



Rewarding Learning

General Certificate of Secondary Education
2014

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Candidate Number

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Mathematics

Unit T4

(With calculator)



Higher Tier

[GMT41]

ML

TUESDAY 27 MAY, 9.15am–11.15am

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-three** 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 6 and 12**.

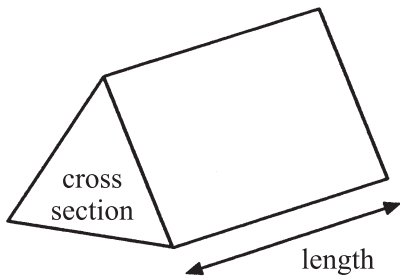
You should have a calculator, ruler, compasses and a protractor.

The Formula Sheet is on page 2.

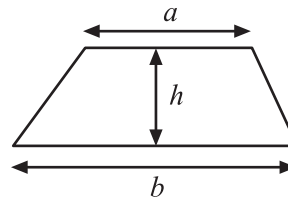
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Formula Sheet

Volume of prism = area of cross section \times length

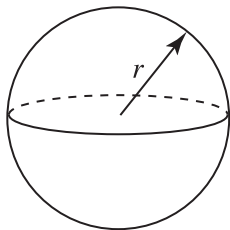


Area of trapezium = $\frac{1}{2}(a + b)h$



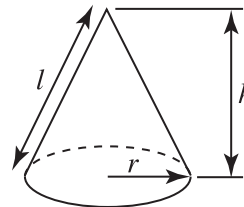
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

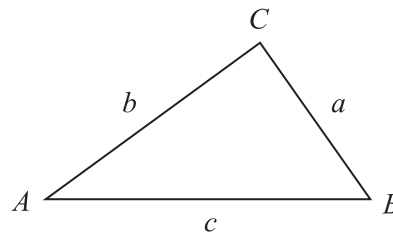


Quadratic Equation

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

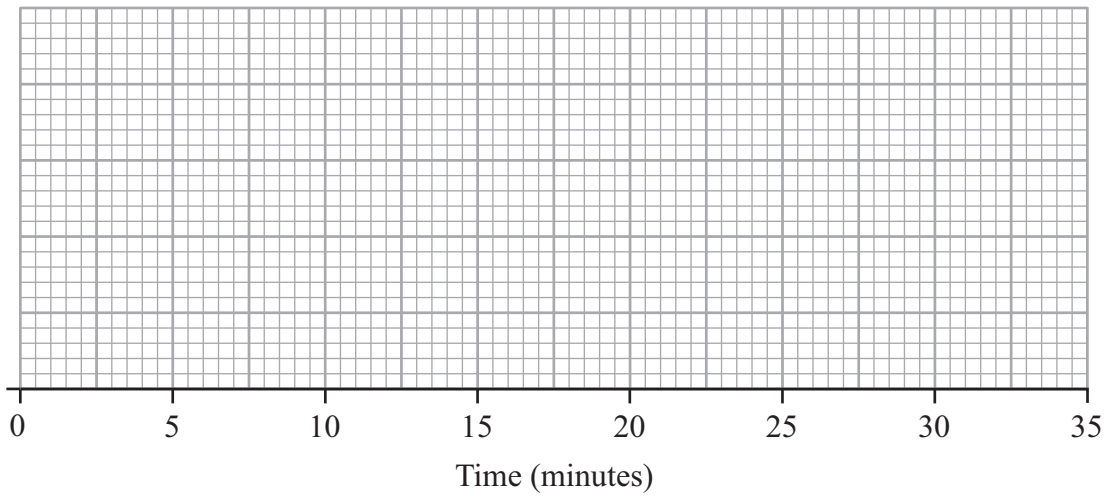
Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$

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

1 The 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, 18, 19, 21, 21, 23, 24, 25, 27, 29, 31

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

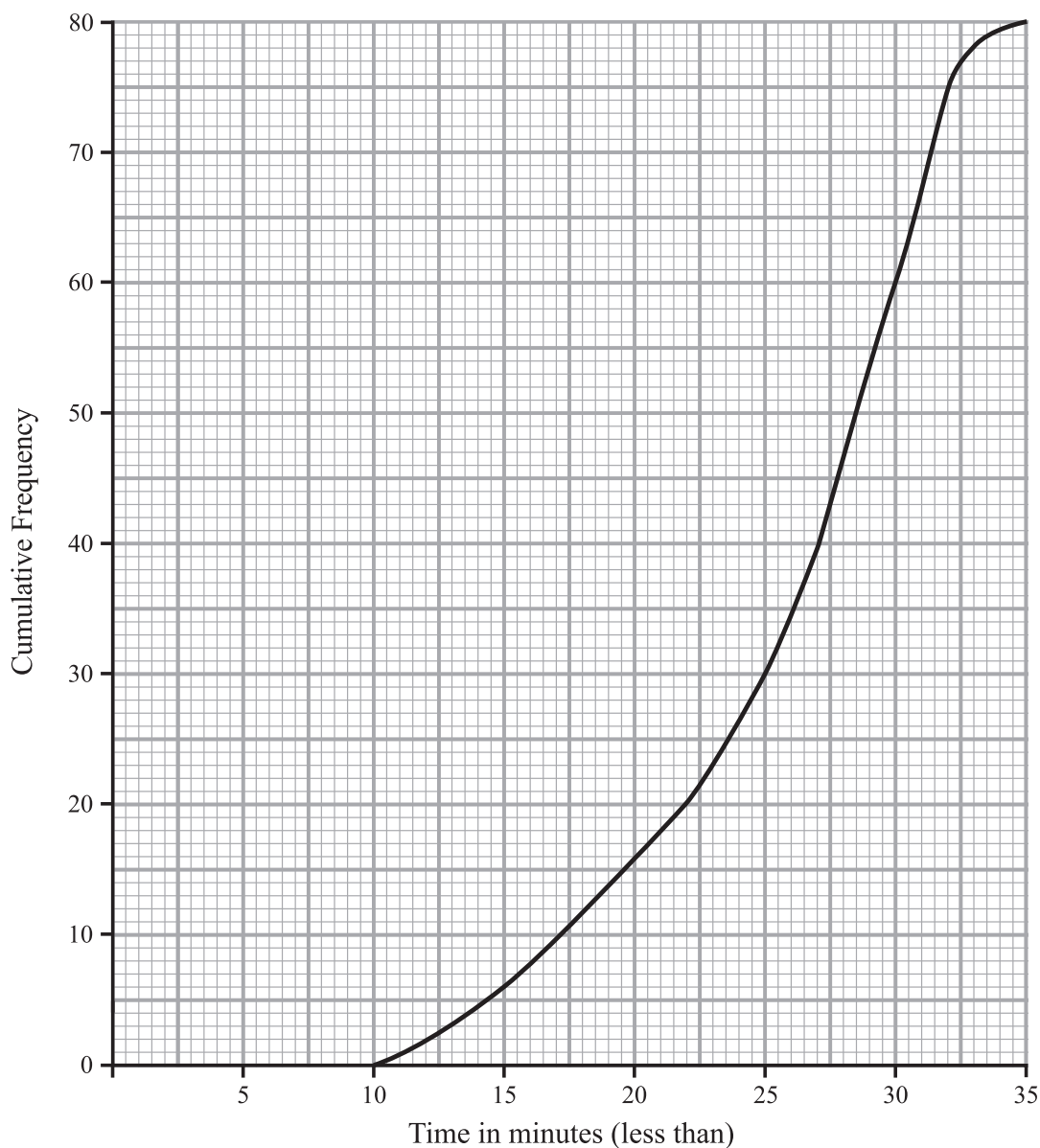


[3]

Examiner Only	
Marks	Remark
Total Question 1	

[Turn over

- 2 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) (i) Use the graph to estimate the median.

Answer _____ minutes [1]

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

Answer _____ minutes [2]

Examiner Only	
Marks	Remark

(b) What percentage of the adults took more than 25 minutes to do the survey?

Answer _____ % [2]

Examiner Only	
Marks	Remark
Total Question 2	

3 The diagram shows a trapezium, EFGH.

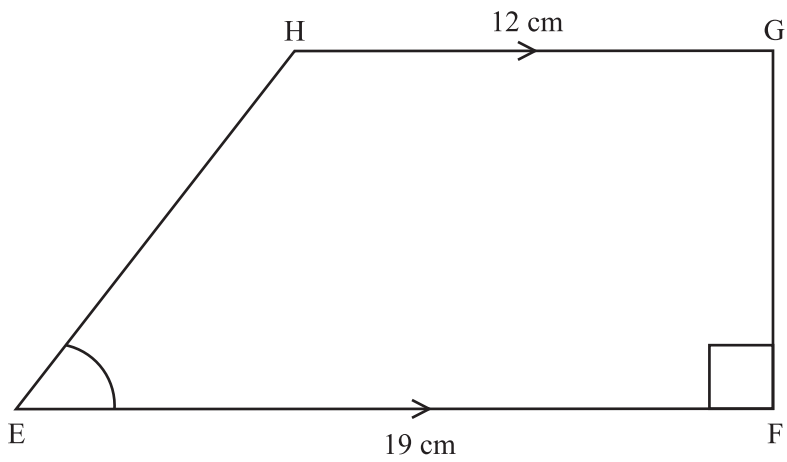


diagram not drawn accurately

EF is parallel to HG. Angle EFG = 90°
 EF = 19 cm, FG = 9 cm and HG = 12 cm.

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

Answer _____ ° [3]

Total Question 3	

[Turn over

- 4 (a) Solve the simultaneous equations
You must show your working out.
A solution by trial and improvement
will not be accepted.

$$4p + q = 7$$

$$2p - 5q = 20$$

Answer $p = \underline{\hspace{2cm}}$, $q = \underline{\hspace{2cm}}$ [3]

- (b) Factorise fully $3xy - 9y^2$

Answer $\underline{\hspace{4cm}}$ [2]

- (c) Solve $\frac{2p + 5}{6} = \frac{p}{4} + 2$

Answer $p = \underline{\hspace{2cm}}$ [4]

Examiner Only	
Marks	Remark
Total Question 4	

5 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 $\frac{q}{p}$

Answer _____ [2]

Examiner Only	
Marks	Remark
Total Question 5	

[Turn over

Quality of written communication will be assessed in this question.

- 6 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 6	



7 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 7

8 A straight line cuts the x axis at the point $(6, 0)$ and the y axis at the point
 $(0, 12)$.
Find the equation of the line.

Answer _____ [3]

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Total Question 8

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[Turn over



11 A square garden of side p metres is surrounded completely by a path of width q metres. The path's outer boundary also forms a square.

Find and express in its simplest terms an expression for the area of the path in square metres.

Answer _____ m² [4]

Examiner Only	
Marks	Remark

Total Question 11

Quality of written communication will be assessed in this question.

12 There are 200 Year 8 pupils in Northfield High School. There are 100 girls and 100 boys. A survey is to be done to find out how they have settled in to their new school. Forty pupils from Year 8 are needed for this survey.

(a) From an alphabetical list of Year 8 pupils' names, every third pupil is chosen until there are 40 pupils.

Explain why this may not produce a fair sample, giving two reasons.

Reason 1 _____
 _____ [1]

Reason 2 _____
 _____ [1]

(b) Write down a more suitable way of choosing a sample.

Answer _____
 _____ [2]

Total Question 11

Total Question 12

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[Turn over

13 Ten girls and thirty boys took part in a goal scoring competition. The mean score for the girls was 7.5 and the mean score for the boys was 8.5

What was the mean score for the 40 competitors?

Answer _____ [3]

Examiner Only	
Marks	Remark
Total Question 13	
Total Question 14	

14 A teacher has fourteen players of equal ability keen to play on the school netball team. She decides to choose the tallest seven players. Which measure of central tendency (average) could help her choose the players? Write down a reason for your answer.

Answer _____ because _____
 _____ [2]

15 (a) Evaluate each of the following without using your calculator.
Show all your working out.

(i) $27^{\frac{2}{3}}$

Answer _____ [1]

(ii) $9^{0.5} \div 36^{-\frac{1}{2}}$

Answer _____ [2]

(b) Find the value of x when
 $16^x = 32$

Answer _____ [2]

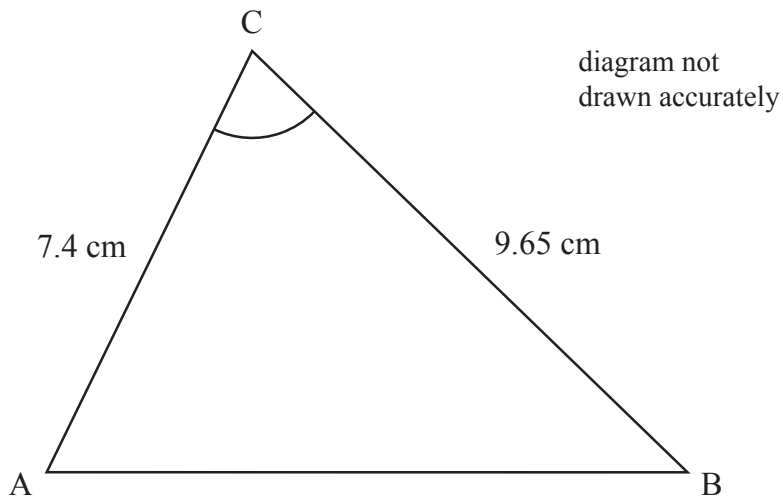
Examiner Only

Marks Remark

Total Question 15

[Turn over

16



In the triangle ABC above, $AC = 7.4$ cm, $BC = 9.65$ cm and angle $ACB = 72^\circ$

Calculate the length of AB.

Answer _____ cm [3]

Examiner Only	
Marks	Remark
Total Question 16	

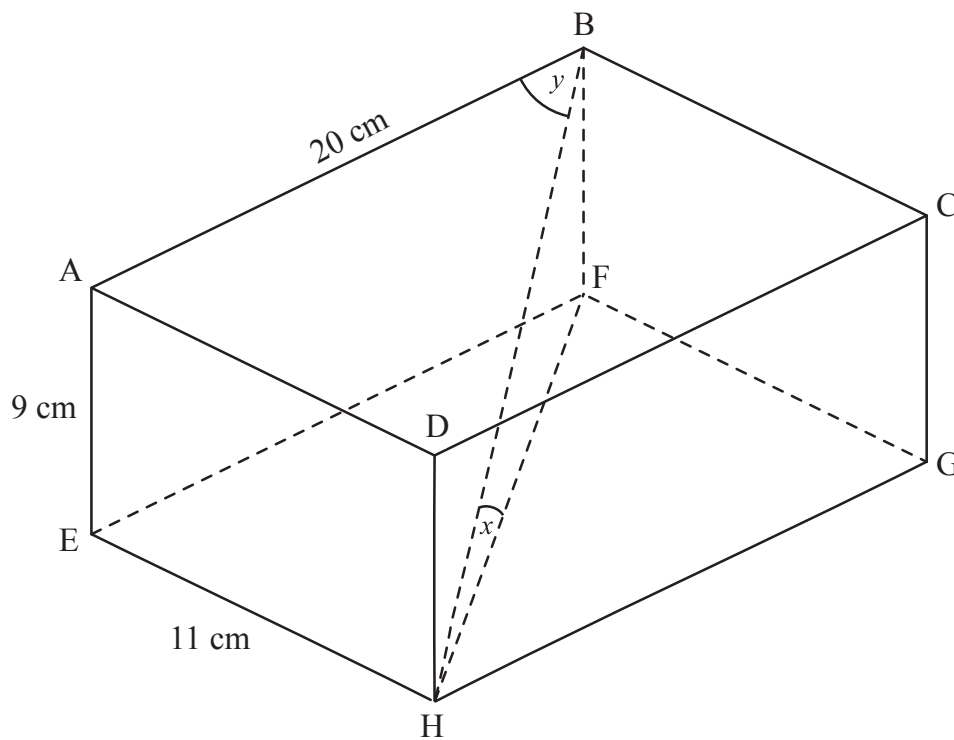


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(Questions continue overleaf)

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- 17 The diagram below shows a cuboid.
 $AB = 20\text{ cm}$, $AE = 9\text{ cm}$ and $EH = 11\text{ cm}$.



- (a) Find the length of the space diagonal BH.

Answer BH = _____ cm [2]

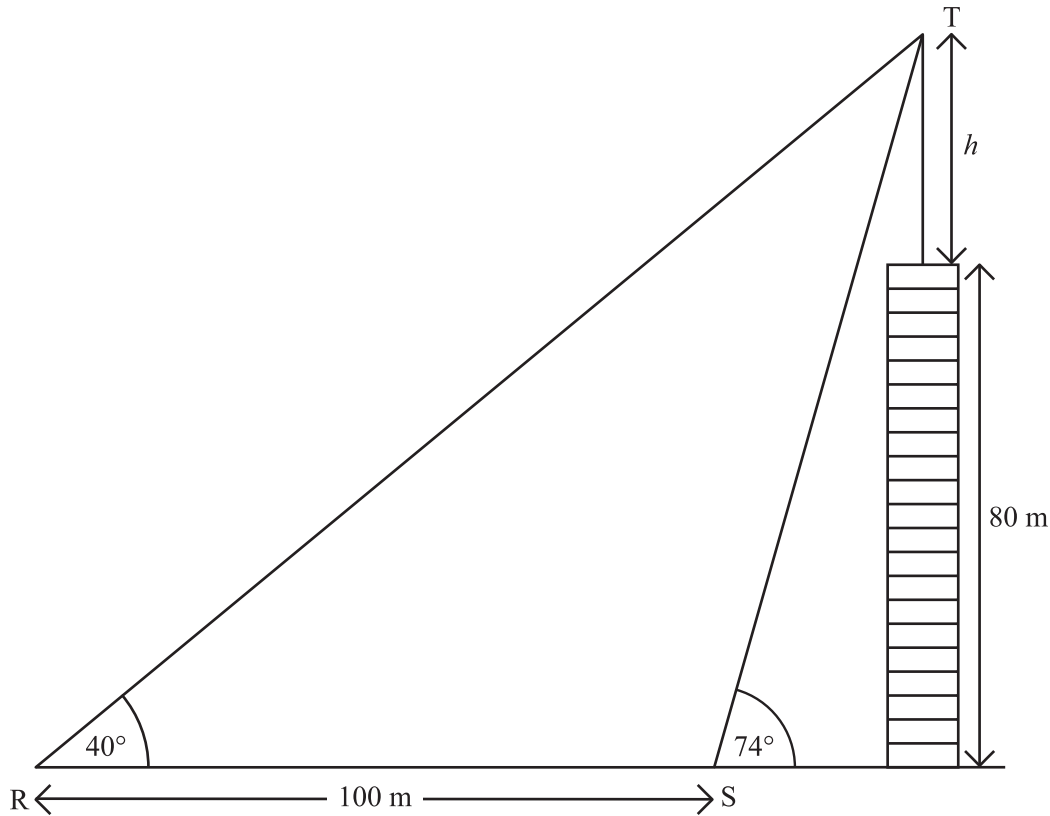
Examiner Only	
Marks	Remark

(b) The angle between BH and HF is x .
 The angle between BH and AB is y .
 Which angle is bigger, x or y ?
 You must show your working out to justify your answer.

Examiner Only	
Marks	Remark
Total Question 17	

Answer _____ [4]

19



A block of flats has a TV transmitter on top of it as shown above.
 From a point R on the ground the angle of elevation of the top of the TV transmitter, T, is 40°
 From a point S that is 100 metres horizontally closer to the tower block, the angle of elevation of T is 74°
 The height of the tower block is 80 metres.
 Calculate the height, h , of the TV transmitter.

Examiner Only

Marks Remark

Total Question 19

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Answer _____ metres [5]

20

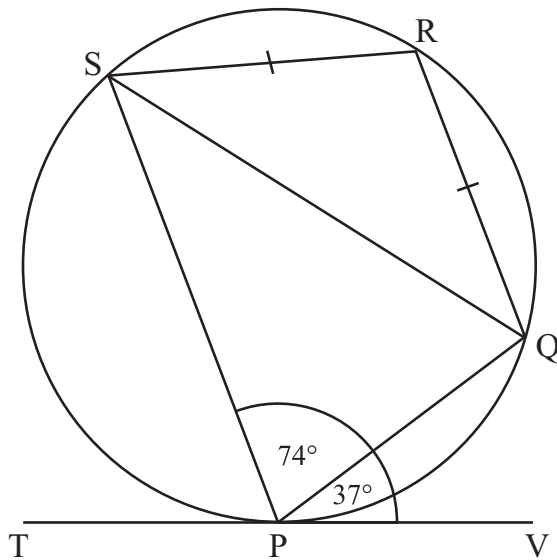


diagram not
drawn accurately

- PQRS is a cyclic quadrilateral.
 TV is a tangent to the circle at P.
 SR = RQ.
 Angle QPV = 37° and angle SPQ = 74°
 Show that SP is parallel to RQ.
 You must write down reasons to justify any angles that you calculate.

Examiner Only

Marks	Remark
Total Question 20	

[4]

[Turn over

21 (a) Write $\frac{1}{\sqrt{x^3}}$ in the form x^p

Answer _____ [2]

(b) Show that $(0.36)^{\frac{3}{2}} = \frac{27}{125}$ without using a calculator.

[2]

Examiner Only	
Marks	Remark
Total Question 21	

22 Solve the simultaneous equations

$$y = 3x - 2$$
$$6x^2 + x = y^2$$

Answer _____ [6]

Examiner Only

Marks Remark

Total Question 22

[Turn over

- 23** Find three consecutive positive odd integers such that 5 times the square of the middle integer exceeds the product of the other two by 488
 You should use an algebraic method.
 A solution by trial and improvement will not be accepted.

Examiner Only	
Marks	Remark
Total Question 23	

Answer _____ [5]

THIS IS THE END OF THE QUESTION PAPER



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

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