



Rewarding Learning

General Certificate of Secondary Education
2014

Centre Number

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Candidate Number

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Mathematics

Unit T3

(With calculator)



Higher Tier

[GMT31]

TUESDAY 27 MAY, 9.15am–11.15am

ML

TIME

2 hours, plus your additional time allowance.

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-nine** 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.

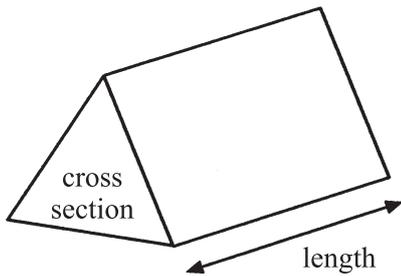
Quality or written communication will be assessed in **questions 19 and 24**.

You should have a calculator, ruler, compasses and a protractor.

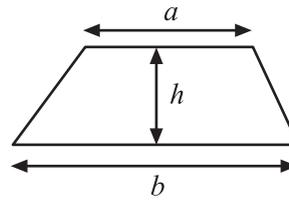
The Formula Sheet is on page 2.

Formula Sheet

Volume of prism = area of cross section \times length

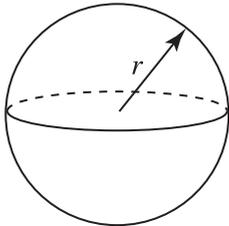


Area of trapezium = $\frac{1}{2}(a + b)h$



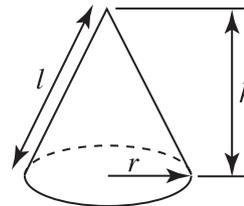
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

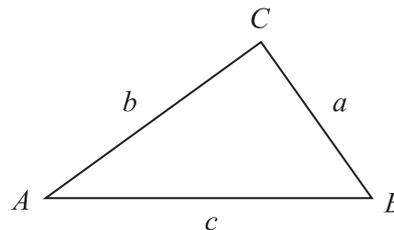


Quadratic Equation

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 The petrol tank of a lawnmower holds $\frac{2}{3}$ of a litre.

How many times can this lawnmower be completely filled from a 5 litre can?

Answer _____ [2]

Examiner Only

Marks	Remark
Total Question 1	

2 There are 150 Year 8 pupils in St. Kilda's Secondary School.

$\frac{3}{5}$ of these pupils come to school by bus.

24% of these pupils walk to school. The remainder come by car.

How many Year 8 pupils come to school by car?

Answer _____ [3]

Total Question 2

[Turn over

3 Bill has two options on how to pay for a car.

Option 1. Cash Price £9695

Option 2. A deposit of £1899 + 35 monthly payments of £146 + a final payment of £3785

Calculate which option is cheaper and by how much.

Answer Option _____ is cheaper by £ _____ [3]

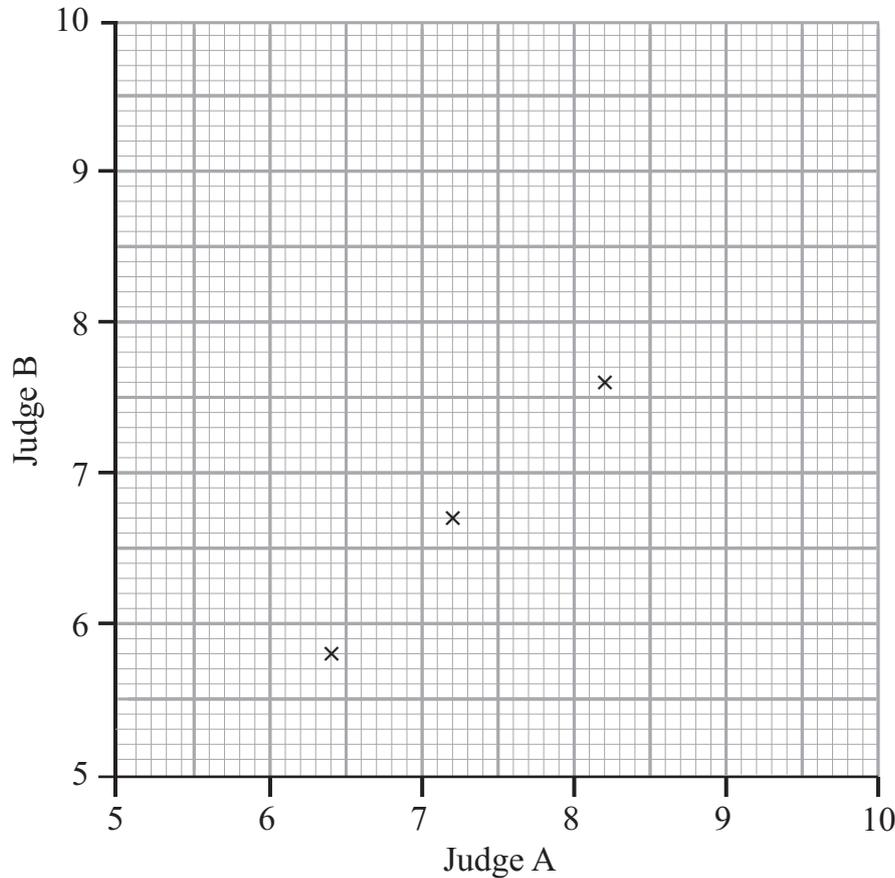
Examiner Only	
Marks	Remark
Total Question 3	
Total Question 4	

4 The average match attendance for Bidford United last week was 2350
This week the match attendance fell by 640
To the nearest whole number, what was the percentage fall on the match attendance?

Answer _____ % [2]

- 5 The table shows the marks awarded by two judges to seven competitors in a dancing competition.

Judge A	8.2	6.4	7.2	6.8	5.6	8.2	9.0
Judge B	7.6	5.8	6.7	6.8	5.2	8.6	9.2



- (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 7.7 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

Total Question 5

[Turn over

- 6 Look at the graph below. It shows the increase in height of 100 children over a period of time.

Increase in height (h cm)	$0 < h \leq 2$	$2 < h \leq 4$	$4 < h \leq 6$	$6 < h \leq 8$	$8 < h \leq 10$
Frequency	12	34	42	10	2

- (a) Show this information on a bar chart.



[3]

- (b) Write down the modal class interval.

Answer _____ [1]

- (c) Describe how you would construct a frequency polygon for the data.

_____ [2]

Examiner Only

Marks Remark

Total Question 6

7 Donna wants to investigate the hypothesis

‘Children play more computer games than adults.’

She surveys 10 girls in her class. She also surveys their parents.

Write down two reasons why her sample is unsuitable.

Reason 1 _____

_____ [1]

Reason 2 _____

_____ [1]

Examiner Only

Marks Remark

Total Question 7

8 A window cleaning firm cleans the windows of an office block.

The firm charges £50 plus £4 for each window they clean.

They clean w windows and charge £230

(a) Write an **equation** in terms of w using this information.

Answer _____ [2]

(b) Solve this equation to find the number of windows cleaned.

Answer _____ windows [2]

Total Question 8

[Turn over

10 Factorise fully

(a) $8 - 4x$

Answer _____ [1]

(b) $x^2 + 3x$

Answer _____ [1]

(c) $3x^2 - x$

Answer _____ [1]

Examiner Only

Marks Remark

Total Question 10

[Turn over

11 The diagram shows a triangle ABC and a straight line CD.

AB is parallel to CD.

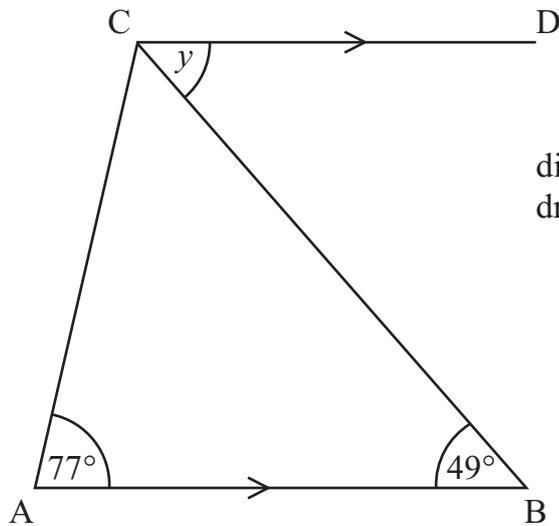


diagram not
drawn accurately

(a) Write down the size of the angle marked y

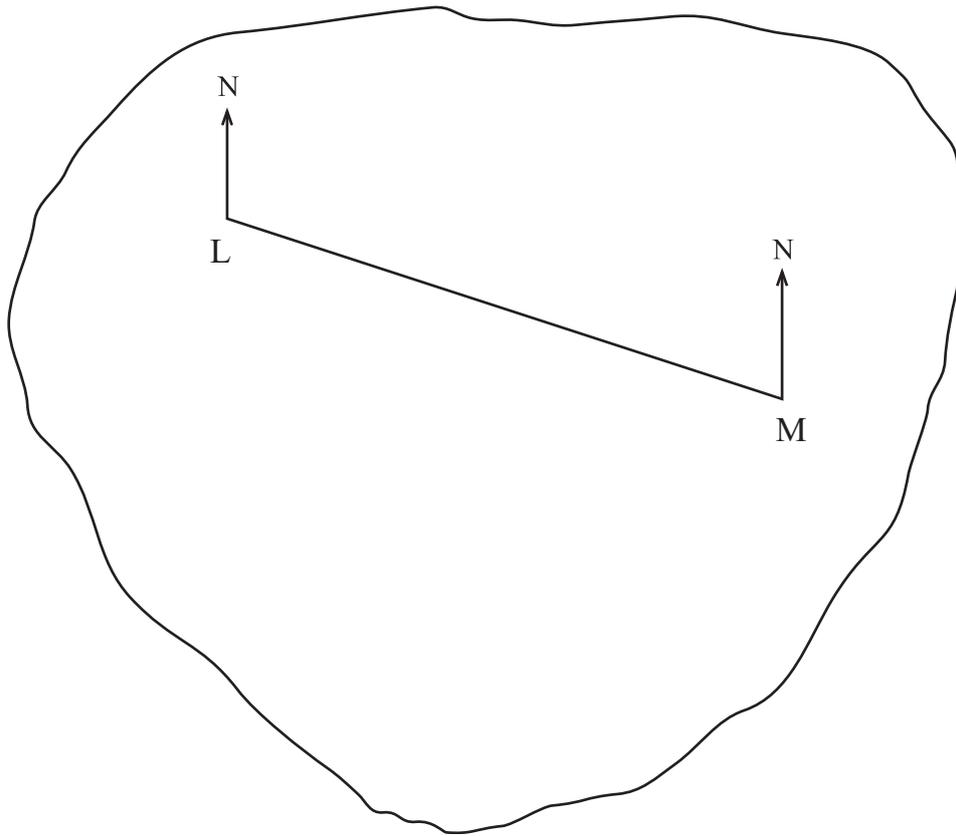
Answer $y =$ _____ $^{\circ}$ [1]

(b) Write down a reason for your answer.

Reason _____ [1]

Examiner Only	
Marks	Remark
Total Question 11	

12 A map of an island is shown below.
L and M are the positions of two houses on the island.



A third house, H, is on a bearing of 130° from L and on a bearing of 225° from M.

Mark the position of H on the diagram above.

[3]

Examiner Only	
Marks	Remark
Total Question 12	

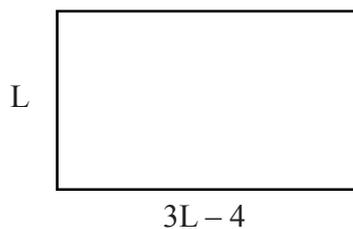
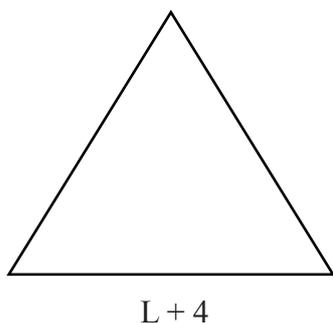
13 Calculate the area of a circle with a diameter of 11 cm.

Answer _____ [3]

Total Question 13	

[Turn over

- 14 An equilateral triangle has sides of length $(L + 4)$ and a rectangle has sides of length L and $(3L - 4)$ as shown.



diagrams not
drawn accurately

The **perimeter** of the triangle and the **perimeter** of the rectangle are equal.
Set up and solve an equation to find the value of L .
A solution by trial and improvement will not be accepted.

Answer $L =$ _____ [3]

Examiner Only	
Marks	Remark
Total Question 14	
Total Question 15	

- 15 Half of the chimpanzees in a zoo weigh less than 45 kg.

$\frac{4}{5}$ of the chimpanzees weigh less than 55 kg.

No chimpanzees weigh exactly 45 kg.

What fraction of the chimpanzees weigh between 45 kg and 55 kg?

Answer _____ [3]

16 Sammy borrows £400 for nine months.

He is charged 12.5% per annum simple interest.

How much does he have to pay back?

Answer £ _____ [3]

Examiner Only

Marks	Remark
Total Question 16	

17 The interior angle of a regular polygon is 144°

Work out the number of sides of the polygon.

Show your working out.

Answer _____ sides [3]

Total Question 17	

[Turn over

18

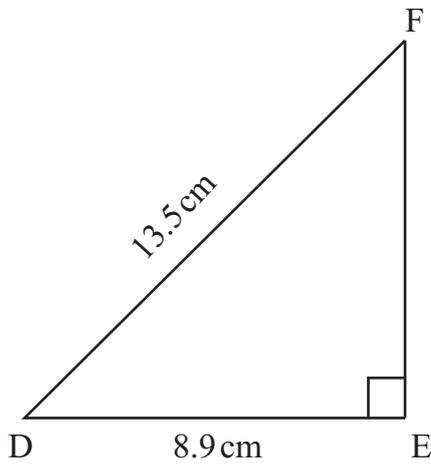


diagram not
drawn accurately

DEF is a right-angled triangle.

DF = 13.5 cm and DE = 8.9 cm.

Calculate the length of EF.

Answer EF = _____ cm [3]

Examiner Only	
Marks	Remark
Total Question 18	

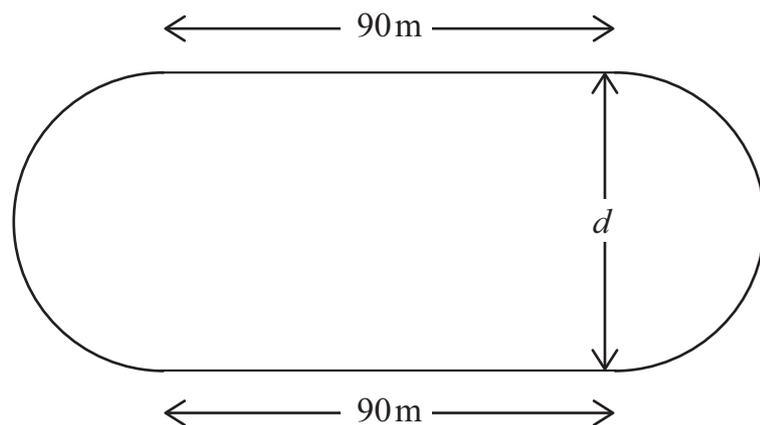
Quality of written communication will be assessed in this question.

19 The diagram below represents a running track.

It has two parallel straight lines and two semicircles.

The straight lines are each 90 metres in length.

The running track has a total perimeter of 400 metres.



Calculate the distance, d , between the two straight lines.

Examiner Only

Marks Remark

Total Question 19

Answer $d =$ _____ metres [4]

[Turn over

- 21 Jill asked a number of pupils in her year group how much they paid for their mobile phone. The results are shown in the frequency table.

Price (£ P)	Frequency
$0 < P \leq 40$	4
$40 < P \leq 80$	14
$80 < P \leq 120$	65
$120 < P \leq 160$	64
$160 < P \leq 200$	33

Write down the class interval that contains the median price.

Answer _____ [1]

Examiner Only	
Marks	Remark

Total Question 21

- 22 The number of customer complaints received by an airline during a year was 1148
This was 18% down on the year before.
How many customer complaints did the airline receive during the year before?

Answer _____ [3]

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Total Question 22

[Turn over

23 Jack looked at the books on the floor.

“You must have at least one hundred books there” said his sister Katie.
 “Not quite” said Jack, “but I do have a problem in packing them into boxes.
 If I pack them away with 6 in a box, I am one book short of filling the last
 box and the same happens if I try to pack them with 8 in a box. If however
 I pack them with 5 in a box, I have one book left over. I’m not sure what to
 do!”

How many books are there on the floor?

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 23	

Quality of written communication will be assessed in this question.

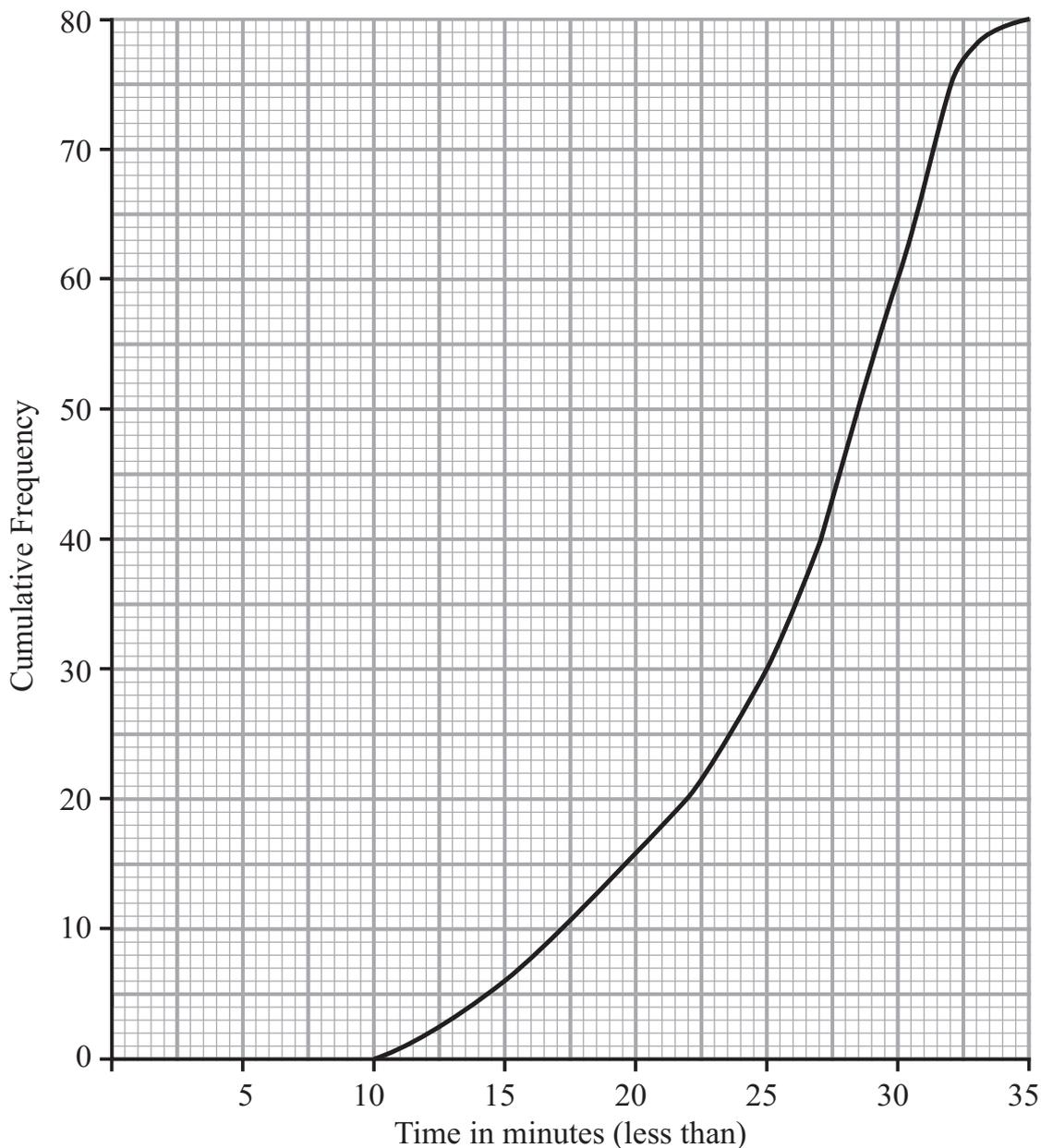
- 24 A company decreases its debt by 18% each month.
At the start of January the debt is £12 500
The target is to reduce the debt to half its value by the end of March.
Will the target be achieved? Explain your answer.

Answer _____ because _____
_____ [3]

Examiner Only	
Marks	Remark
Total Question 24	

[Turn over

- 25 The time taken by a number of adults to do a survey was recorded. The cumulative frequency graph for the results is shown below.



- (a) Use the graph to estimate the median.

Answer _____ minutes [1]

- (b) Use the graph to estimate the inter-quartile range.

Answer _____ minutes [2]

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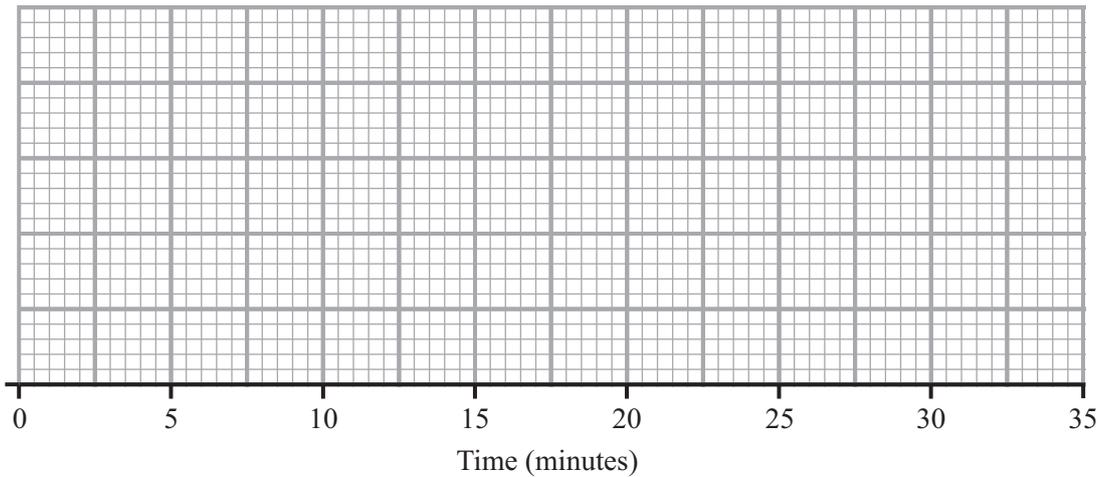
Marks Remark

Total Question 25

26 The times, in minutes, taken by 19 pupils to do a homework are listed in order below.

6, 9, 11, 14, 15, 16, 17, 18, 18, 19, 21, 21, 23, 24, 25, 27, 29, 31

Draw a box plot for this data on the grid below.



[3]

Examiner Only	
Marks	Remark
Total Question 26	

[Turn over

28 The diagram shows a trapezium, EFGH.

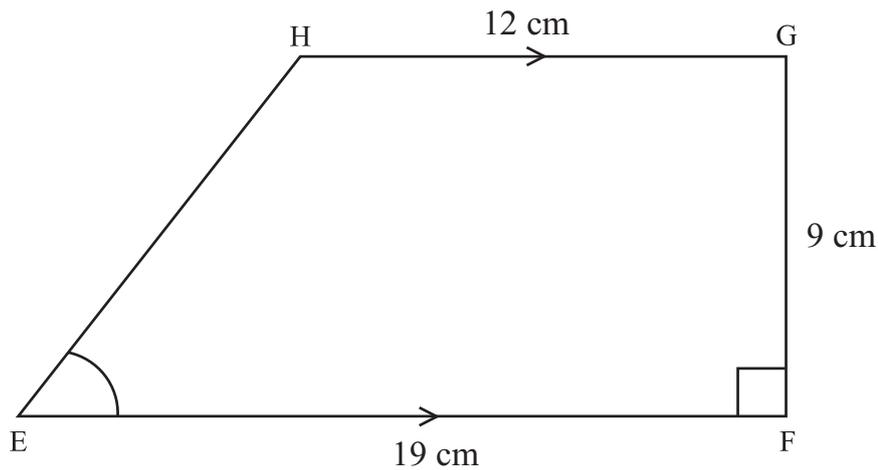


diagram not
drawn accurately

EF is parallel to HG. Angle $EFG = 90^\circ$

EF = 19 cm, FG = 9 cm and HG = 12 cm.

Calculate the size of angle HEF. Write down your answer correct to 1 decimal place.

Examiner Only

Marks	Remark
Total Question 28	
Answer _____° [3]	

29 To the nearest centimetre, $p = 13$ cm and $q = 8$ cm.

(a) Calculate the least value of pq

Answer _____ [2]

(b) Calculate the greatest value of $\frac{q}{p}$

Total Question 29

8799.03 ML

Answer _____ [2]

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Question Number	Marks
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Total Marks	
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