Rewarding Learning

71	

Candidate Number

General Certificate of Secondary Education
2011

Mathematics

Unit T3
(With calculator)
Higher Tier

[GMT31]

TUESDAY 31 MAY
9.15 am–11.15 am

GMT31

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
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11	
12	
13	
14	
15	
16	
17	
18	
19	
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22	
23	
24	
Total Marks	

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

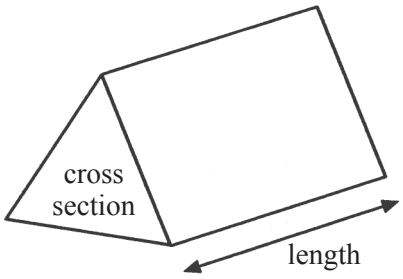
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all twenty-four** questions.
Any working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

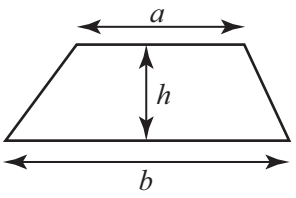
The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in **question 3**.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is overleaf.

Formula Sheet

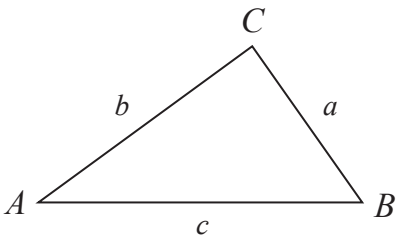
Volume of prism = area of cross section × length



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



In any triangle *ABC*



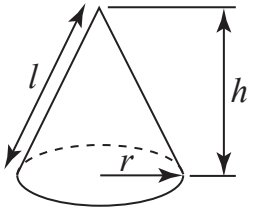
Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

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

Curved surface area of cone = πrl



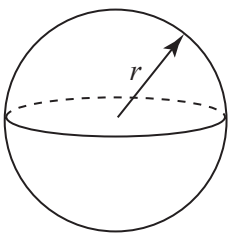
Quadratic Equation

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

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

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

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



Answer **all** questions.

Examiner Only	
Marks	Remark

1 **(a)** The Ross family eat $\frac{3}{5}$ of a loaf of bread each day.

What is the least number of loaves they will need to buy for 9 days?

Answer _____ [3]

(b) The family spend £150 per week on food.

They spend £36 of this on meat.

What percentage of the food bill is spent on meat?

Answer _____% [2]

---

2 A new bicycle is priced at £240

In a sale it is reduced by 35%.

Calculate the sale price.

Answer £ _____ [3]

Quality of written communication will be assessed in this question.

Examiner Only	
Marks	Remark

3 (a)

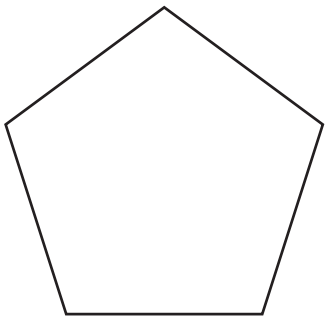
A ten pence piece has a radius of 1.4 cm.

Calculate the circumference of this coin.

Show your work clearly.

Answer _____ cm [2]

(b)



Explain why the sum of the interior angles in a regular pentagon is 540°.

_____

_____

_____

_____

[2]

Examiner Only	
Marks	Remark

4 **(a)** Lines AB, CD and EF are parallel

Angles of 96° and 60° are marked in the diagram as shown.

Calculate the size of the angles marked x, y and z.

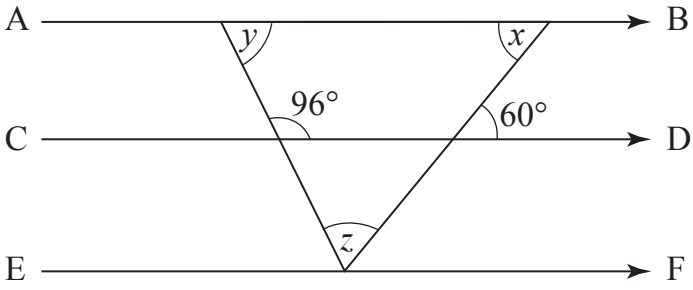


Diagram not drawn accurately

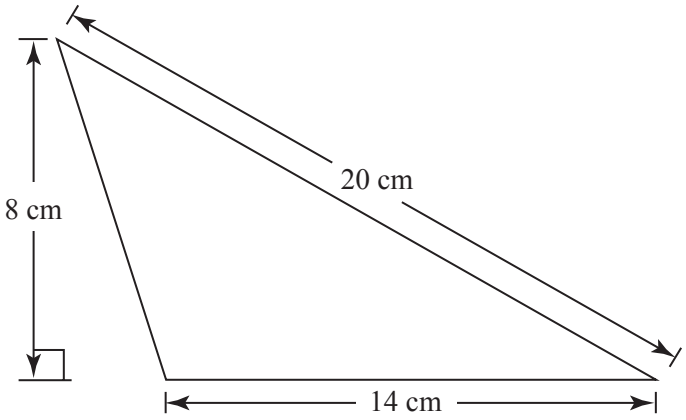
Answer Angle x = _____° [1]

Angle y = _____° [1]

Angle z = _____° [1]

(b) This triangle has some lengths marked on it.

Calculate the area of the triangle.



Answer _____ cm^2 [2]

5 An adult ticket for a show costs £a.

A child ticket costs £4 less than an adult ticket.

Daisy buys two adult tickets and three child tickets. The total cost is £23

(a) Use this information to write down an **equation** in terms of a.

Answer _____ [3]

(b) Solve your equation to find the cost of an adult ticket.

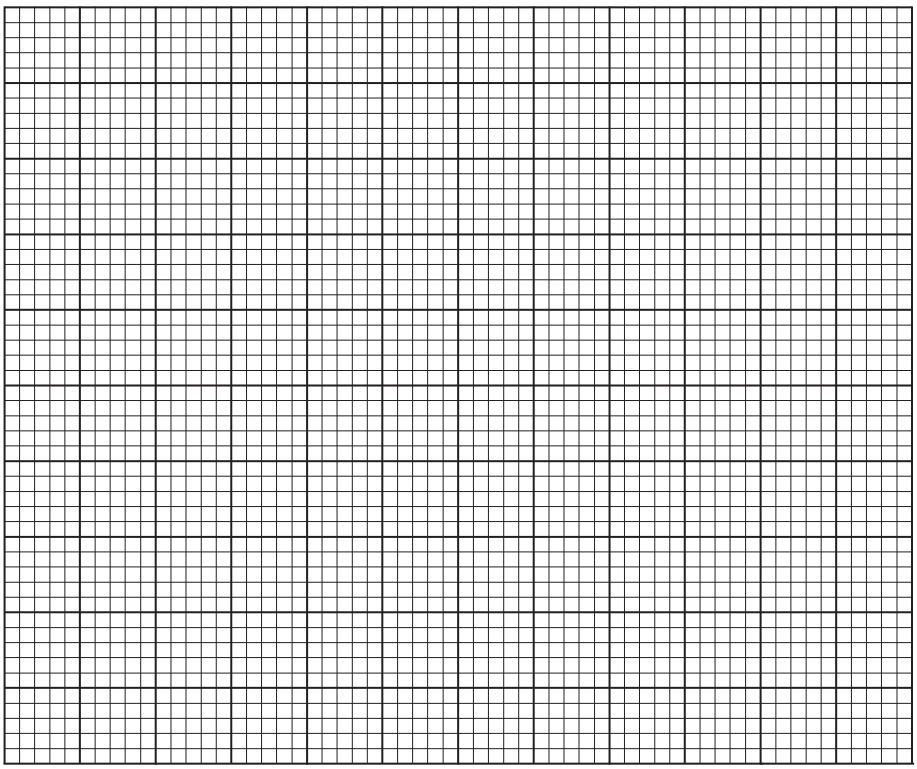
Answer £ _____ [2]

Examiner Only	
Marks	Remark

6 The increase in test scores of 100 children over a period of time was recorded.

Increase in test scores (w)	$0 < w \leq 5$	$5 < w \leq 10$	$10 < w \leq 15$	$15 < w \leq 20$	$20 < w \leq 25$
Frequency	16	36	22	14	12

(a) Show this information on a grouped frequency diagram. [3]



(b) Write down the modal class interval.

Answer _____ [1]

7 Sam wants to buy travel insurance.

One company quotes £54.80

A second quotes £62.00 with a discount of 15% for buying online.

How much cheaper is the second quote?

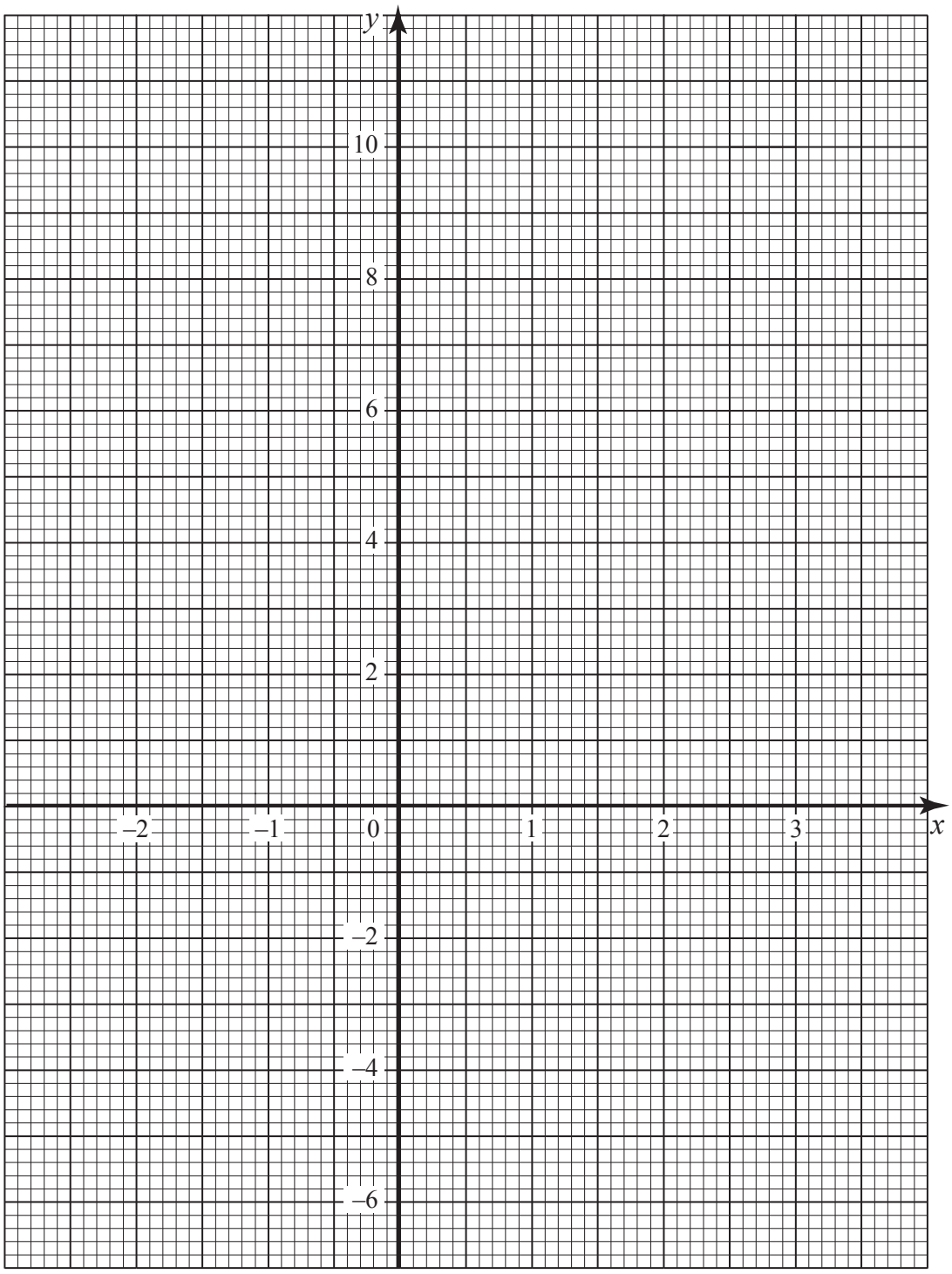
Answer £ _____ [4]

Examiner Only

Marks	Remark

8 Draw the graph of $y = 4 - 3x$ on the graph paper below.

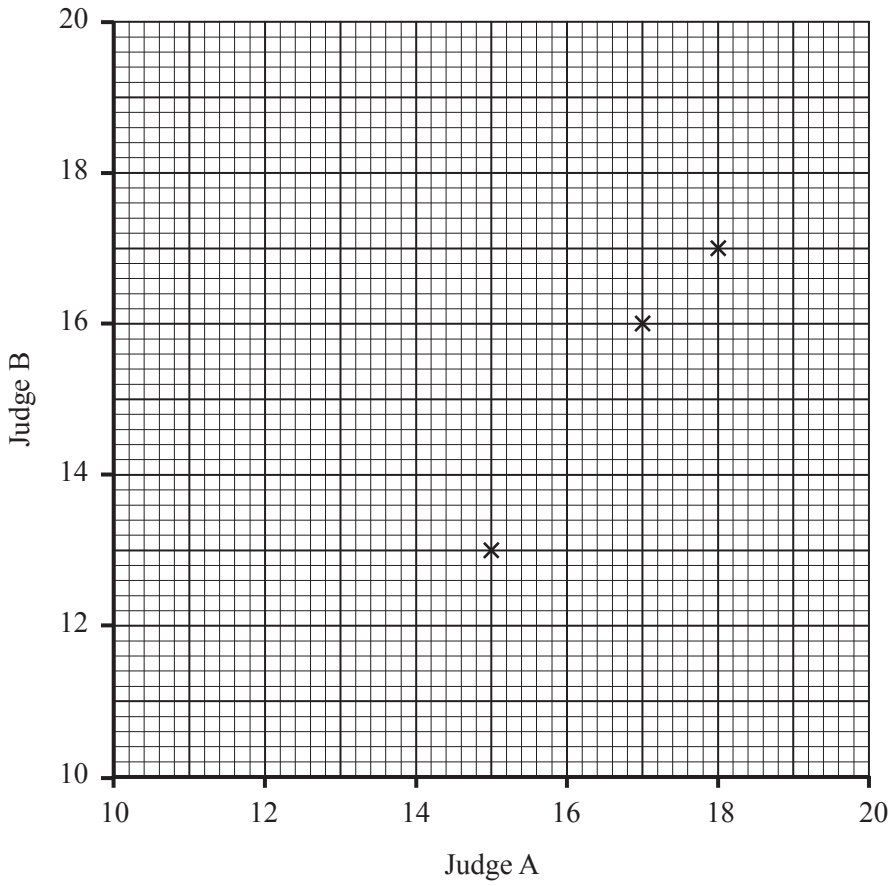
Examiner Only	
Marks	Remark



[3]

9 The table shows the marks awarded by two judges to the first eight competitors in a gymnastics competition.

Judge A	**18**	**15**	**17**	13	19	15	12	18
Judge B	**17**	**13**	**16**	13	18	16	14	16



(a) The first three points have already been plotted.

Use the data to complete the scatter graph [2]

(b) Draw the line of best fit. [1]

(c) Another competitor was awarded 14 marks by Judge A.

Estimate the marks awarded to this competitor by Judge B.

Answer _____ [1]

(d) What type of correlation does your graph show?

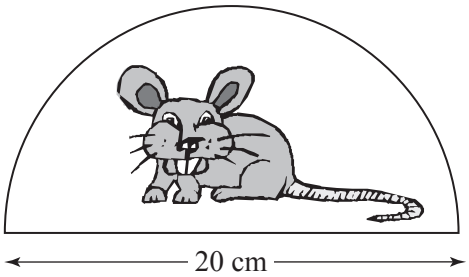
Answer _____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

10 **(a)** A computer mouse mat is semicircular in shape. It has a diameter of 20 cm. Calculate the area of the mat.



Answer _____ cm^2 [2]

(b) **(i)** Find the midpoint of the line joining the points A (–1, 6) and B (3, –2)

Answer (_____, _____) [2]

(ii) The point M (4, 1) is the midpoint of the line joining the points C and D. C is the point (1, –1). Find the co-ordinates of the point D.

Answer (_____, _____) [2]

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11 Write 84 as a product of prime factors. Express your answer in index notation.

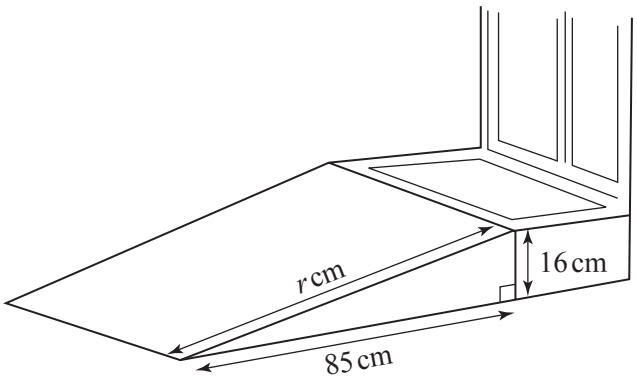
Answer _____ [3]

Examiner Only	
Marks	Remark

12 A ramp is placed next to a step to allow wheelchair access.

The ramp is 16 cm high and reaches 85 cm from the step.

Calculate the sloping length, r cm, of the surface of the ramp to the edge of the step.



Answer _____ cm [3]

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13 **(a)** At birth a baby boy weighed 4 kg. Six weeks later he weighed 7 kg.

What was the percentage increase in his weight?

Answer _____% [2]

(b) Colin leaves £4,800 in the bank for two years.

It earns compound interest of 3% per year.

Calculate the total amount Colin has in the bank at the end of the two years.

Answer £_____ [2]

Examiner Only	
Marks	Remark

14 **(a)** Expand and simplify $(x - 6)(x + 4)$

Answer _____ [2]

(b) Write down the nth term for the sequence

6, 12, 18, 24, ...

Answer _____ [1]

(c) Write down the nth term for the sequence

4, 9, 14, 19, ...

Answer _____ [2]

---

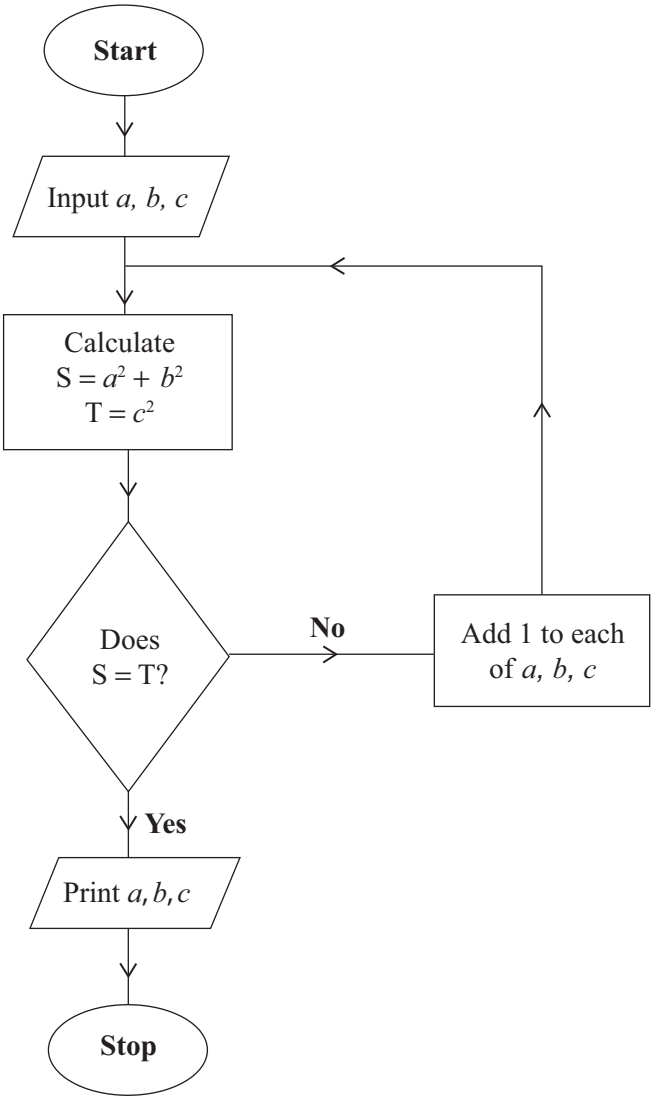
15 The times that 100 students spent watching TV during one weekend were recorded. The times were grouped as shown in the table.

Time t (hours)	**Frequency**		
$0 < t \leq 2$	4		
$2 < t \leq 4$	18		
$4 < t \leq 6$	32		
$6 < t \leq 8$	20		
$8 < t \leq 10$	16		
$10 < t \leq 12$	10		

Calculate an estimate for the mean time.

Answer _____ hours [4]

16



Starting with $a = 2$, $b = 9$, $c = 10$ use the flow chart to find the values printed.

a	b	c	S	T
2	9	10		

Answer $a =$ _____, $b =$ _____, $c =$ _____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

17 One solution of $x^2 + 4x = 50$ lies between 5 and 6

Use the method of **trial and improvement** to find this solution correct to one decimal place.

Show all your working.

Answer $x =$ _____ [3]

18 **(a)** Find the highest common factor (HCF) of 64 and 96

Answer _____ [2]

(b) Find the lowest common multiple (LCM) of 21 and 70

Answer _____ [2]

19 Bags of coal weigh 12 kg, to the nearest kg.

Find the least and greatest total weight of 9 of these bags.

Answer least _____ kg

greatest _____ kg [2]

Examiner Only	
Marks	Remark

20 **(a)** Solve the equation $\frac{2x-4}{5}+\frac{x+11}{2}=2$

Show your working.

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [4]

(b) Solve the simultaneous equations $4x + 3y = 1$
$2x - y = -2$

Show your working.

A solution by trial and improvement will not be accepted.

Answer _____ [3]

21 The graph opposite shows the cumulative frequency of scores obtained in a darts tournament.

Examiner Only	
Marks	Remark

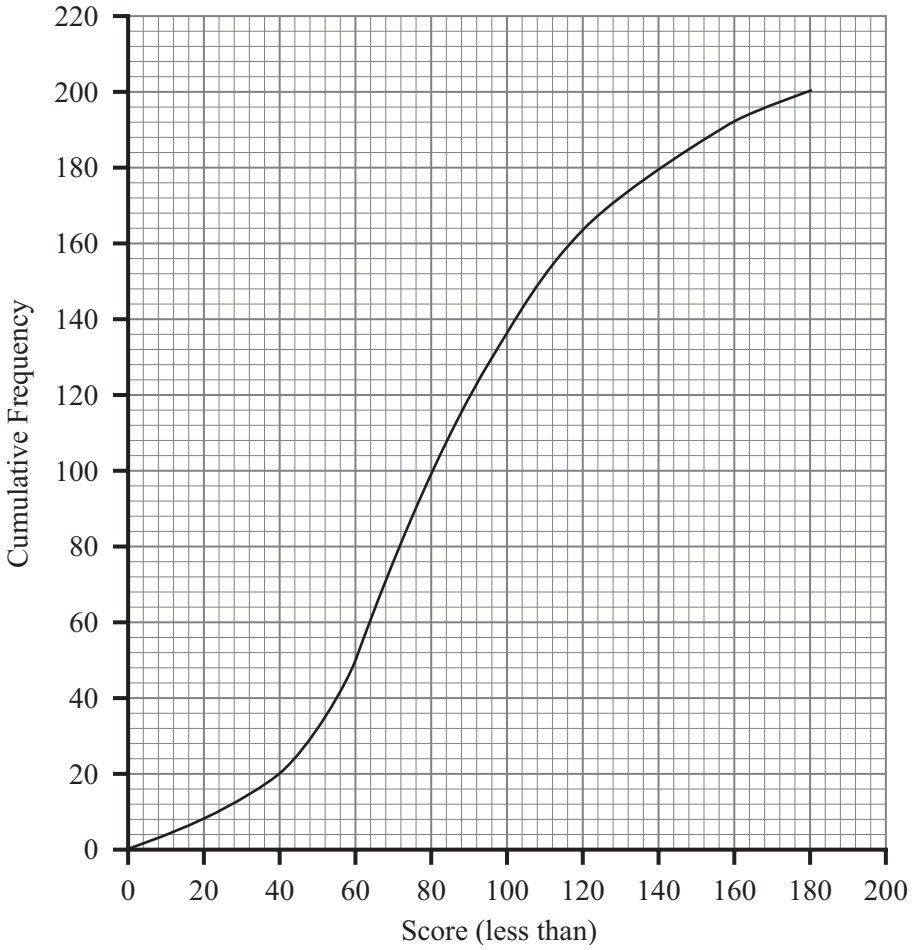
(a) Use the graph to estimate

(i) the median,

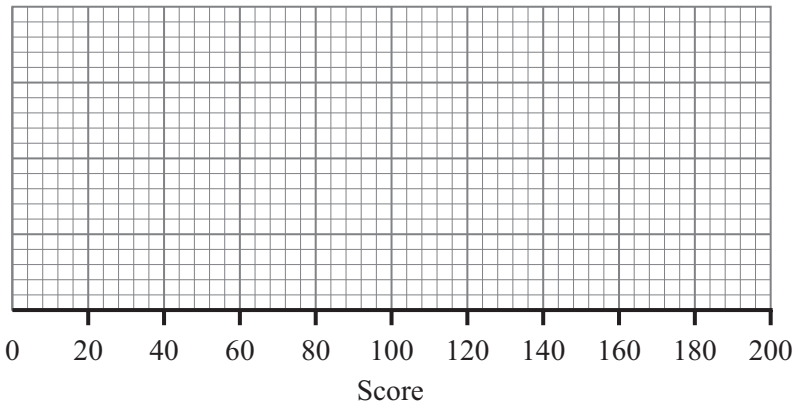
Answer _____ [1]

(ii) how many scores were more than 150

Answer _____ [2]



(b) From the graph draw a box plot.



[3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

22 The angle of elevation of the top of a telephone mast is 23° from a point 60 metres from the base of the mast on horizontal ground. Calculate the height of the mast.

Answer _____ m [4]

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23 A tea set has a sale price of £63.36 which is a saving of 12% on the original price.

What was the original price of the tea set?

Answer £ _____ [3]

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24 **(a)** Factorise $9a^2 - 3ay$

Answer _____ [2]

(b) **(i)** Factorise $x^2 + x - 6$

Answer _____ [2]

(ii) Hence solve the equation $x^2 + x - 6 = 0$

Answer _____ [1]

THIS IS THE END OF THE QUESTION PAPER