Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2013

Mathematics

Unit T3
(With calculator)
Higher Tier

[GMT31]

GMT31

TUESDAY 11 JUNE 9.15 am–11.15 am

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 box, around each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen**.
Answer **all twenty-six** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

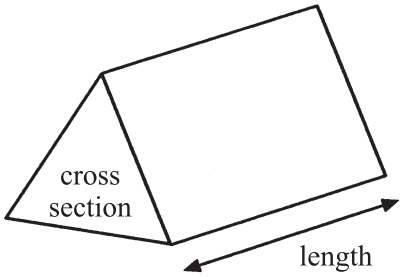
INFORMATION FOR CANDIDATES

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.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **questions 17 and 26.**
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

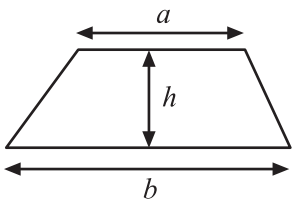
8167

Formula Sheet

Volume of prism = area of cross section × length

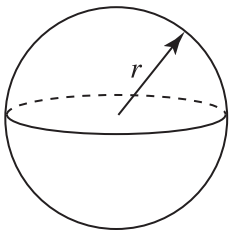


Area of trapezium = $\frac{1}{2}(a+b)h$



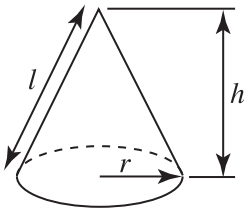
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = πrl

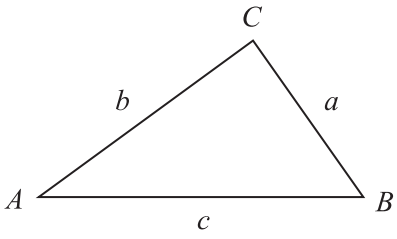


Quadratic Equation

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

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

In any triangle *ABC*

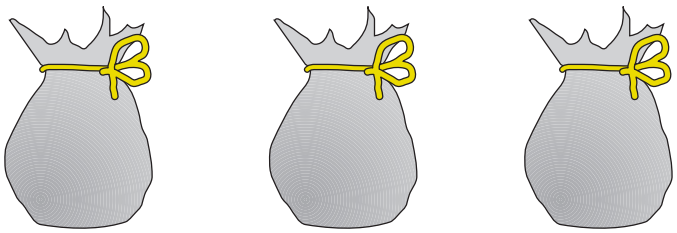


Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

1



1 **2** **3**

Bag 1 contains m marbles.

Bag 2 contains 5 less marbles than Bag 1

(a) Write down an expression in terms of m for the number of marbles in Bag 2

Answer _____ [1]

Bag 3 contains twice as many as in Bag 1 **plus** the number of marbles that are in Bag 2

(b) Write down an expression in terms of m for the number of marbles in Bag 3
Give your answer in its simplest form.

Answer _____ [2]

The total number of marbles in Bag 3 is 22

(c) Set up and solve an equation to help find how many marbles are **in Bag 2**

Answer In Bag 2 there are _____ marbles [3]

Examiner Only	
Marks	Remark
Total Question 1	

[Turn over

Examiner Only	
Marks	Remark

2 **(a)** Solve $6x + 9 = 11 - 2x$

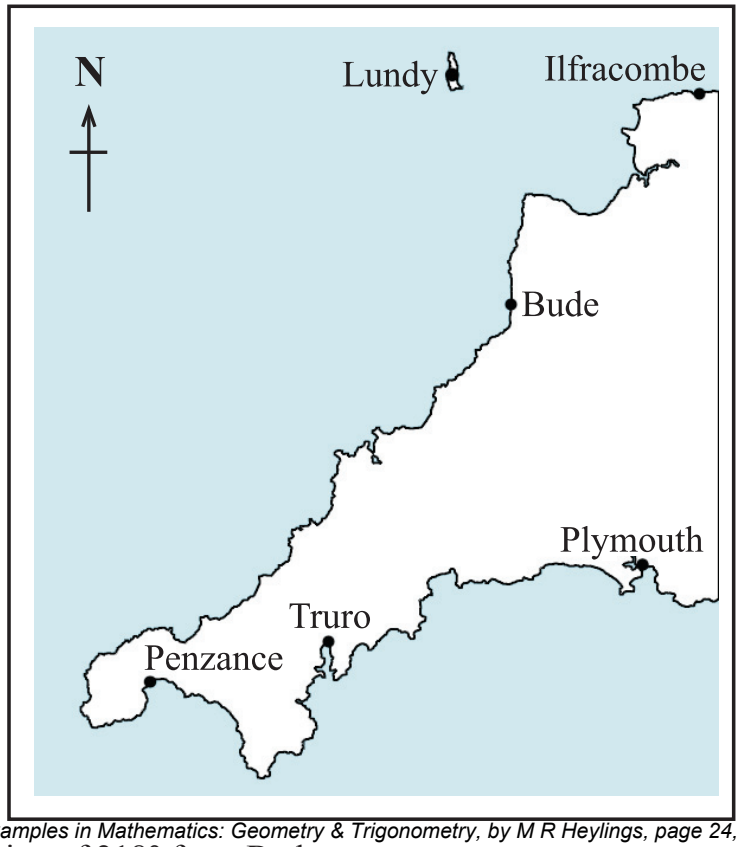
Answer _____ [3]

(b) Simplify $\frac{x}{3} - \frac{x}{5}$

Answer _____ [2]

Total Question 2

3



Boscastle is on a bearing of 218° from Bude.
Boscastle is on a bearing of 310° from Plymouth.
Locate the position of Boscastle on the map above. Indicate Boscastle with a point marked B. [3]

Total Question 3

Examiner Only	
Marks	Remark

4 **(a)** Show how to work out the answer to the following without using a calculator.

$$\frac{3}{8} \div \frac{3}{4}$$

[2]

(b) What percentage is £24 of £320?

Answer _____ % [2]

Total Question 4

5 The correlation in a scatter graph may be described as one of the following:

no correlation positive correlation negative correlation

Write down the type of correlation you would expect to find in scatter graphs which show the following information:

(a) average daily temperature and cold drinks sales,

Answer _____ [1]

(b) marks in a test and distance travelled to school,

Answer _____ [1]

(c) number in family and average weekly amount spent on food,

Answer _____ [1]

(d) average speed for journey to school and average time for journey to school.

Answer _____ [1]

Total Question 5

[Turn over

6 The heights (in centimetres) of fifteen girls in a Dance Class are:

151	173	157	165	166	168	170	169
169	169	168	171	154	176	177	

Construct a stem and leaf diagram to illustrate these heights.

[3]

Examiner Only	
Marks	Remark
Total Question 6	

7

Primus Energy Gas Tariff

Standing charge is 7.93p per day

Gas used is 4.433p per unit

Marie's gas meter was read on 1st March.

The reading was

0	1	9	5	7

The meter was read again on 1st June.

The reading was

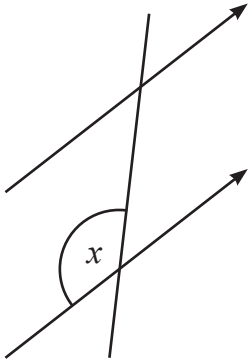
0	4	1	0	8

Calculate the total gas bill that Marie will have to pay for the 92 days from 1st March, if VAT is charged at 5% on the total.

Answer £ _____ [5]

Examiner Only	
Marks	Remark
Total Question 7	

8 **(a)** Mark the angle corresponding to angle x on the diagram.



[1]

(b) Write down the size of angle y.

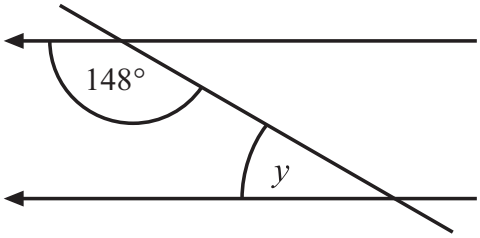


diagram not drawn accurately

Answer _____° [1]

(c) Calculate the sum of the interior angles of a regular octagon.

Answer _____° [2]

(d) Is it possible to have a regular polygon with an interior angle of 130°?
Explain your answer.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark
Total Question 8	

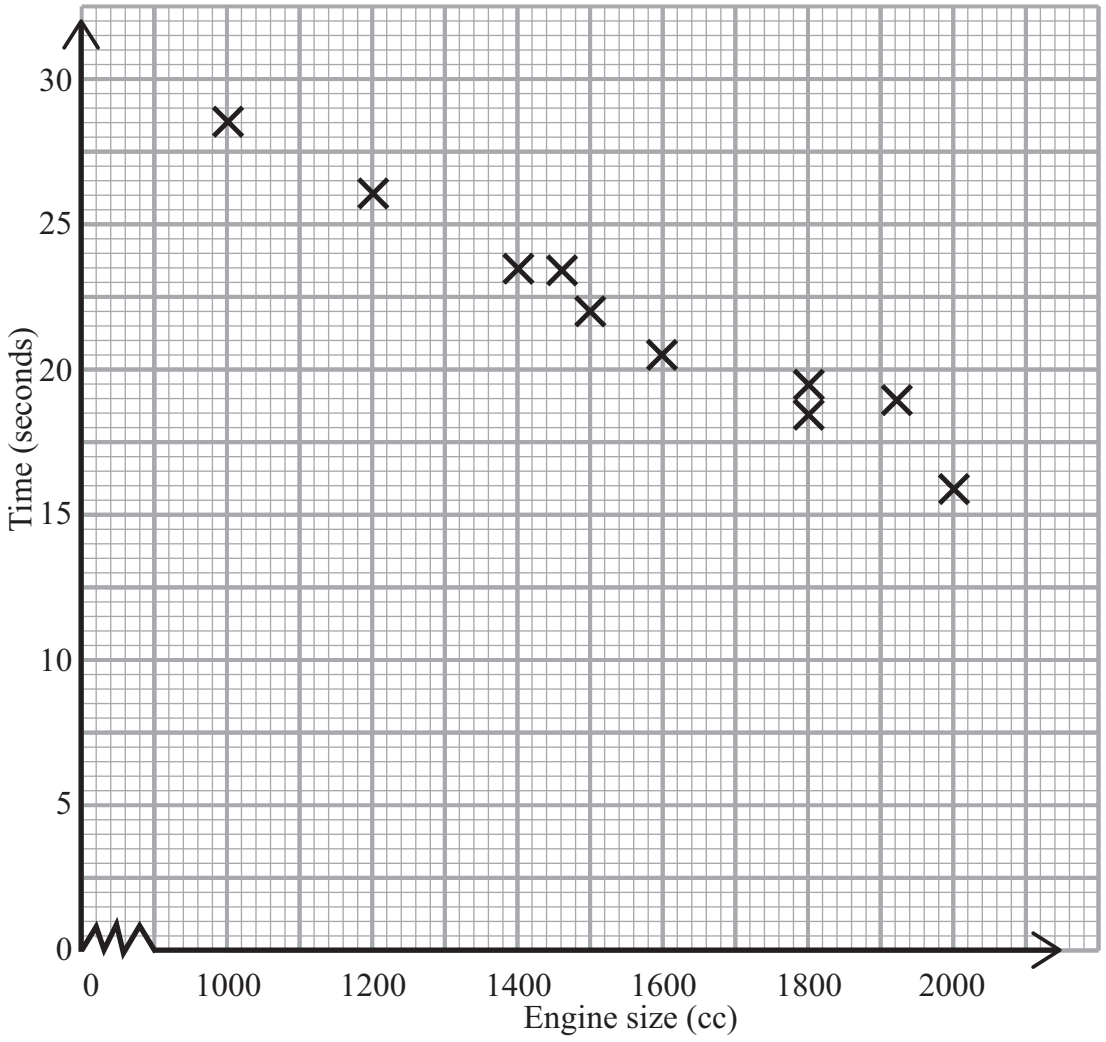
9 Convert 62 000 cm^2 into m^2.

Answer _____ m^2 [2]

Examiner Only	
Marks	Remark

Total Question 9

10 Ten models of car were tested to find how long it took each car to travel 500 metres. The times and engine sizes are plotted below.



(a) Draw a line of best fit. [1]

(b) Use your line to predict the time for a car with engine size 1700 cc to travel 500 metres.

Answer: _____ seconds [1]

Total Question 10

[Turn over

Examiner Only	
Marks	Remark

11 Solve $\frac{2x}{5} - 3 = 7$

Answer $x =$ _____ [2]

Total Question 11

12 Derek is trying to find a number x such that $x^2 + \sqrt{x} = 90$

He knows the answer is between 9 and 10
Use trial and improvement to find Derek's number to **2 decimal places**.
Show your work.

Answer Derek's number is _____ [4]

Total Question 12

13 Expand $y(4 - 2y)$

Answer _____ [2]

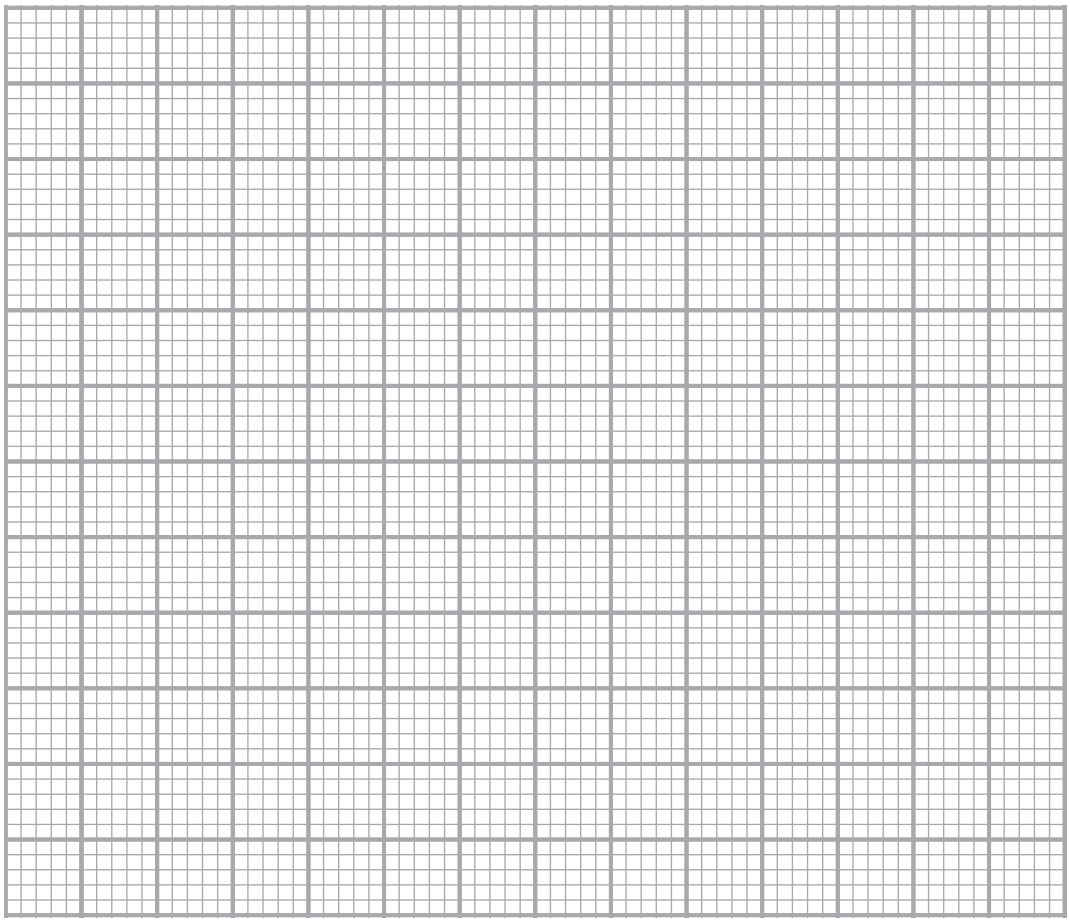
Examiner Only	
Marks	Remark
Total Question 13	

[Turn over

14 The number of items that 80 students had in their sports bags was recorded. The numbers were grouped as shown in the table.

Number (n)	Frequency
$2 < n \leqslant 4$	8
$4 < n \leqslant 6$	24
$6 < n \leqslant 8$	18
$8 < n \leqslant 10$	17
$10 < n \leqslant 12$	9
$12 < n \leqslant 14$	4

(a) Show this information on a frequency polygon.



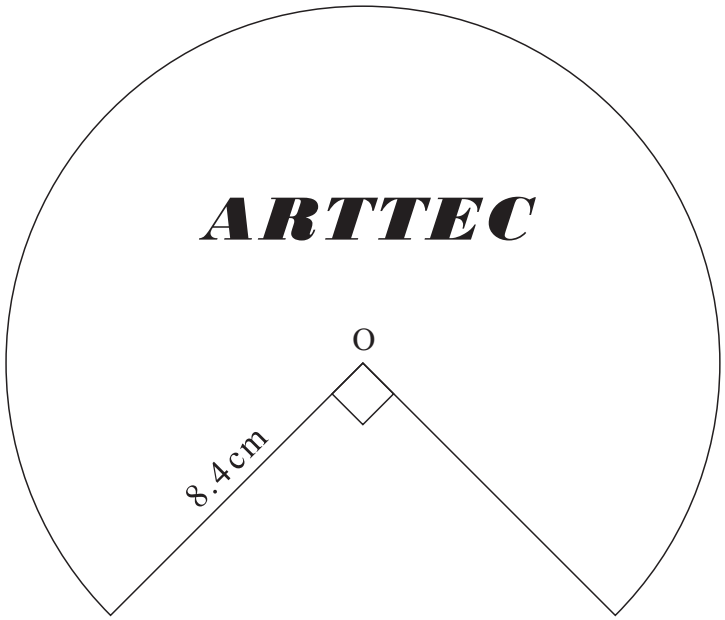
[3]

(b) Which class interval contains the median number?

Answer _____ [1]

Examiner Only	
Marks	Remark
Total Question 14	

15 A company logo is shown below. It is $\frac{3}{4}$ of a circle centre O.



Calculate the perimeter of the logo.

Answer _____ cm [3]

Examiner Only	
Marks	Remark
Total Question 15	

[Turn over

16 The times that 100 sportsmen spent playing golf one week were recorded. The times were grouped as shown in the table.

Time t (hours)	Frequency		
$0 < t \leqslant 4$	4		
$4 < t \leqslant 8$	19		
$8 < t \leqslant 12$	32		
$12 < t \leqslant 16$	18		
$16 < t \leqslant 20$	16		
$20 < t \leqslant 24$	11		

Calculate an estimate for the mean time.

Answer _____ hours [4]

Examiner Only

Marks	Remark

Total Question 16

Quality of written communication will be assessed in this question.

17 The dimensions of three triangles are given:

Triangle A: 5 cm 6 cm 8 cm
Triangle B: 5 cm 12 cm 13 cm
Triangle C: 5 cm 10 cm 12 cm

Only one of these triangles is right-angled. Which one?
Explain your answer clearly.

Triangle: _____ because _____

_____

_____ [3]

Total Question 17

Examiner Only	
Marks	Remark

18 **(a)** Calculate the exact value of $4\frac{1}{6} - 2\frac{5}{8}$ without using a calculator.
Show your work.

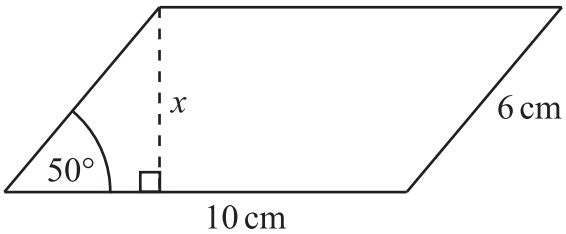
[3]

(b) Conor bought a new car for £23 000
Each year the value of the car depreciated by 15%.
Work out the value of the car at the end of 3 years, giving your answer to the nearest pound.

Answer £ _____ [4]

Total Question 18

19 A parallelogram has sides of 6 cm and 10 cm, with an angle of 50° between the sides.
Calculate the height x of the parallelogram.



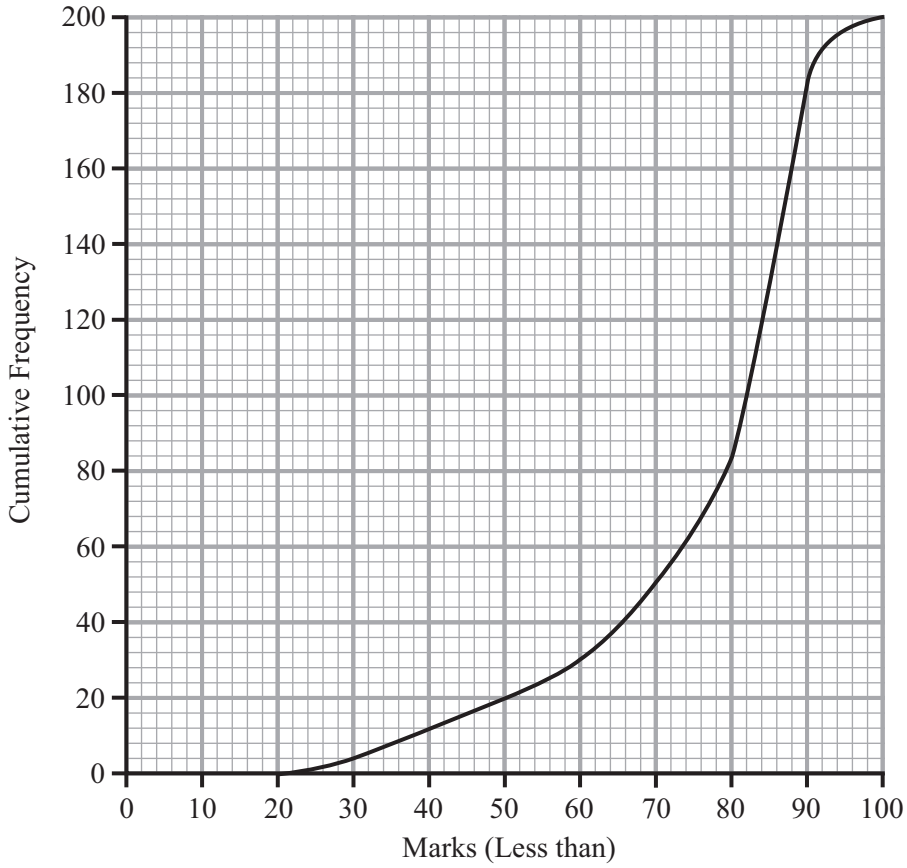
Answer x _____ cm [3]

Total Question 19

[Turn over

20 The graph below shows the cumulative frequency of marks obtained in a spelling test.

Examiner Only	
Marks	Remark



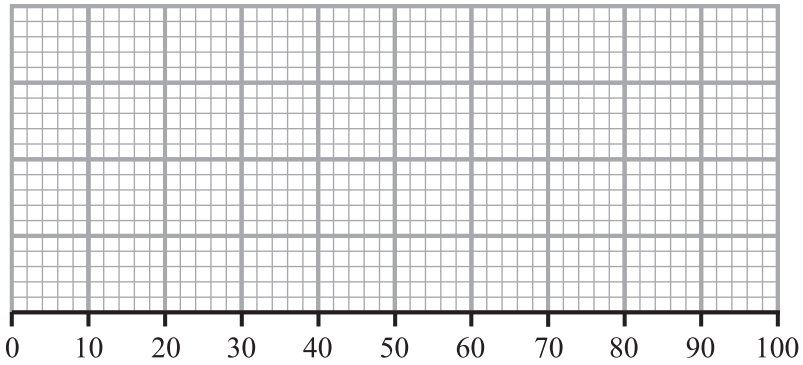
(a) Use the graph to estimate the median.

Answer _____ [1]

(b) The pass mark is 75
Estimate how many passed the spelling test.

Answer _____ [2]

(c) From the graph opposite draw a box plot.



[3]

Examiner Only

Marks	Remark

Total Question 20

21 **(a)** Solve the simultaneous equations $5x - y = 9$
$-2x + y = 3$

Show your working clearly.

Answer $x =$ _____ $y =$ _____ [2]

(b) Solve $\frac{2}{3}(1 - x) - \frac{1}{4}(3x - 1) = 8$

Answer $x =$ _____ [4]

Total Question 21

[Turn over

22 Factorise

(a) $15xy - 5y^2$

Answer _____ [2]

(b) $x^2 - 9x - 36$

Answer _____ [2]

Examiner Only

Marks	Remark

Total Question 22

23 What is the Highest Common Factor (HCF) of 210 and 252?

Answer _____ [2]

Total Question 23

24 Tony opened a savings account with the Western Bank.
After one year, the bank paid 6% per annum interest into his account.
The total amount in his account was then £710.20
Work out the amount of money with which Tony opened the account.

Answer £ _____ [3]

Total Question 24

25 The area of the sector is 20.11 cm^2
Calculate the angle x.

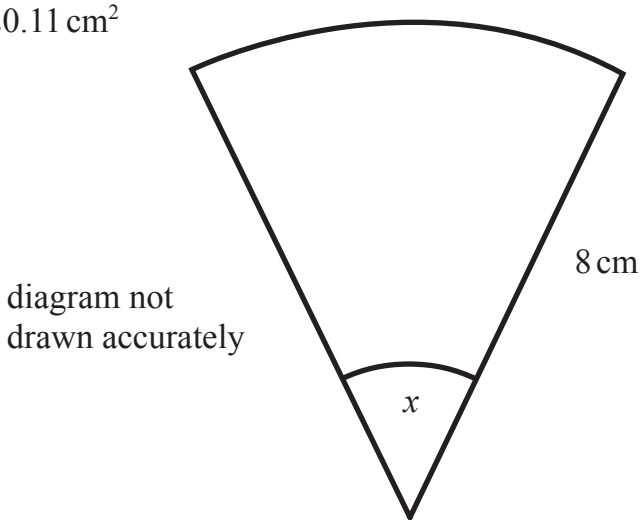


diagram not drawn accurately

Answer _____ ° [4]

Examiner Only	
Marks	Remark
Total Question 25	

Quality of written communication will be assessed in this question.

26 A football pitch is 105 metres long and 68 metres wide.
The length is measured to the nearest 5 metres.
The width is measured to the nearest metre.
Work out the maximum area of the pitch.
Show your working.

Answer _____ m^2 [3]

Total Question 26	

For Examiner's use only	
Question Number	Marks
1	
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Total Marks	

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Examiner Number