



Rewarding Learning

General Certificate of Secondary Education
January 2014

Centre Number

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Candidate Number

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Mathematics

Unit T4

(With calculator)



Higher Tier

[GMT41]

GMT41

FRIDAY 10 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 twenty** 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 3(b) and 10**.

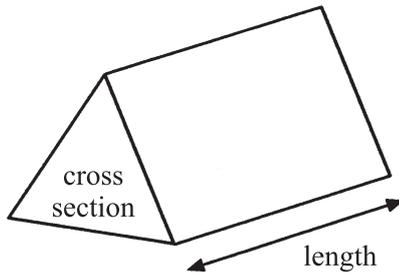
You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

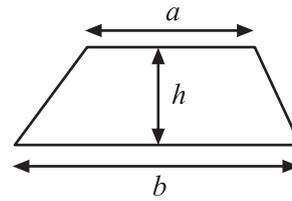


Formula Sheet

Volume of prism = area of cross section \times length

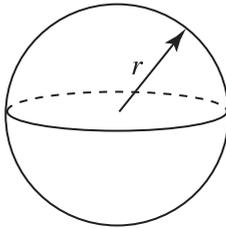


Area of trapezium = $\frac{1}{2}(a + b)h$



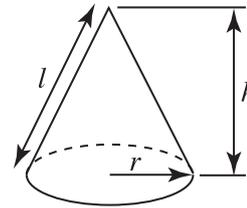
Volume of sphere = $\frac{4}{3}\pi r^3$

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

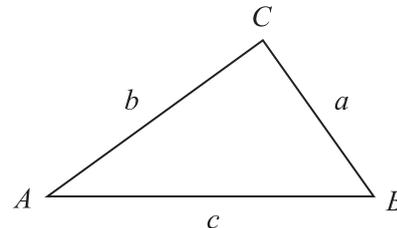


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 = $\frac{1}{2} ab \sin C$



1 On every swing, a pendulum reaches 60% of the previous distance.

The pendulum swings 1.8 metres on its first swing.

After how many swings will the distance first fall below 20 cm?

Answer _____ swings [2]

Examiner Only

Marks	Remark
Total Question 1	

2 During a very cold winter a glacier increased its volume by 32%.

At the end of the winter its volume was found to be 6864 km^3 .

What was its original volume at the start of that winter?

Answer _____ km^3 [3]

Total Question 2

[Turn over

8693



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Quality of written communication will be assessed in part (b) of this question.

3 The information given below relates to the ages (in years) of members of a badminton club.

Lower Quartile = 28

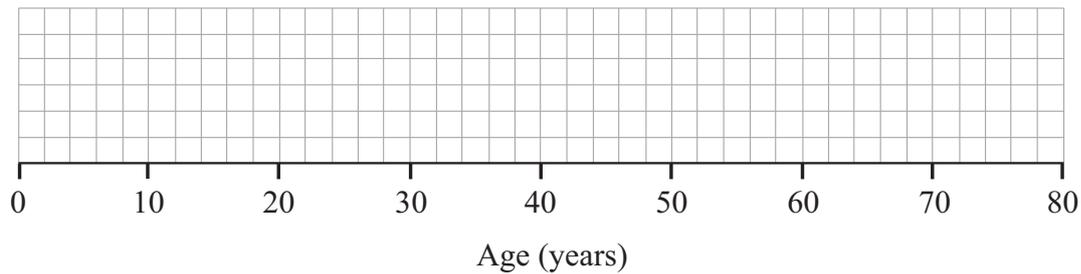
Median = 32

Upper Quartile = 54

Youngest = 12

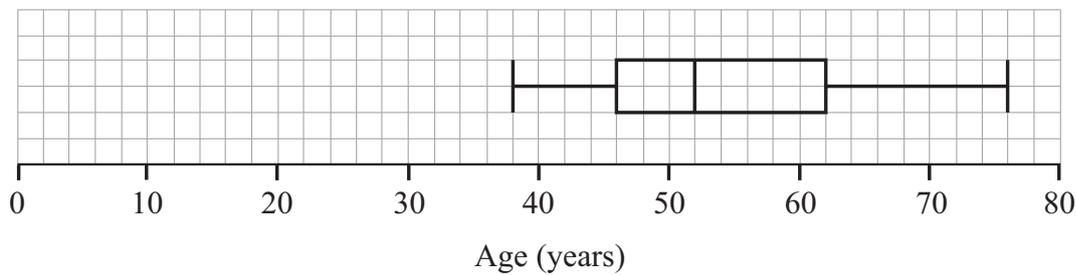
Range = 58

(a) Draw a box plot to show this information.



[3]

(b) The box plot below shows the age distribution of members of a bowls club.



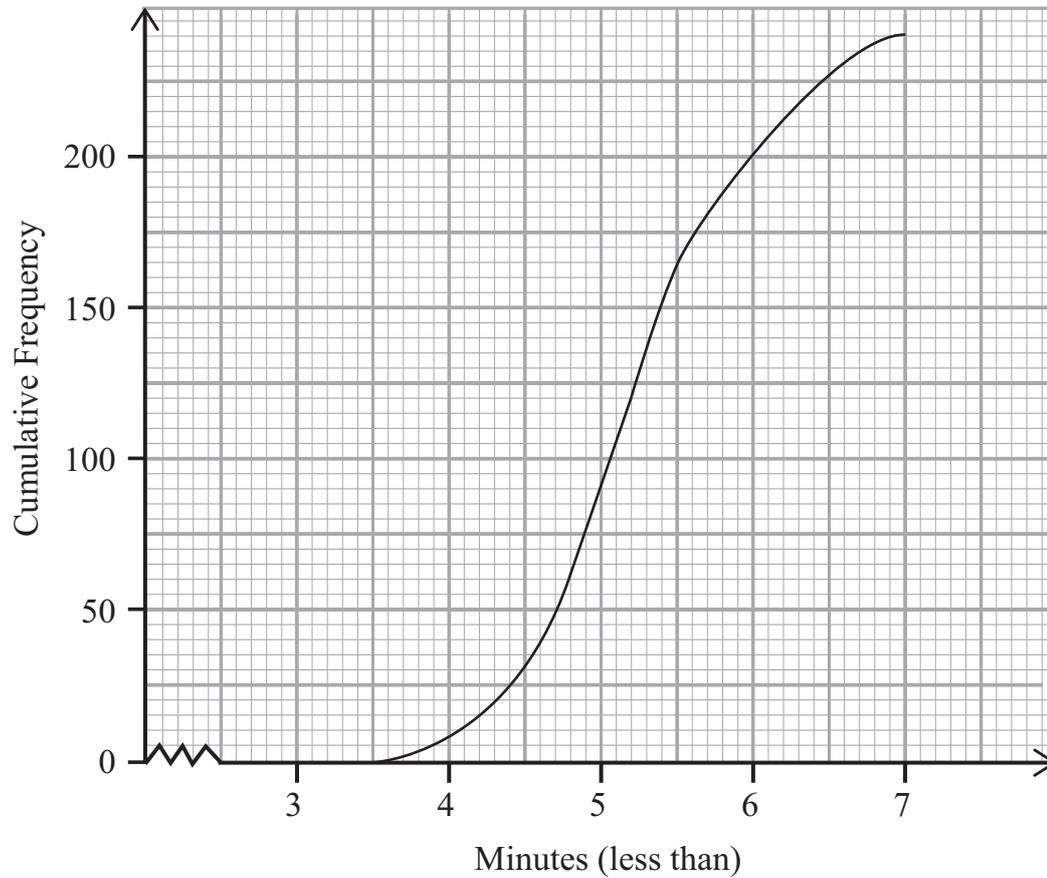
Compare the age distributions of the members of the badminton club and the bowls club.

_____ [2]

Examiner Only	
Marks	Remark
Total Question 3	



- 4 The cumulative frequency curve represents the times taken to run 1500 m by each of the members of a running club.



- (a) Use the graph to estimate the interquartile range.

Answer _____ minutes [2]

- (b) Any member taking more than $5\frac{1}{2}$ minutes has to do extra training. Use the graph to estimate the percentage of runners who have to undertake extra training.

Answer _____ % [2]

Examiner Only

Marks Remark

Total Question 4

[Turn over





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(Questions continue overleaf)
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- 6 (a) R, S, T and U are points on the circumference of a circle, centre O.
The angle RUS is 46° and the angle URT is 36°

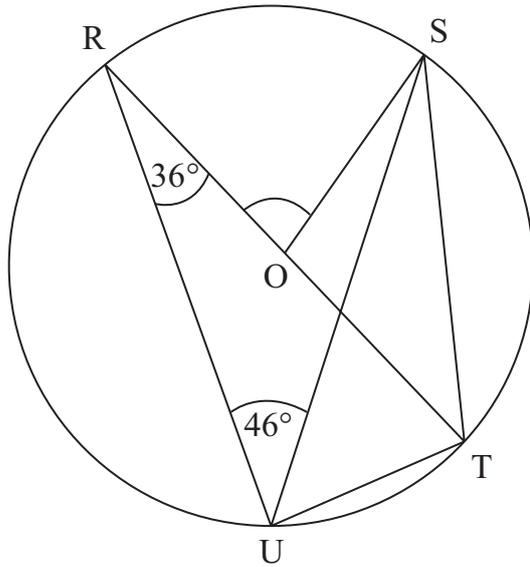


diagram not
drawn accurately

Calculate

- (i) the angle RTS,

Answer _____ $^\circ$ [1]

- (ii) the angle ROS,

Answer _____ $^\circ$ [1]

- (iii) the angle SUT.

Answer _____ $^\circ$ [1]

Examiner Only	
Marks	Remark



- (b) D, E, F and G are points on the circumference of the circle below.
The angle FDG = 62° and the angle DFG = 31°
HG is a tangent to the circle.

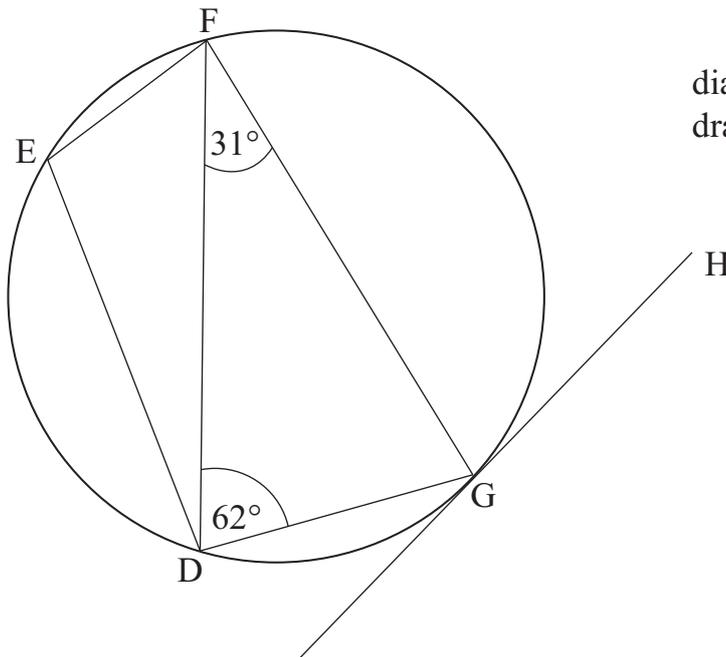


diagram not
drawn accurately

- (i) Write down the size of angle FGH.

Answer _____ $^\circ$ [1]

- (ii) Calculate the size of angle DEF.

Answer _____ $^\circ$ [2]

Examiner Only

Marks	Remark
Total Question 6	

[Turn over



- 8 (a) Solve the simultaneous equations
Show your working.
A solution by trial and improvement
will not be accepted.

$$3x + 2y = 10$$

$$2x - 6y = 3$$

Answer $x = \underline{\hspace{2cm}}$, $y = \underline{\hspace{2cm}}$ [3]

- (b) Hence write down the coordinates of the point of intersection of the two lines whose equations are

$$3x + 2y = 10 \quad \text{and} \quad 2x - 6y = 3$$

Answer ($\underline{\hspace{2cm}}$, $\underline{\hspace{2cm}}$) [1]

Examiner Only	
Marks	Remark
Total Question 8	

[Turn over



Quality of written communication will be assessed in this question.

10 (a) The test results for a class are recorded as

26 26 29 32 37 38 40 41 99

Why would the mean **not** be the **most suitable** average to use when commenting on these results?

_____ [1]

(b) In another test the results are recorded as

18 18 18 18 19 27 29 36 39 47 59 62

Which average would be **least suitable** to use when commenting on these results? Give a reason for your answer.

_____ because _____ [1]

Examiner Only

Marks Remark

Total Question 10

[Turn over



- 12 The electrical resistance, R ohms, of a wire varies inversely as the square of its diameter, d mm.
A wire, 6 mm in diameter, made from a certain alloy has a resistance of 36 ohms.

(a) Express R in terms of d .

Answer $R =$ _____ [3]

- (b) (i) Work out the electrical resistance of a wire made from the same alloy whose diameter is 9 mm.

Answer _____ ohms [1]

- (ii) Another wire made from the same alloy has an electrical resistance of 20 ohms.
Work out the diameter of this wire.

Answer _____ mm [2]

Examiner Only

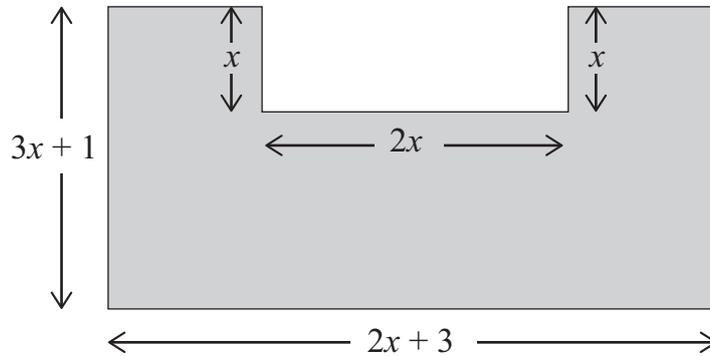
Marks Remark

Total Question 12

[Turn over



- 13** A rectangular piece of card has a length of $(2x + 3)$ cm and a width of $(3x + 1)$ cm.
A rectangle of length $2x$ cm and width x cm is cut from it as shown in the diagram.
The remaining piece of card, shown shaded in the diagram, has an area of 25 cm^2 .



- (a) Show that $4x^2 + 11x - 22 = 0$

[3]

- (b) Solve the equation $4x^2 + 11x - 22 = 0$ to find the value of x .
Give your answer to 3 significant figures.

Answer $x =$ _____ [3]



Examiner Only	
Marks	Remark
Total Question 13	

15 Town B is 73 km from Town A on a bearing of 069°

Town C is 64 km from A on a bearing of 112°

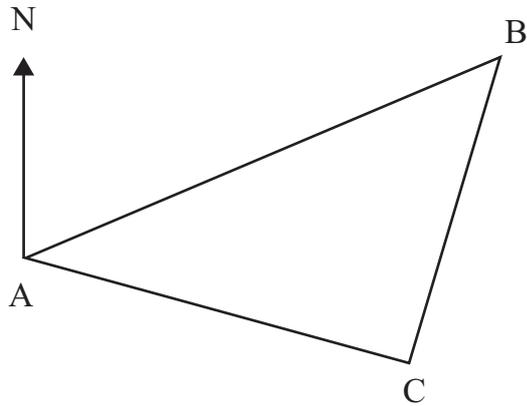


diagram not
drawn accurately

Calculate

(a) the distance between B and C,

Answer _____ km [3]

(b) the area of triangle ABC,

Answer _____ km^2 [2]



Examiner Only	
Marks	Remark

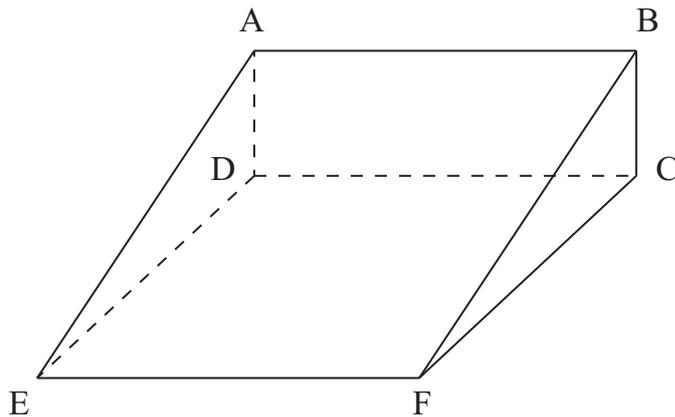
(c) the bearing of B from C.

Examiner Only	
Marks	Remark

Answer _____ ° [4]

Total Question 15

16 ABCDEF is a ramp which is in the shape of a triangular prism.
 AB = 120 cm, FC = 90 cm and BC = 30 cm. Angle FCB = 90°
 Calculate the angle between EB and the base DCFE.



Total Question 16

Answer _____ ° [3]

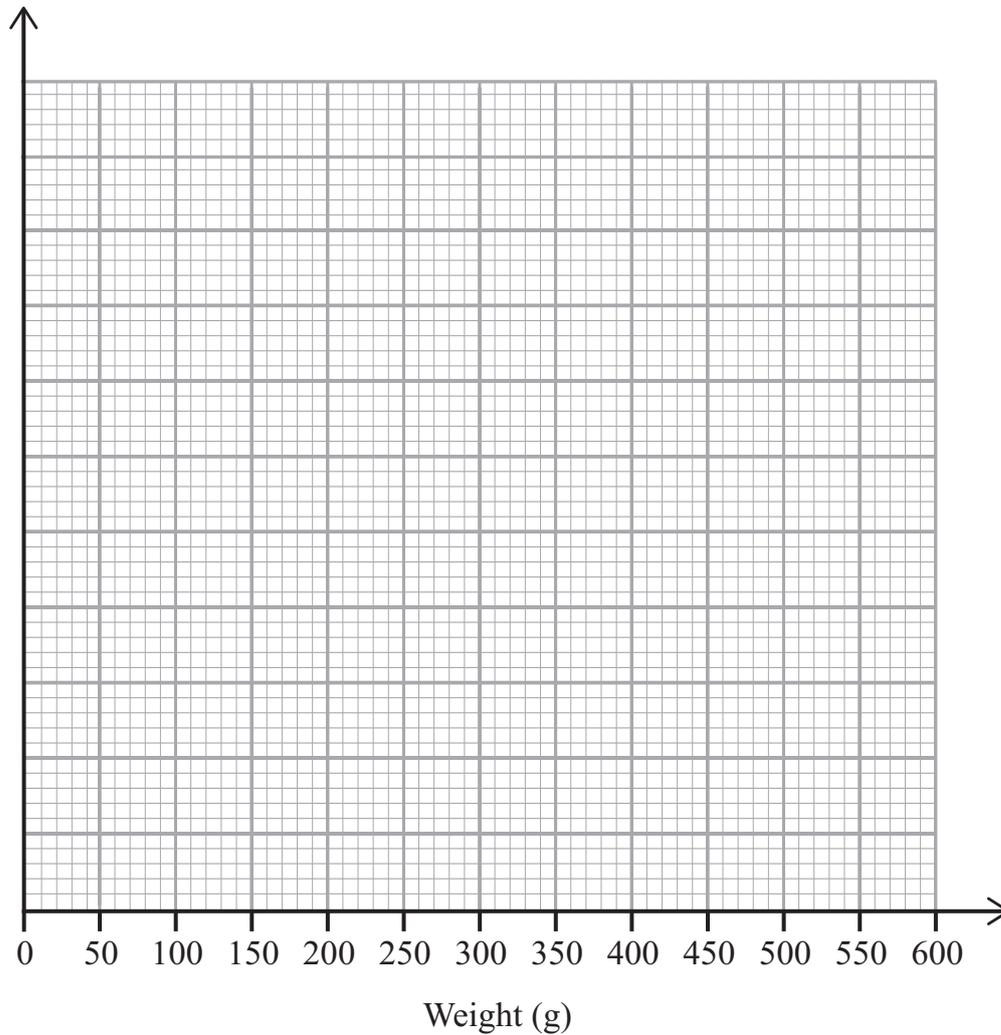
[Turn over



- 17 (a) The weights of packages passing through a Post Office in one day are recorded below.

Weight (g)	Frequency
$0 < w \leq 100$	80
$100 < w \leq 150$	200
$150 < w \leq 250$	160
$250 < w \leq 400$	540
$400 < w \leq 550$	360
$550 < w \leq 600$	130

On the axes below draw a clearly labelled histogram to illustrate this information.



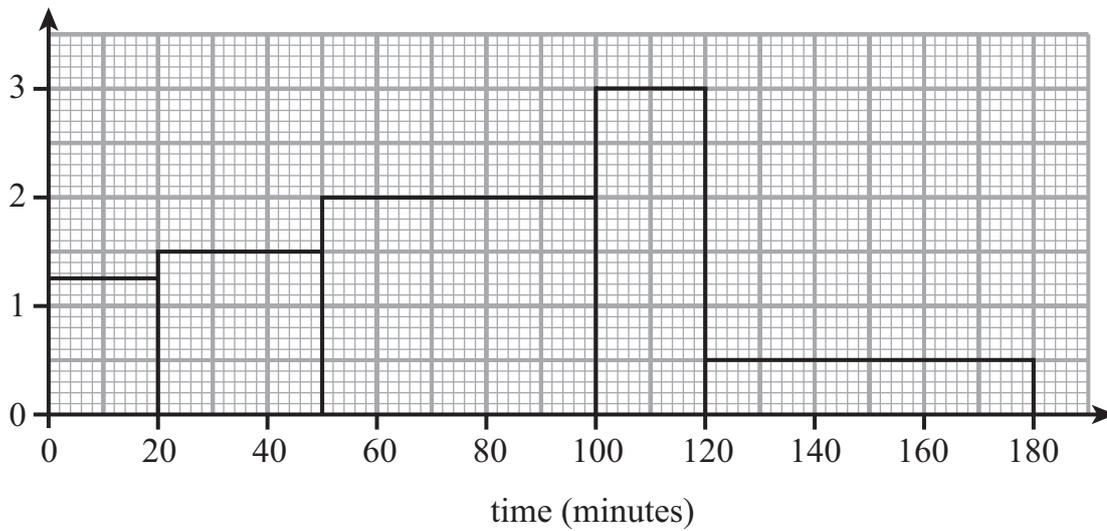
[3]

Examiner Only	
Marks	Remark



(b) The histogram illustrates how much time cars spent in a car park.

frequency
density



(i) Calculate an estimate for the mean time.

Answer _____ minutes [4]

(ii) Half the cars using the car park were there for more than M minutes.

Calculate an estimate for the value of M.

Answer _____ minutes [3]

Examiner Only

Marks Remark

Total Question 17

[Turn over



19 Simplify fully $\frac{3}{x+3} + \frac{2x+21}{x^2+x-6}$

Examiner Only

Marks	Remark
Total Question 19	

Answer _____ [5]

20 Given that $\frac{16^a}{9^b} = 54^{\frac{1}{2}}$
find the values of a and b .

Answer $a =$ _____ , $b =$ _____ [5]

Total Question 20	

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

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