Rewarding Learning

General Certificate of Secondary Education

Centre Number

Candidate Number

Mathematics

Unit M4
(With calculator)
Higher Tier

[GMC41]
Assessment

GMC41

Assessment Level of Control:
Tick the relevant box (✓)

Controlled Conditions	
Other	

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all twenty-four** questions.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

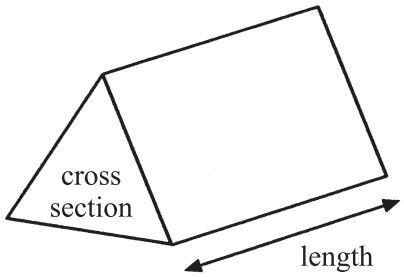
INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

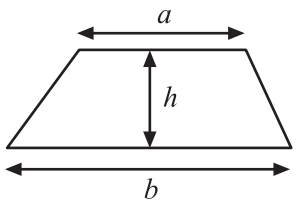
12371

Formula Sheet

Volume of prism = area of cross section × length

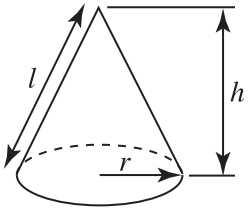


Area of trapezium $= \frac{1}{2}(a+b)h$



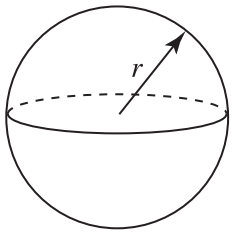
Volume of cone $= \frac{1}{3}\pi r^2 h$

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

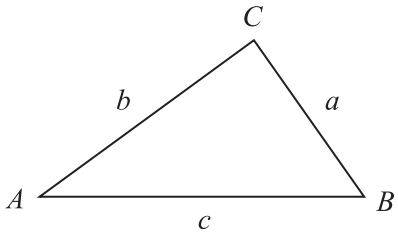


Volume of sphere $= \frac{4}{3}\pi r^3$

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



In any triangle *ABC*



Quadratic Equation

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

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

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

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

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

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1 Solve $2(3x - 1) + 5 = 4(x + 2)$

Answer $x =$ _____ [3]

[Turn over

2 Data on the weights of 16 players on a sports team is recorded in the grouped frequency table.

Weight (W kg)	**Frequency**		
$60 < W \leq 70$	1		
$70 < W \leq 80$	5		
$80 < W \leq 90$	4		
$90 < W \leq 100$	6		

The manager states that "the estimated mean weight of the team lies within the median class".

Is his statement correct? **You must justify your answer fully.**

[4]

3 Which of these numbers is prime?

Explain your reasoning clearly for each number below.

Number	11	111	1111
Yes/No			
Reason			

[2]

4 A caravan depreciates in value by 15% each year.

Two years ago Malcolm bought a new caravan costing £24 000

(a) What is its value now?

Answer £ _____ [2]

(b) Malcolm states his caravan has depreciated by 30% over the two years.

Is he correct?

Explain your answer clearly.

[3]

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(Questions continue overleaf)

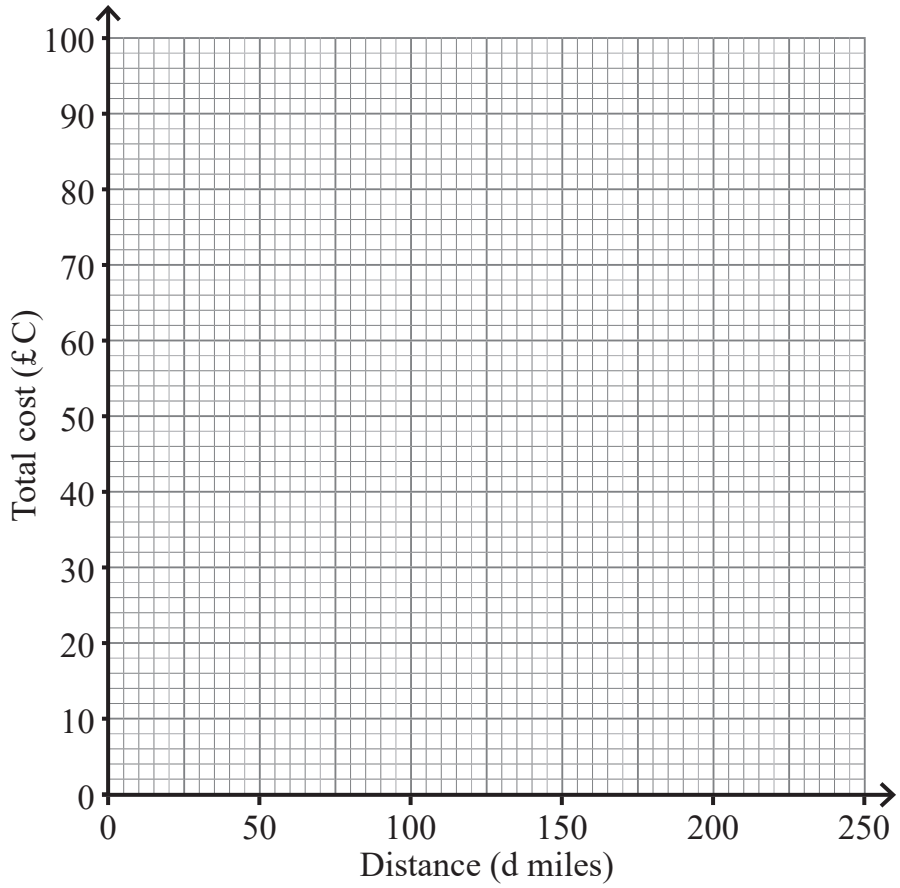
[Turn over

5 Martine wants to hire a van.

The table shows the costs for hiring the van.

Distance (d miles)	50	100	150	200	250
Total cost (£C)	50	60	70	80	90

(a) Draw a straight line graph to illustrate this information.



[2]

(b) Use the graph to find

(i) the initial fixed charge for hiring the van,

Answer £ _____ [1]

(ii) the cost per mile, in pence, for using the van.

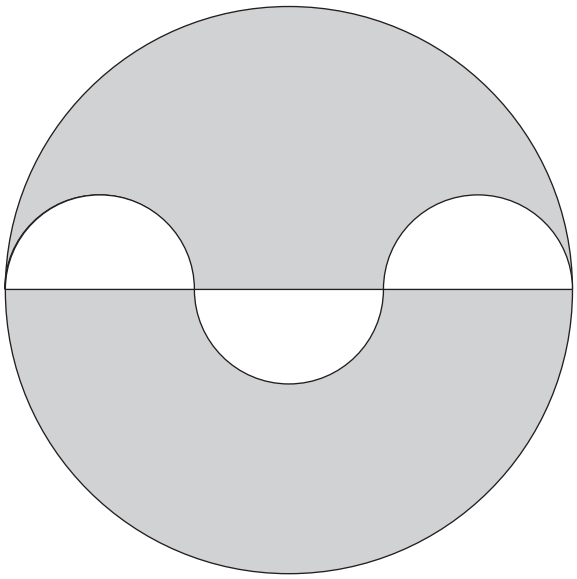
Answer _____ p [1]

(c) Work out the total cost if the van travels 450 miles.

Answer £ _____ [2]

[Turn over

6



A large circle has three semicircles of equal diameters placed across its diameter as shown.

The radius of each of the small semicircles is 2 cm.

Work out the area shaded.

Answer _____ cm^2 [5]

7 Coffee is sold in 250 gram packets and costs £4.20 a packet.

Tea is sold in 450 gram packets and costs £3.60 a packet.

Helen runs a café and buys the same number of grams of coffee and tea.

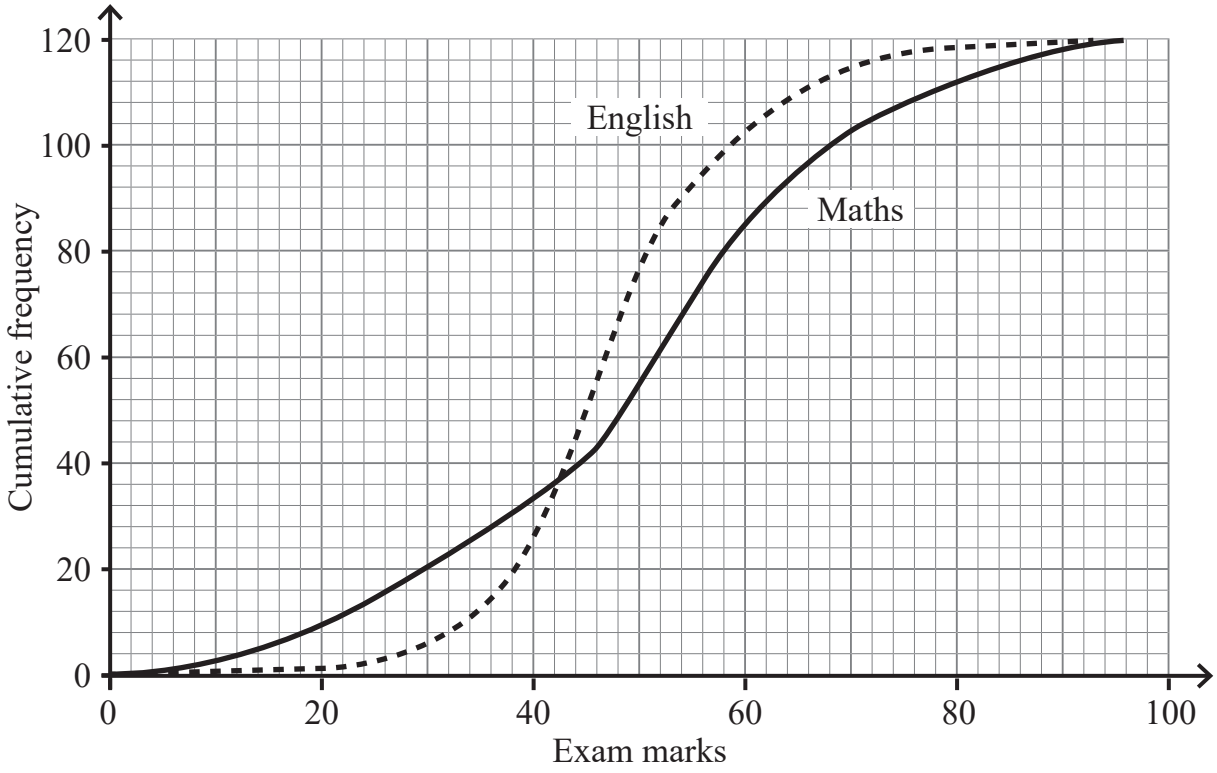
What is the least amount of money she could have spent?

Answer £ _____ [5]

[Turn over

8 120 students sat a Maths exam and an English exam.

The cumulative frequency curves show the distribution of results.



With reference to three different statistical measures compare the two sets of results.

_____ [1]

_____ [1]

_____ [1]

9 Calculate the perimeter of the isosceles triangle.

You must show all your working.

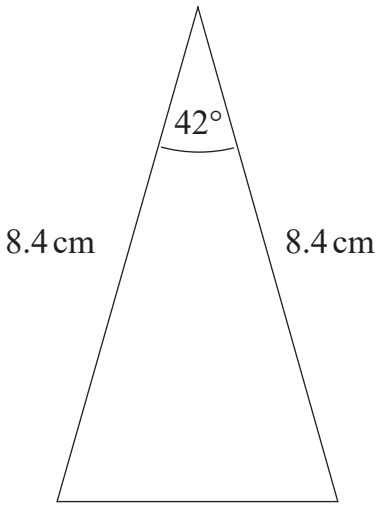


diagram
not drawn
accurately

Answer _____ cm [4]

[Turn over

10 A guitar is on sale in a shop.

The sale price is £120.96 after a 28% reduction.

What was the price of the guitar before the sale?

Answer £ _____ [2]

11 An elephant puts a total force of 33 000 N on its four feet.

Each foot has an area of 1500 cm^2

What is the pressure the elephant exerts on the ground?

Answer _____ N/cm^2 [2]

12 Find the area of the shaded sector of this circle, centre O and radius 3 cm.

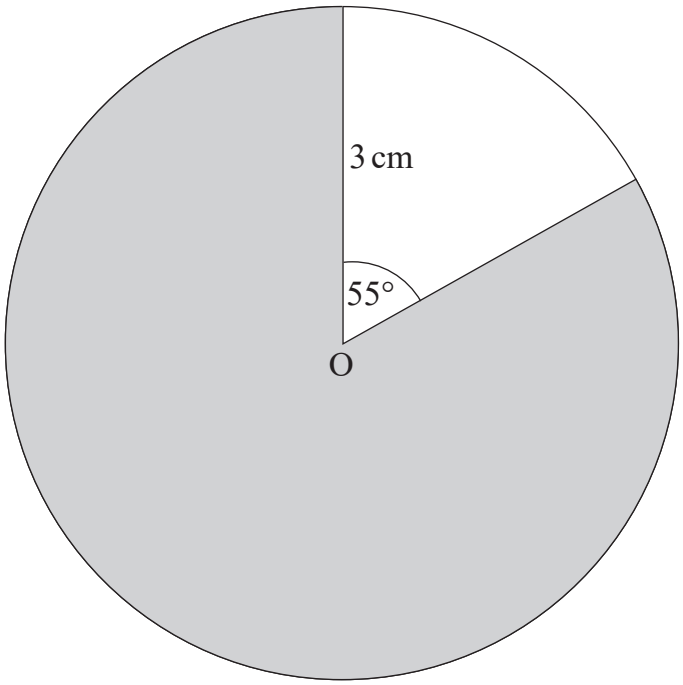


diagram
not drawn
accurately

Answer _____ cm^2 [2]

[Turn over

13 Solve the equation $\frac{2(3x + 2)}{5} - \frac{(3x - 4)}{3} = \frac{2}{15}$

Show all your working out clearly.

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [4]

14 Martin runs 200 metres, correct to the nearest metre.

It takes him 26.4 seconds, correct to the nearest tenth of a second.

Calculate the upper bound of Martin's average speed.

Answer _____ m/s [3]

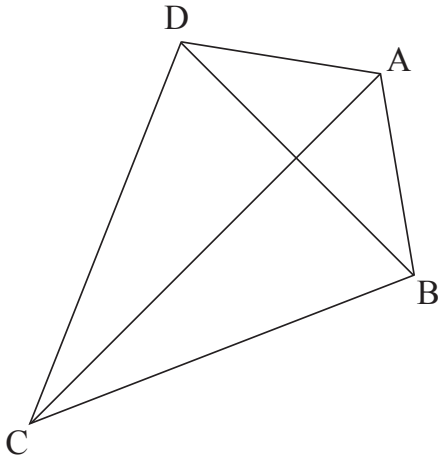
[Turn over

15 The lines AC and BD are diagonals of a kite.

The line AC has equation $y = 3x + 2$

The diagonals meet at (1, 5).

Find the equation of the line BD.



Answer _____ [4]

16 In a right-angled triangle the two shorter sides have lengths of $(3x + 3)$ cm and $(2x - 1)$ cm.

The hypotenuse has length $(5x - 2)$ cm.

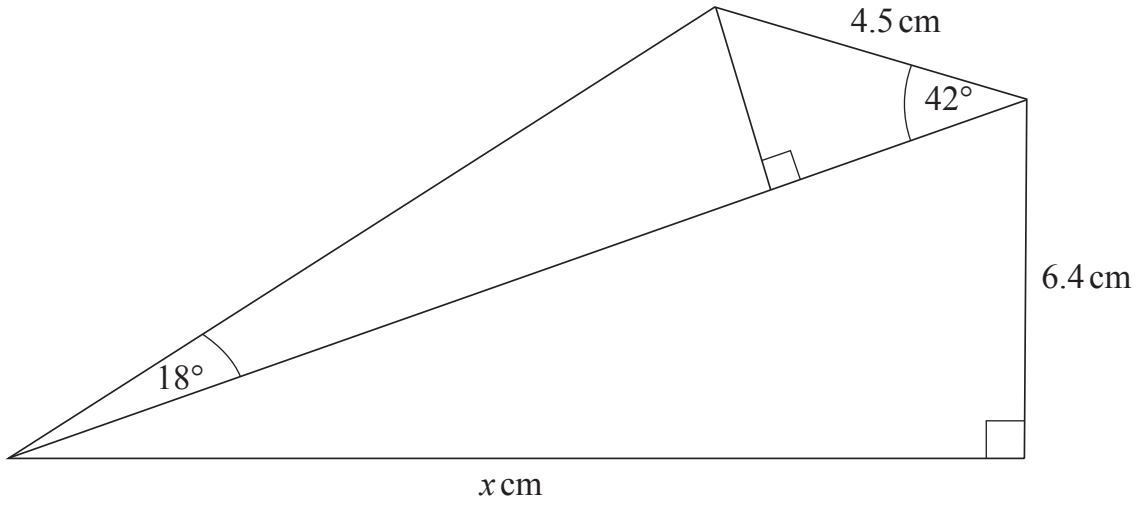
Form an equation and solve it to find x.

Show all your working.
A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [4]

[Turn over

17 Find the value of x in the diagram below.



Answer x = _____ [5]

18 Rob records the number of miles he drives each day for one week.

His results are given in the table below:

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Distance (miles)	16	26	24	20	18	14	88

Which average is the most appropriate to use to represent this data?

Give a reason for your answer.

Answer _____ because _____

_____ [2]

19 A, B, C and D are points on the circumference of a circle with centre M.

BD is the diameter of the circle.

Angle BAC = 38°

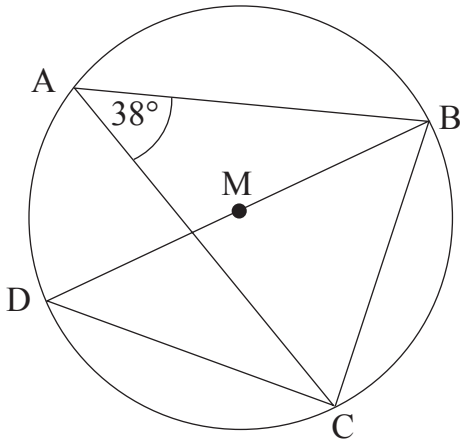


diagram not drawn accurately

(a) Find the size of angle BDC, giving a reason for your answer.

Answer _____° because _____ [2]

(b) Find the size of angle BCD, giving a reason for your answer.

Answer _____° because _____ [2]

(c) Find the size of angle BMC, giving a reason for your answer.

Answer _____° because _____ [2]

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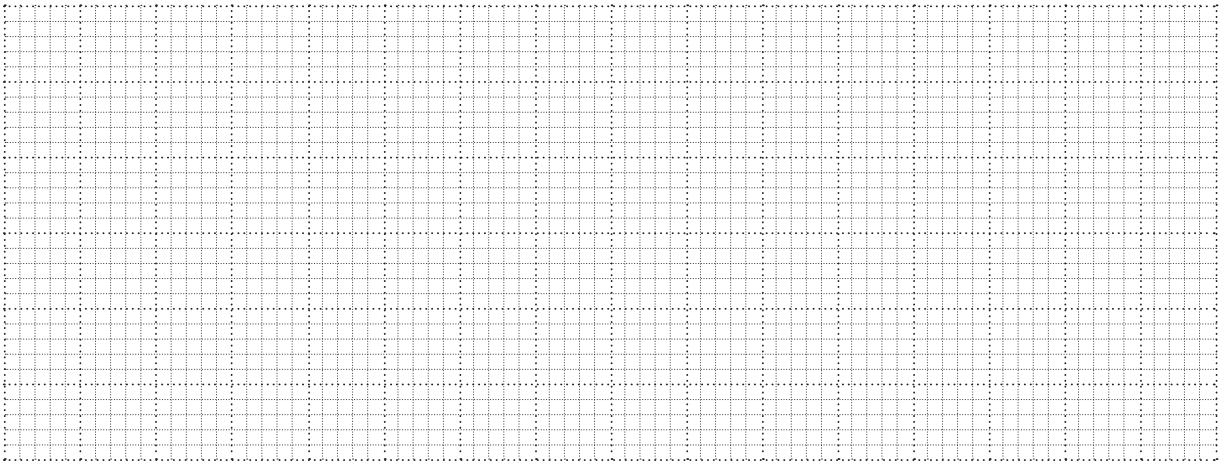
(Questions continue overleaf)

[Turn over

20 A speed camera in a 30 mph speed zone records the following results over a two-hour period:

Speed(s) in mph	Number of cars
$0 < s \leq 30$	66
$30 < s \leq 33$	18
$33 < s \leq 40$	21
$40 < s \leq 60$	8
$60 < s \leq 75$	3

(a) Illustrate this data by drawing a histogram on the grid below.



[4]

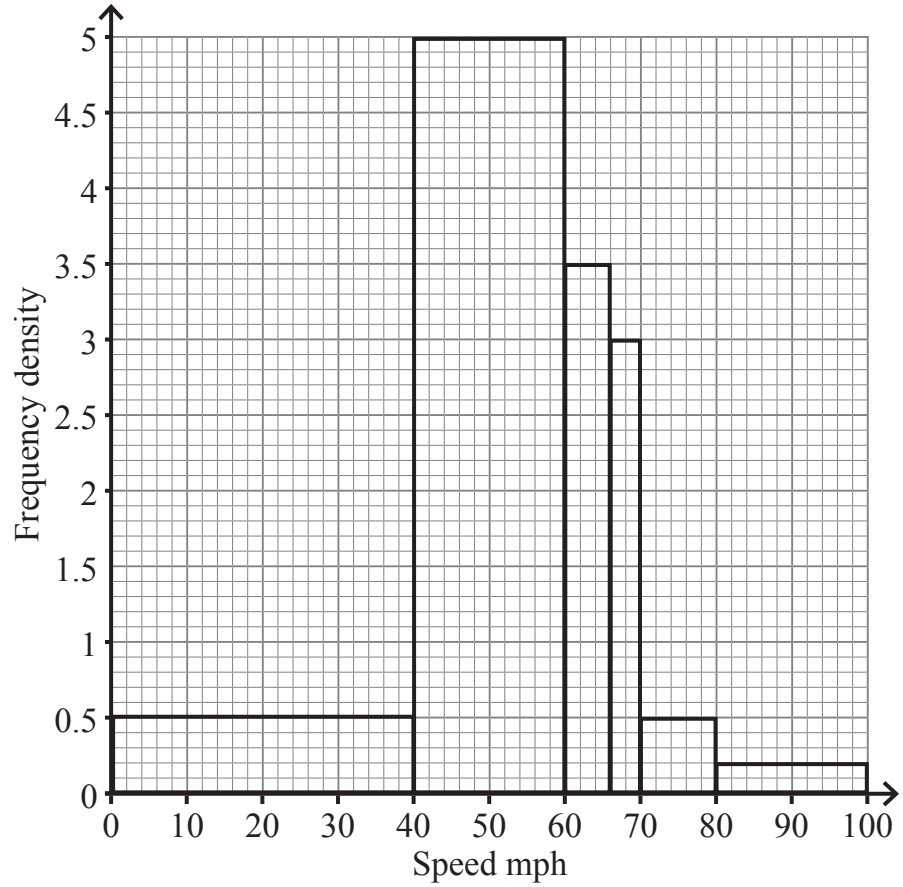
(b) A stratified sample of 50 cars was taken from the data on the previous page.

Estimate how many cars sampled had a speed between 33 and 40 mph.

Answer _____ [2]

[Turn over

(c) A speed camera in a 60 mph speed zone records the speeds of cars and the results are shown in the histogram below.



Calculate an estimate for the mean speed over the two-hour period for this data.

Answer _____ mph [4]

(d) Anyone driving at a speed that is greater than 10% above the speed limit is given a fine.

Compare the percentage of fines given in the two speed zones.

[2]

21 Factorise $15x^2 + 2xy - 8y^2$

Answer _____ [2]

[Turn over

22 Solve the equation

$$\frac{3}{2x+5} = \frac{1}{11} + \frac{2}{4x-1}$$

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [6]

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23 Simplify $\dfrac{8x^2 - 18}{6x^2 + 7x - 3}$

Answer _____ [3]

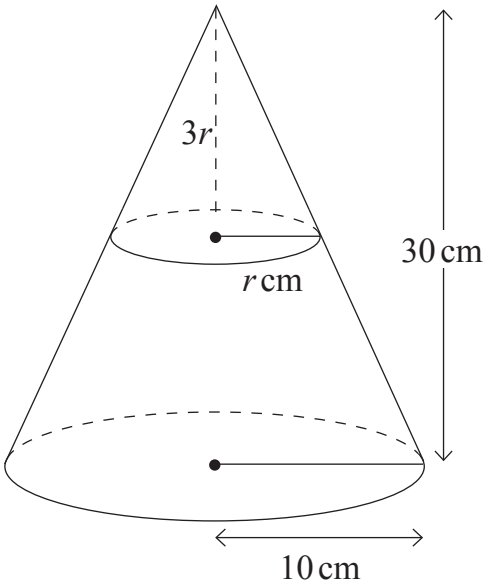
[Turn over

24 A cone of radius r cm and height $3r$ cm is removed from a cone of radius 10 cm and height 30 cm to give a frustum.

The volume of the frustum is 2855 cm^3

Calculate the value of r.

Show all your working.



Answer _____ [6]

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For Examiner's use only	
Question Number	**Marks**
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