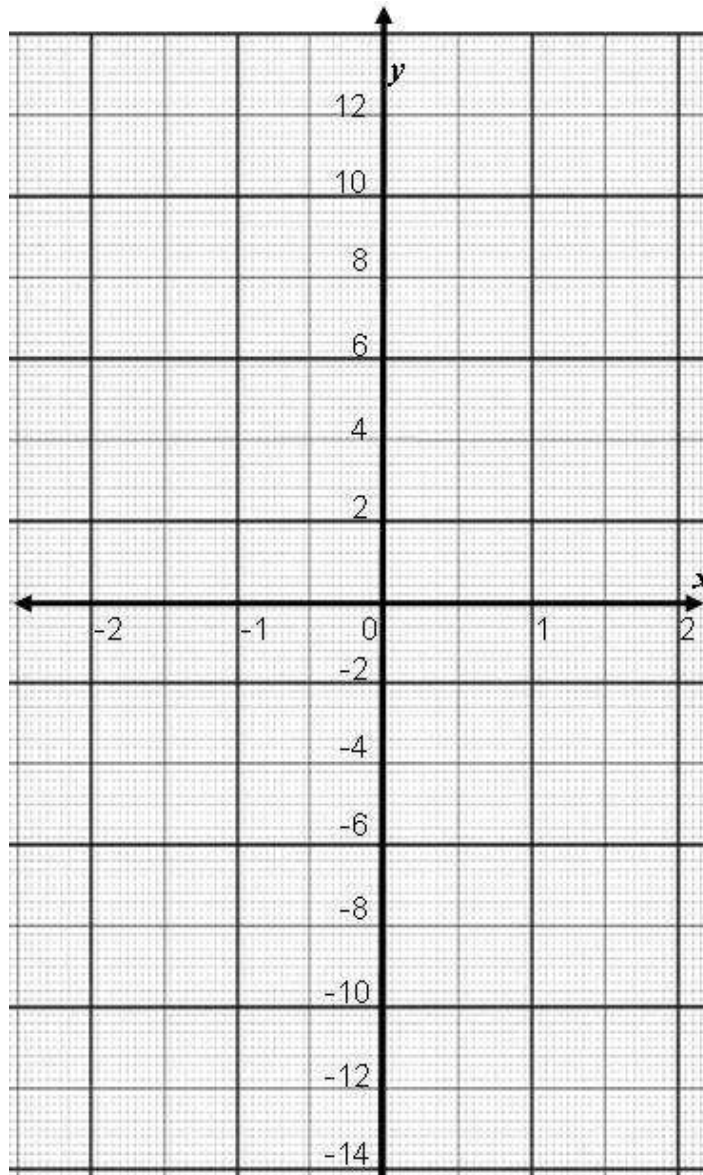
(2)

14. b) Complete the table of values for $y = x^3 + 2x$

x	-2	-1	0	1	2
y	-12		0		

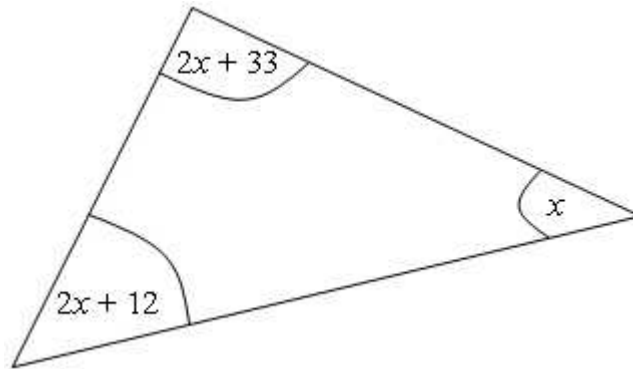
(2)

c) Draw the graph for $y = x^3 + 2x$ on the grid below



(2)

15.



Not drawn accurately

The angles shown in the triangle above are:

$$2x + 33$$

$$x$$

$$2x + 12$$

a) Write down an equation in terms of x using this information

..... (2)

b) Using your answer above work out the value of x

$x =$ (2)

16. The two shapes below are mathematically **similar**.

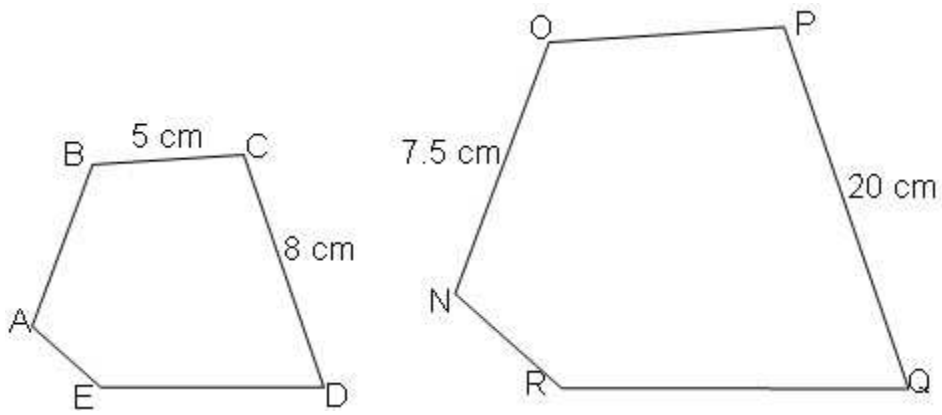


Diagram not accurately draw

In ABCDE , $BC = 5 \text{ cm}$, $CD = 8 \text{ cm}$
 In NOPQR, $ON = 7.5 \text{ cm}$, $PQ = 20 \text{ cm}$
 Angle AED = angle NRQ
 Angle EAB = angle RNO

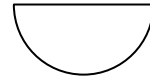
a) Calculate the length of OP

.....cm. (2)

b) Calculate the length of AB

.....cm. (2)

17. Jane bought some inserts for her hanging baskets.
They were shaped like hemispheres with diameter 12 inches.



- a) Using the conversion 1 inch = 2.54 cm work out the volume of the insert in millilitres.

..... (3)

Jane has twenty basket to fill with compost. Compost comes in bags of 50 litres.

- b) How many bags of compost will she need to fill all her baskets.

..... (2)

18.

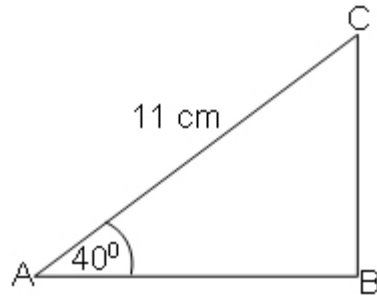


Diagram not
drawn accurately

AC = 11 cm
Angle ABC = 90°
Angle CAB = 40°

Calculate the length of BC
Give your answer to 3 significant figures

.....cm (3)

19. Simplify fully

$$\frac{4x^2 - 9}{6x^2 + 5x - 21}$$

..... (3)

20. There are 650 pupils at Toddington Middle Boys School.
The table shows information about the pupils.

Year	Boys
Year 7	180
Year 8	240
Year 9	230

An inspector is carrying out a survey into pupils' views about the school.
He takes a stratified sample of 50 of the 650 pupils.

(a) Calculate the number of boys in each year group to be sampled.

Year 7.....
Year 8..... (3)
Year 9.....

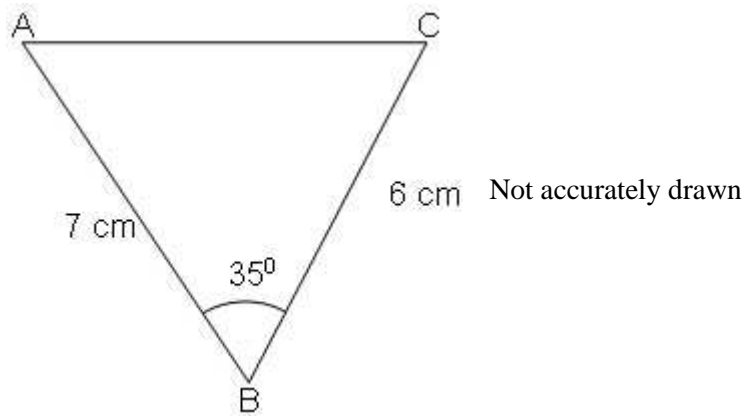
21. Solve the equation

$$\frac{2x}{x-3} + \frac{4}{x+1} = 1$$

$x = \dots\dots\dots$

(4)

22.

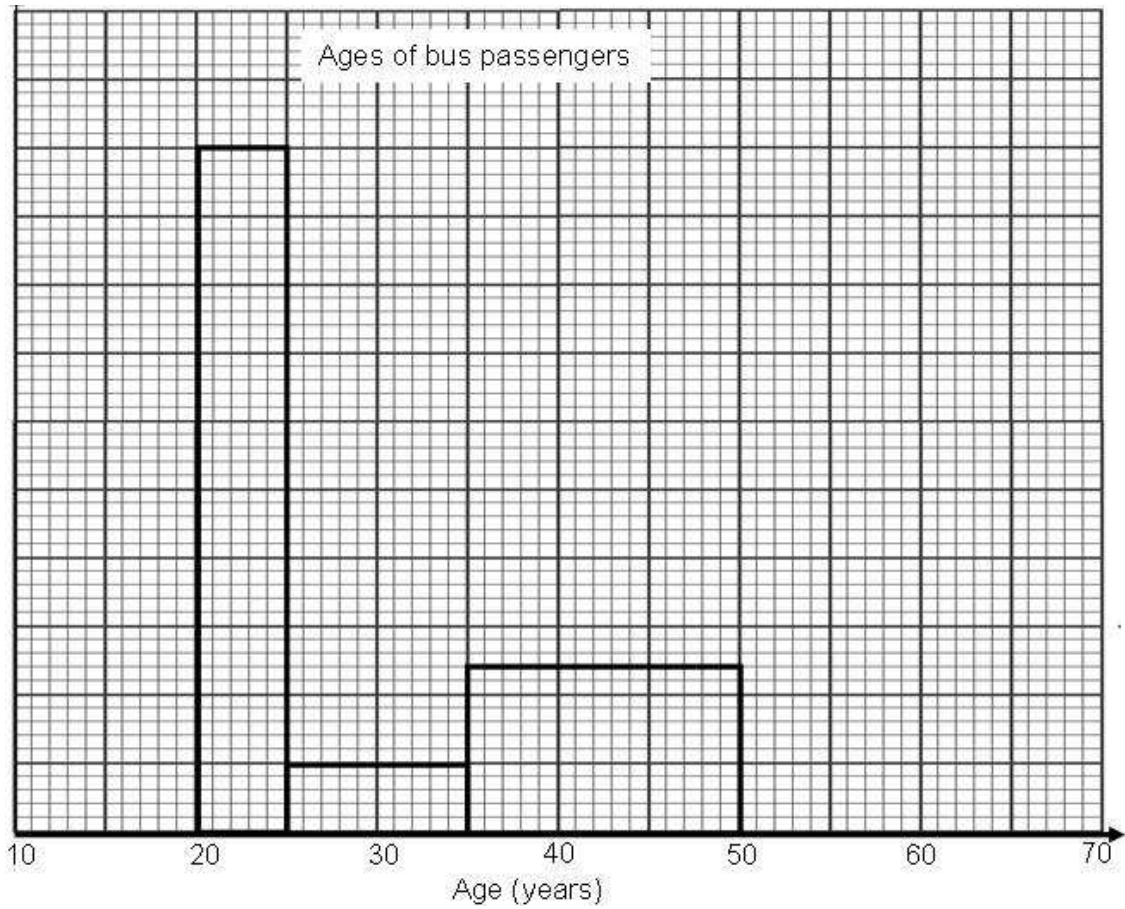


ABC is a triangle with:
AB = 7 cm
BC = 6 cm
Angle ABC = 35°

Calculate the length of AC
Give your answer to 3 significant figures.

.....cm (3)

23. The table and histogram show information about the age of passengers on a bus



a) Use the histogram to complete the table

(2)

Time (t years)	Frequency
$10 < t \leq 20$	11
$20 < t \leq 25$	25
$25 < t \leq 35$	
$35 < t \leq 50$	
$50 < t \leq 70$	4

b) Use the table to complete the histogram

(2)

24. Nina walks 50 metres in a time of 35.6 seconds

The distance of 50 metres was measured to the nearest metre.
The time of 35.6 seconds was measured to the nearest tenth of a second.

a) What is the upper bound for the distance of 50 metres
..... m **(1)**

b) What is the lower bound for the time of 35.6 seconds
.....seconds **(1)**

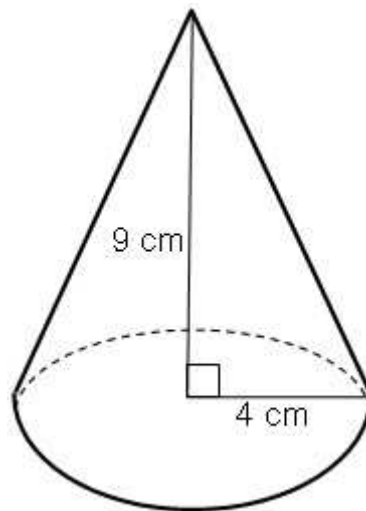
c) Calculate the upper bound for Nina's average speed
Show all the figures on your calculator display
.....metres per second **(2)**

25. Jane has a box which contains 5 blue cushions and 2 red cushions
Jane picks a cushion at random from the box. She notes the colour and then replaces it.
She does this two more times.

Calculate the probability that when Jane takes three cushions that exactly two are the same colour.

..... **(3)**

26.

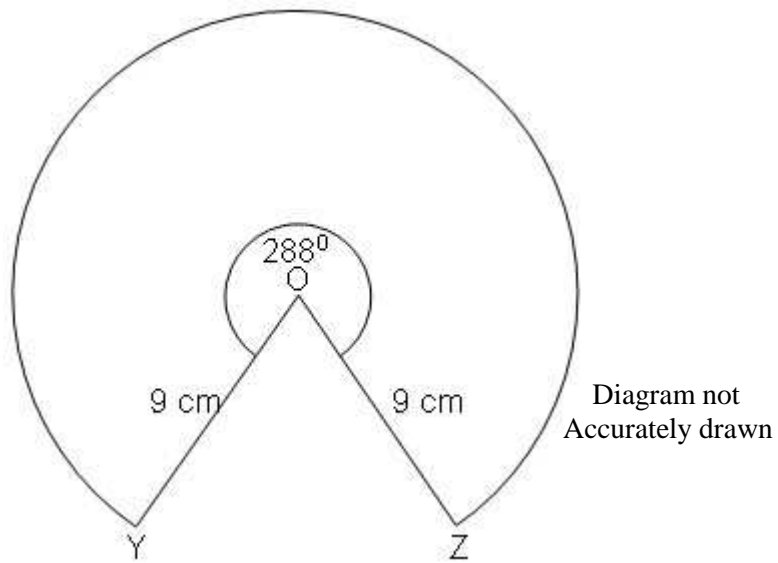


The cone above has a base radius of 4 cm and a vertical height of 9 cm.

- a) Calculate the volume of the cone (given as $\frac{1}{3}\pi r^2 h$)
Give your answer correct to 3 significant figures.

.....cm³ (2)

26b. Below is a net for a different cone



The net is a sector of a circle centre O and radius 9 cm

Reflex angle YOZ is 288°

When folded together the net makes a cone of slant height 9 cm

b) Work out the vertical height of the cone

.....cm (4)

27 **BONUS**

Solve $(2x - 3)(3x + 1) = 2$

Give your solutions correct to 2 decimal places.

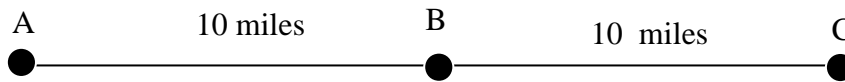
..... (4)

Matty drove his car between three towns A, B and C

He drove at an average speed of 40 mph between A and B.

He drove at an average speed of 60 mph between B and C.

What was his average speed between A and C?



.....mph (2)