



Rewarding Learning

General Certificate of Secondary Education  
January 2015

Centre Number

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Candidate Number

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## Mathematics

Unit T4

(With calculator)



Higher Tier



[GMT41]

\*GMT41\*

FRIDAY 9 JANUARY 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 eighteen** 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 8**.

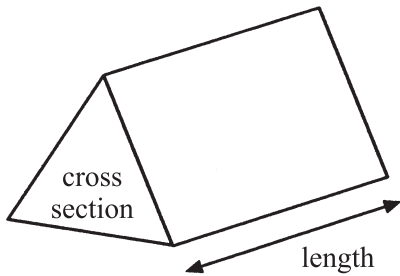
You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

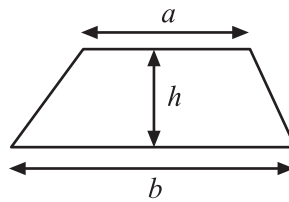


# Formula Sheet

**Volume of prism** = area of cross section  $\times$  length

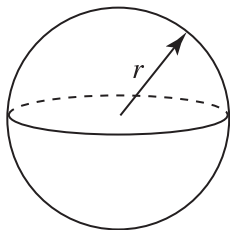


**Area of trapezium** =  $\frac{1}{2}(a + b)h$



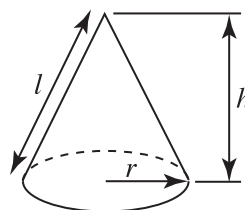
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

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

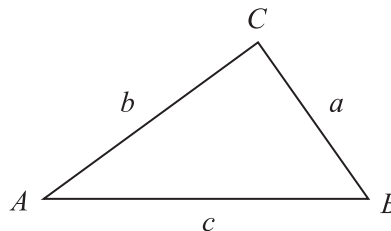


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

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



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

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

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





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**(Questions start overleaf)**

9313

**[Turn over**



\*24GMT4103\*

- 1 In a survey, a group of people were asked to state their weekly wage. The results are shown.

Weekly wage (£)	Frequency	$\leq$ (£)	Cumulative frequency
$0 < w \leq 100$	4	100	4
$100 < w \leq 200$	16	200	20
$200 < w \leq 300$	25	300	
$300 < w \leq 400$	32	400	
$400 < w \leq 500$	54	500	
$500 < w \leq 600$	25	600	
$600 < w \leq 700$	20	700	
$700 < w \leq 800$	6	800	
$800 < w \leq 900$	2	900	

(a) Complete the cumulative frequency column. [1]

(b) Draw the cumulative frequency graph on the axes provided opposite. [3]

(c) Use your graph to estimate

(i) the median,

Answer £ \_\_\_\_\_ [1]

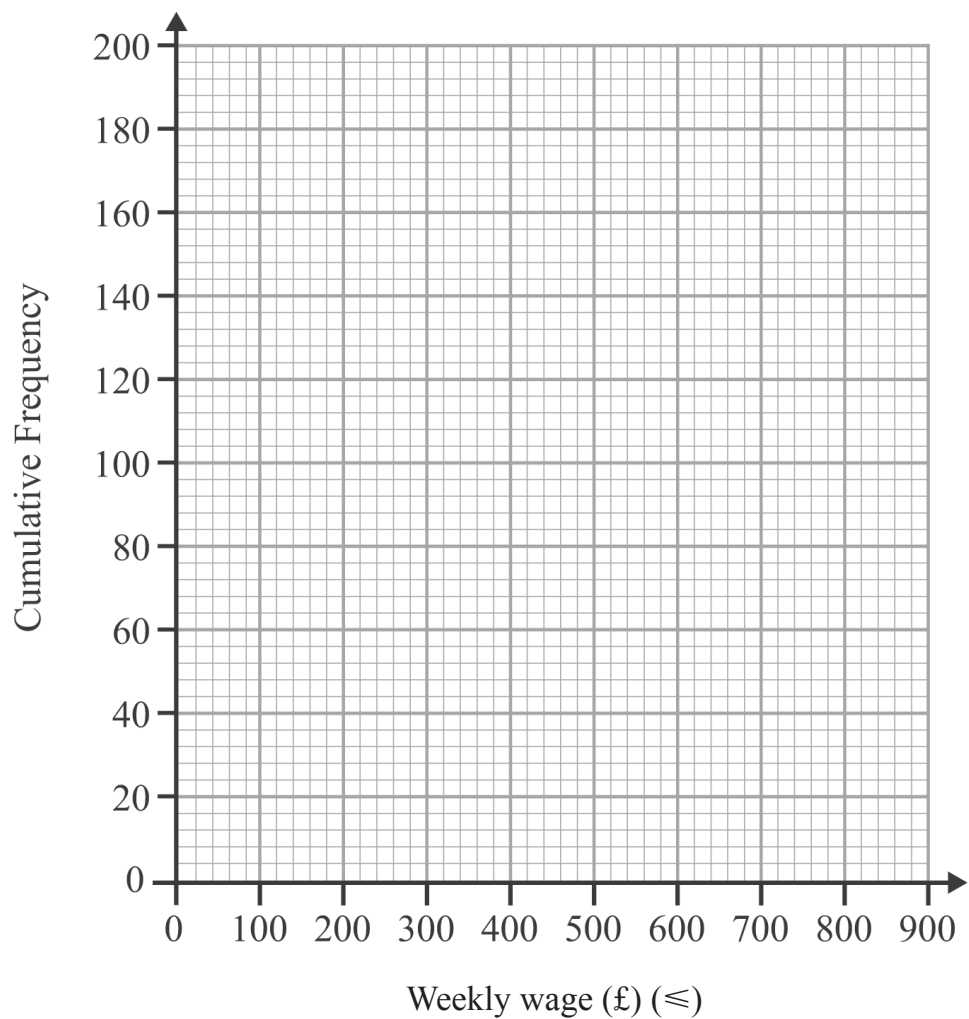
(ii) the inter-quartile range,

Answer £ \_\_\_\_\_ [2]

(iii) the percentage of people who earn at least £640 per week.

Answer \_\_\_\_\_ % [2]





[Turn over



- 2 A bed has a sale price of £257.40  
This is a saving of 22% on the original price.

What was the original price of the bed?

Answer £ \_\_\_\_\_ [3]

- 3 Find the lowest common multiple (LCM) of 54 and 90

Answer \_\_\_\_\_ [2]



4 (a) Solve the simultaneous equations

$$\begin{aligned}9x + 4y &= 51 \\5x + y &= 32\end{aligned}$$

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

Answer  $x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_ [3]

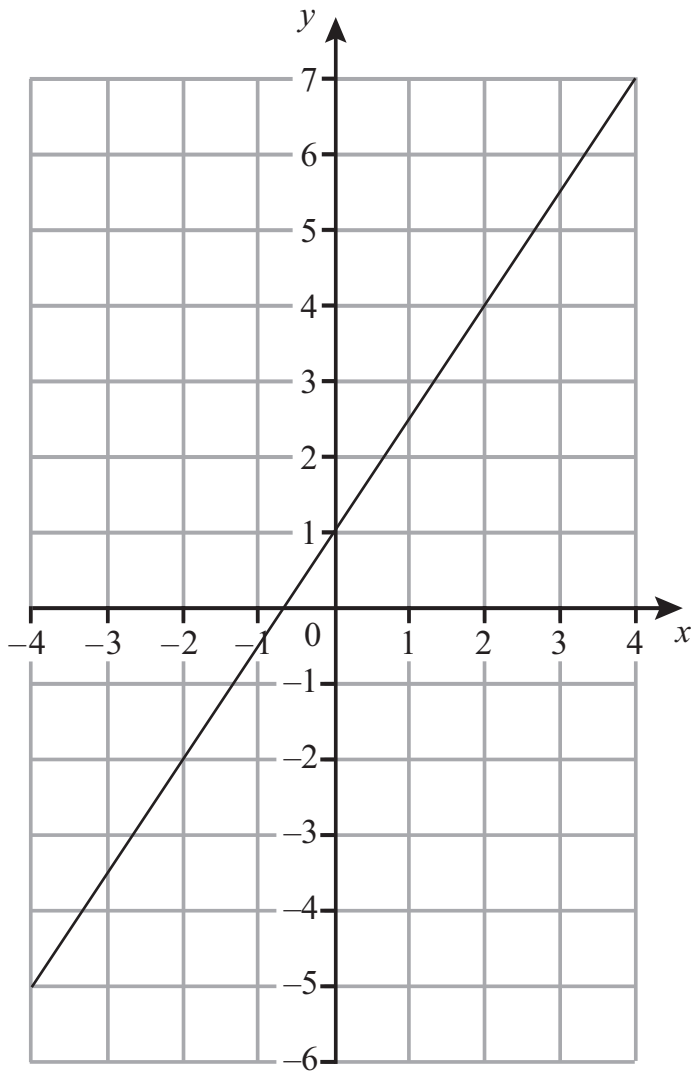
(b) Solve the equation

$$\frac{2x - 1}{5} + \frac{4x + 5}{10} = \frac{5}{2}$$

Answer  $x =$  \_\_\_\_\_ [4]



5



(a) Write down the gradient of the line drawn above.

Answer \_\_\_\_\_ [1]

(b) Hence write down the equation of this line.

Answer \_\_\_\_\_ [2]





6

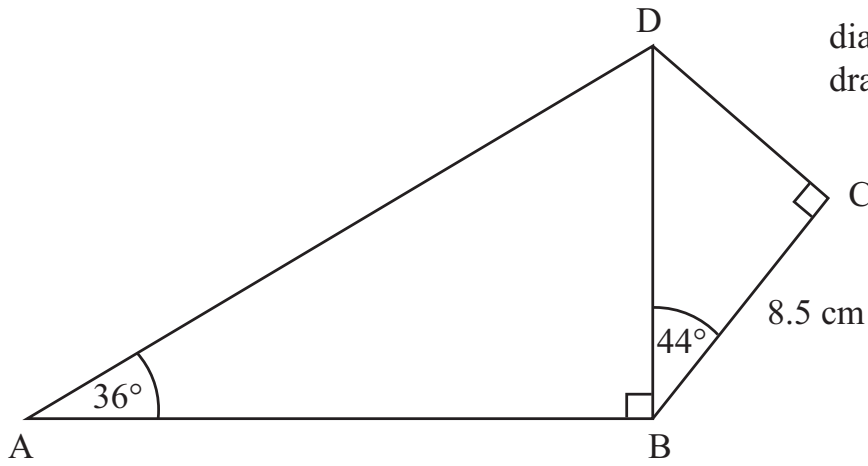


diagram not  
drawn accurately

ABCD is a quadrilateral. Angles ABD and BCD are both right angles.

Angle DBC =  $44^\circ$  Angle DAB =  $36^\circ$

BC = 8.5 cm.

Calculate the length of AD.

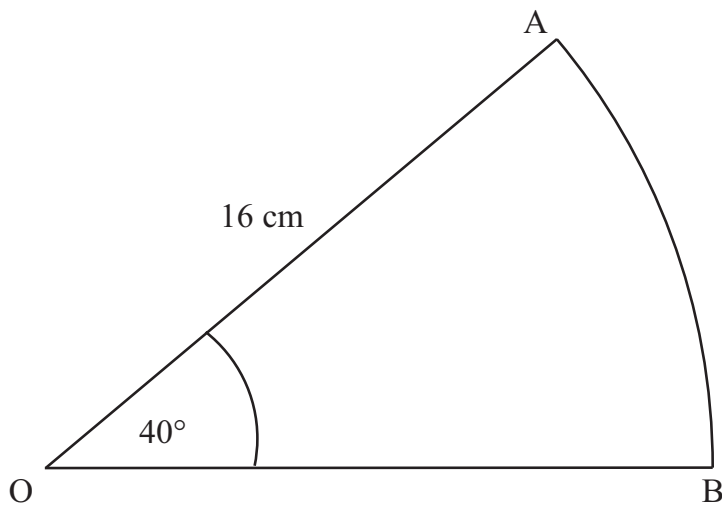
Answer \_\_\_\_\_ cm [6]

[Turn over



7 AOB is a sector of a circle, radius 16 cm.

Angle AOB =  $40^\circ$



Work out the perimeter of the sector AOB.

Answer \_\_\_\_\_ cm [3]



Quality of written communication will be assessed in this question.

- 8 16 buckets each hold 8 litres, to the nearest litre.  
Find the largest and smallest total volume of the 16 buckets.  
Explain your reasoning clearly.

[3]

- 9 (a) Expand and simplify  $(5x + 2)(4x - 3)$

Answer \_\_\_\_\_ [2]

- (b) Simplify  $\frac{x^2 + 4x}{x^2 - 16}$

Answer \_\_\_\_\_ [3]

- (c) Factorise  $8ax^2 - 26axy + 15ay^2$

Answer \_\_\_\_\_ [3]

[Turn over



**10** Find the equation of the line through  $(0, -5)$  which is perpendicular to the line  $y = 4x + 9$

Answer \_\_\_\_\_ [2]

**11** P is inversely proportional to the square of Q.  
 $P = 6$  when  $Q = 3$

**(a)** Express P in terms of Q.

Answer \_\_\_\_\_ [2]

**(b)** Hence

**(i)** find the value of P when  $Q = 4$

Answer \_\_\_\_\_ [1]

**(ii)** find the value of Q when  $P = 24$

Answer \_\_\_\_\_ [2]



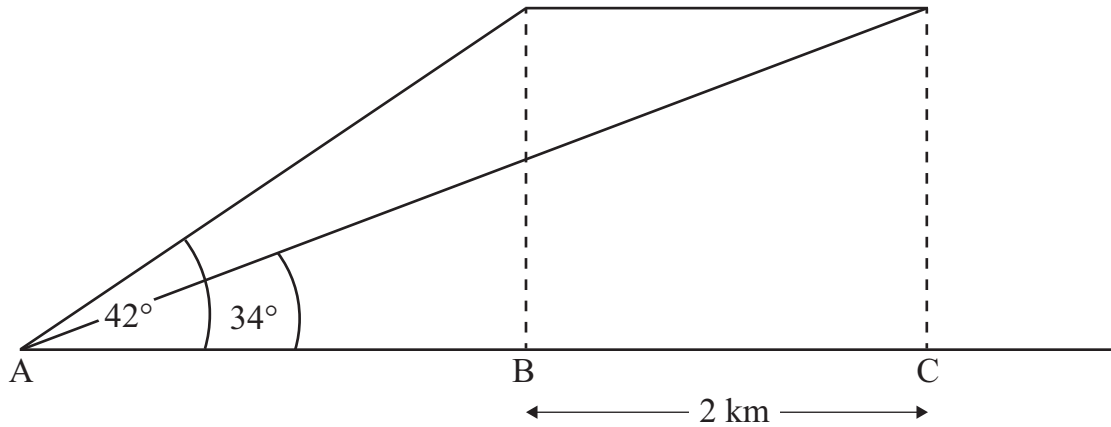
12 Solve  $3y^2 - 8y + 2 = 0$ , correct to 2 decimal places.

Answer \_\_\_\_\_ [3]



- 13 A, B, C are three points in a straight horizontal line.  
A plane is flying horizontally directly above ABC.  
When the plane passes over the point B, the angle of elevation from A is  $42^\circ$ .  
When the plane passes over the point C, the angle of elevation from A is  $34^\circ$ .  
The horizontal distance between B and C is 2 km.

Find the height of the plane above ABC to the nearest km.



Answer \_\_\_\_\_ km [6]



14 (a) Solve

(i)  $7^x = 1$

Answer  $x =$  \_\_\_\_\_ [1]

(ii)  $2^y = \frac{1}{32}$

Answer  $y =$  \_\_\_\_\_ [1]

(b) Evaluate  $81^{-\frac{3}{4}}$

Answer \_\_\_\_\_ [1]

(c)  $(3^a)^{b+1} \times \frac{2^c}{4} = 3^{c+a} \times 2$

Find possible values of  $a$ ,  $b$  and  $c$ .

Answer  $a =$  \_\_\_\_\_,  $b =$  \_\_\_\_\_,  $c =$  \_\_\_\_\_ [3]

[Turn over



15 The lengths of times in minutes for a group of people to complete a task are shown.

Time $t$ (mins)	Frequency
$0 < t \leq 5$	9
$5 < t \leq 8$	12
$8 < t \leq 12$	10
$12 < t \leq 18$	15
$18 < t \leq 23$	11
$23 < t \leq 30$	14
$30 < t \leq 35$	6

- (a) Draw a histogram on the axes provided opposite to illustrate this data. [3]
- (b) Estimate the number of people who took more than 19 minutes to complete the task.

Answer \_\_\_\_\_ [3]

A stratified sample of 24 people is selected from those who took less than 20 minutes to complete the task.

- (c) Estimate how many of this sample took less than 10 minutes.

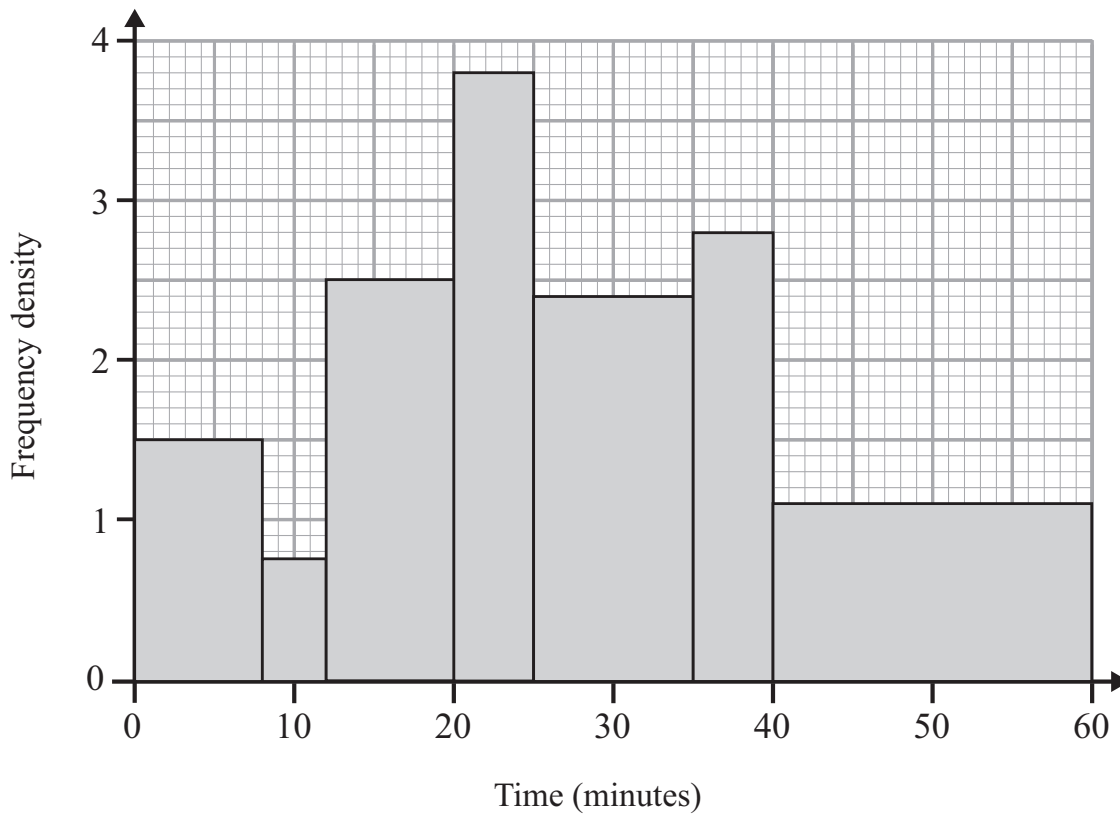
Answer \_\_\_\_\_ [2]







The times for a second group of people are shown in the histogram below.



(d) Estimate the mean time for this second group.

Answer \_\_\_\_\_ minutes [4]



(e) Estimate the median time for this second group.

Answer \_\_\_\_\_ minutes [3]

[Turn over



- 16 In a sporting competition 55% of the total prize money went to the winner, competitor A.  
 $\frac{3}{5}$  of the remaining money went to the runner-up, competitor B, and the rest of the money was split between competitors C, D and E who came 3rd, 4th and 5th respectively. C got 3 times as much as E and D got twice as much as E. If competitor D received £1200, how much did the winner receive?

Answer £ \_\_\_\_\_ [4]



17 Solve the simultaneous equations  $y = 3x - 1$   
 $3x^2 + 2y^2 = 35$

Answer \_\_\_\_\_ [7]

[Turn over



18 Two cars are travelling away from a crossroads on two straight roads.

At noon, one car is at A, 100m from the crossroads, C, and the other is at B, 80m from C. The distance AB is 82.3m. A short time later the first car has travelled 200m from A to D. The second car has travelled 250m from B to E.

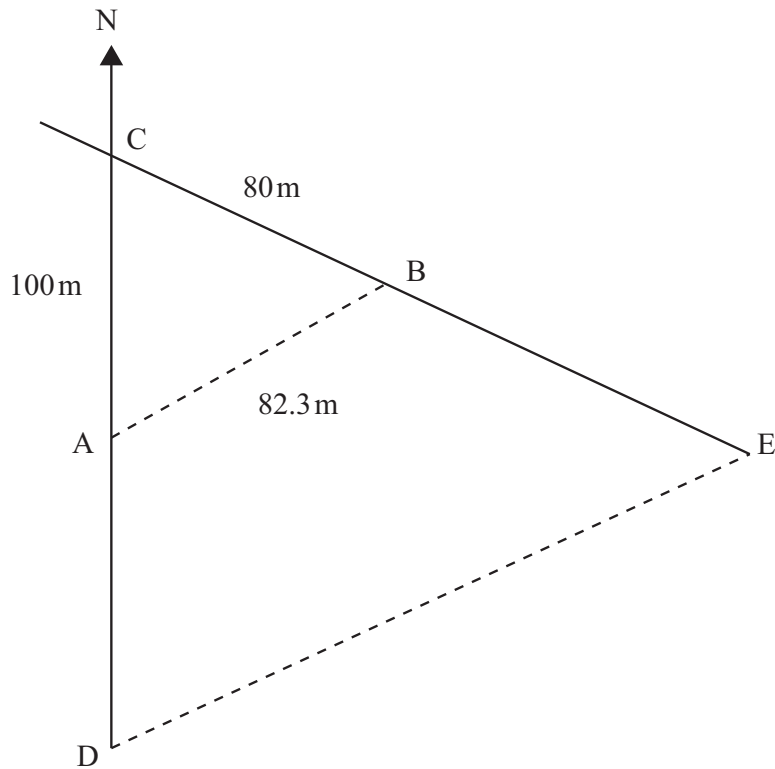


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drawn accurately

(a) Find the distance, DE, between the two cars.

Answer \_\_\_\_\_ m [5]



(b) Find the bearing of E from D.

Answer \_\_\_\_\_ ° [3]

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**THIS IS THE END OF THE QUESTION PAPER**

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For Examiner's use only	
Question Number	Marks
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<b>Total Marks</b>	
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Examiner Number

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