NEW SPECIMEN PAPERS
PUBLISHED JUNE 2015

GCSE
Mathematics
Specification (8300/1H)

H

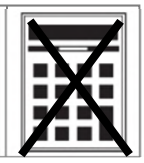
Paper 1 Higher tier

Date Morning 1 hour 30 minutes

Materials

For this paper you must have:
- mathematical instruments

You must **not** use a calculator



Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.
- In all calculations, show clearly how you work out your answer.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname

Forename(s)

Candidate signature _____

Answer **all** questions in the spaces provided.

1 Circle the calculation that increases 400 by 7%

[1 mark]

400×0.07 400×0.7 400×1.07 400×1.7

2 Simplify $3^4 \times 3^4$

Circle the answer.

[1 mark]

3^8 9^8 3^{16} 9^{16}

3 Circle the area that is the same as 5.5 m^2

[1 mark]

550 cm^2 5 500 cm^2 55 000 cm^2 5 500 000 cm^2

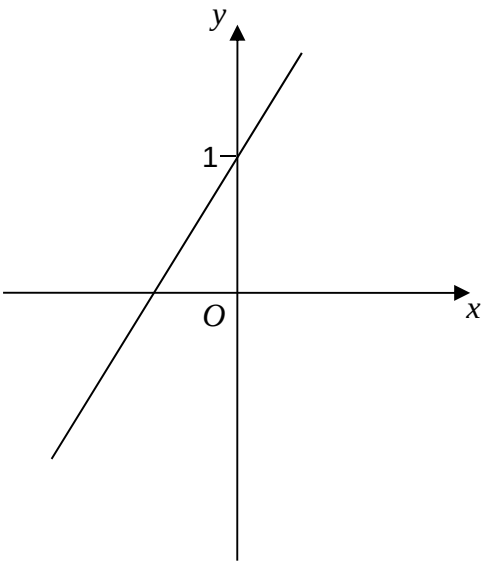
4 One of these graphs is a sketch of $y = 1 - 2x$

Which one?

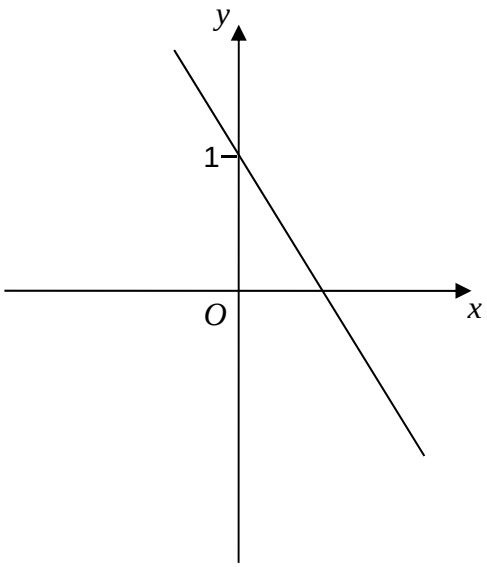
Circle the correct letter.

[1 mark]

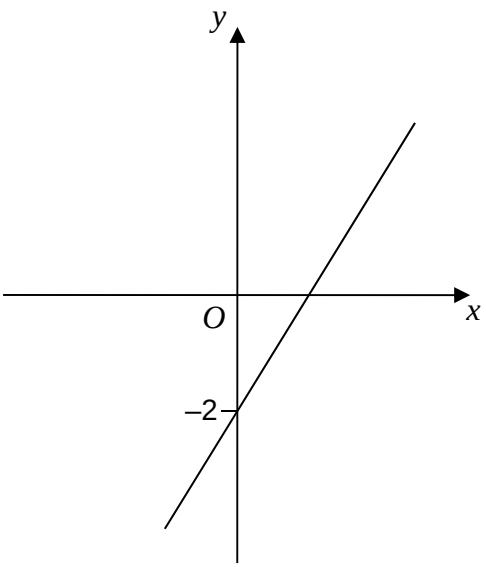
A



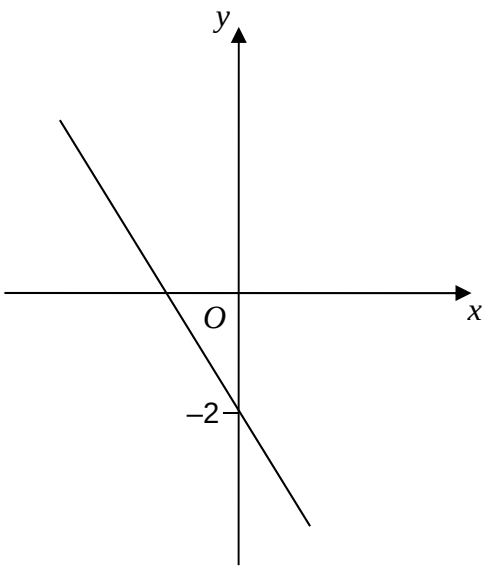
B



C

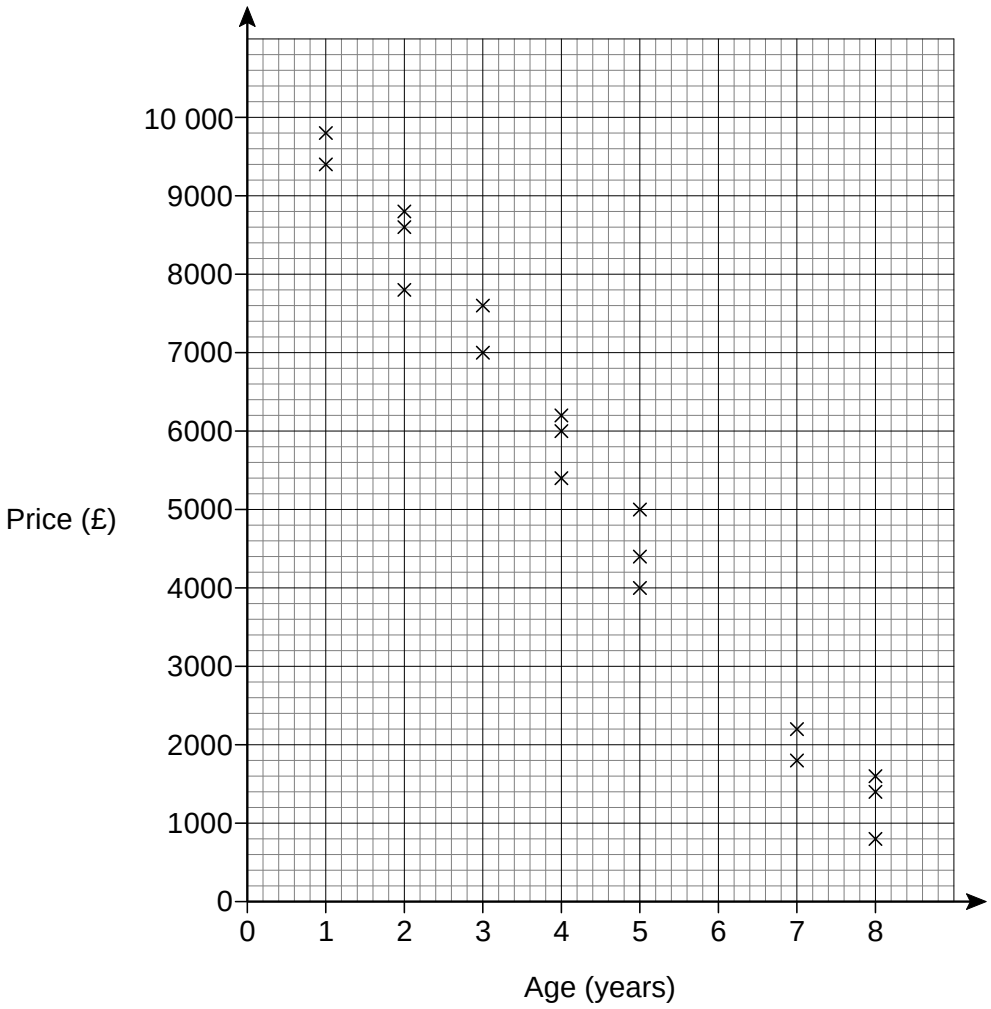


D



5 The scatter graph shows the age and the price of 18 cars.

The cars are all the same make and model.



Use a line of best fit to estimate the price of a 6-year old car.

[2 marks]

Answer £ _____

6 Kelly is trying to work out the two values of w for which $3w - w^3 = 2$

Her values are 1 and -1

Are her values correct?

You **must** show your working.

[2 marks]

7 Work out $2\frac{3}{4} \times 1\frac{5}{7}$

Give your answer as a mixed number in its simplest form.

[3 marks]

Answer _____

8 Solve $5x - 2 > 3x + 11$

[2 marks]

Answer _____

9 The nth term of a sequence is $2n + 1$

The nth term of a different sequence is $3n - 1$

Work out the **three** numbers that are

in both sequences
and
between 20 and 40

[3 marks]

Answer _____ , _____ , _____

10 White paint costs £2.80 per litre.
Blue paint costs £3.50 per litre.
White paint and blue paint are mixed in the ratio 3 : 2

Work out the cost of 18 litres of the mixture.

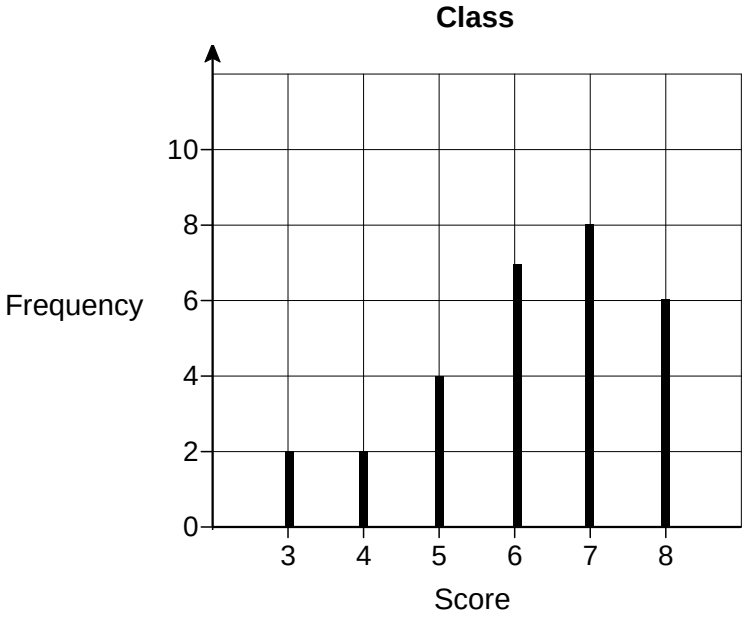
[4 marks]

Answer £ _____

Turn over for the next question

11 Students in a class took a spelling test.

The diagram shows information about the scores.



Lucy is one of the 29 students in the class.

Her score was the same as the **median** score for her class.

Work out her score.

[2 marks]

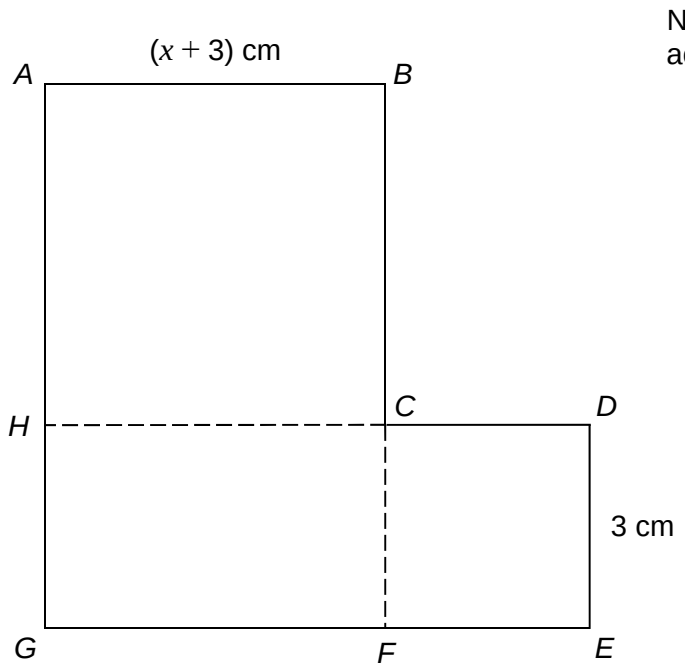
Answer _____

12 *ABCH* is a square.

HCFG is a rectangle.

CDEF is a square.

They are joined to make an L-shape.

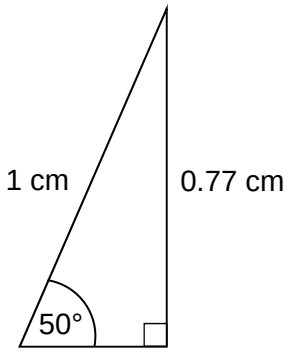


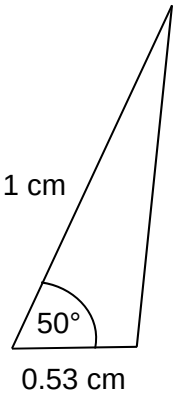
Show that the total area of the L-shape, in cm^2, is $x^2 + 9x + 27$

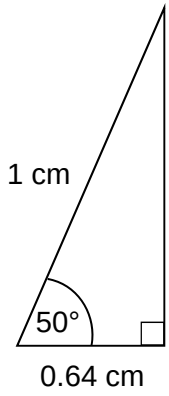
[4 marks]

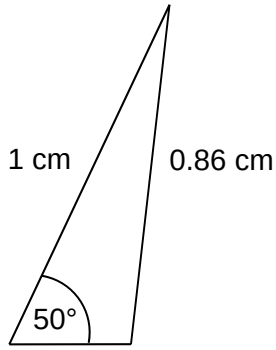
13 Here are sketches of four triangles.

Not drawn accurately









In each triangle

the longest side is **exactly** 1 cm

the other length is given to 2 decimal places.

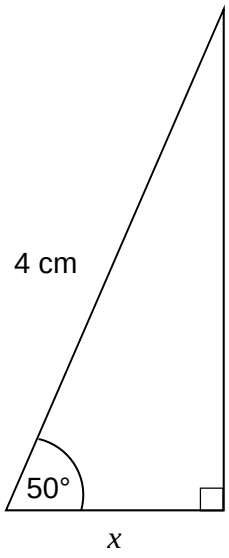
13 (a) Circle the value of cos 50° to 2 decimal places.

[1 mark]

0.77 0.53 0.64 0.86

13 (b) Work out the value of x.

Give your answer to 1 decimal place.



Not drawn accurately

[2 marks]

Answer _____ cm

Turn over for the next question

14 A prime number between 300 and 450 is chosen at random.

The table shows the probability that the number lies in different ranges.

Prime number, *n*	**Probability**
$300 \leqslant n < 330$	0.16
$330 \leqslant n < 360$	0.24
$360 \leqslant n < 390$	x
$390 \leqslant n < 420$	0.16
$420 \leqslant n < 450$	0.24

14 (a) Work out the value of x.

[2 marks]

Answer _____

14 (b) Work out the probability that the prime number is greater than 390

[1 mark]

Answer _____

14 (c) There are four prime numbers between 300 and 330

How many prime numbers are there between 300 and 450?

[2 marks]

Answer _____

15 $a \times 10^4 + a \times 10^2 = 24\,240$ where a is a number.

Work out $a \times 10^4 - a \times 10^2$

Give your answer in standard form.

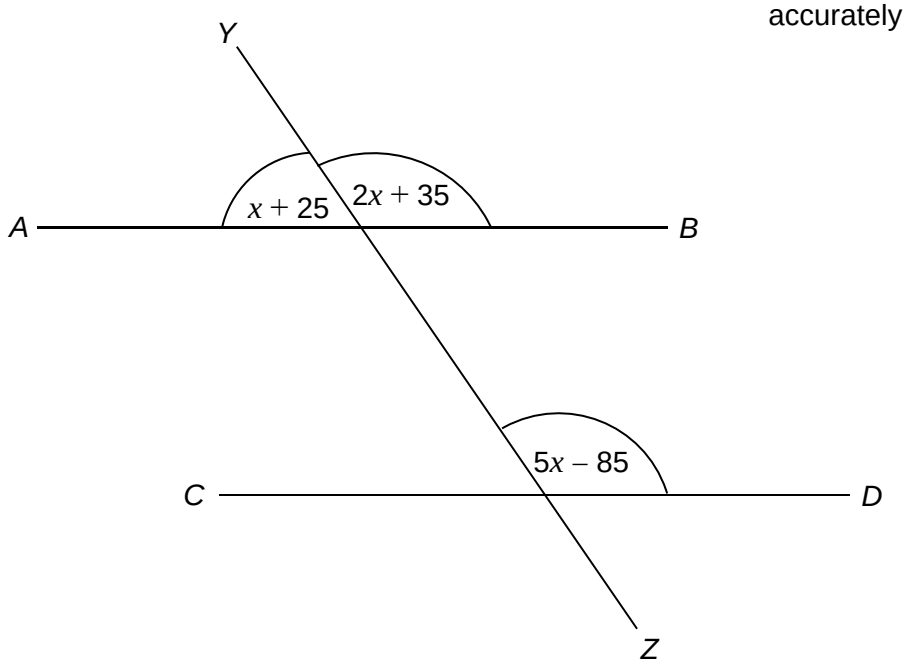
[2 marks]

Answer _____

16 *AB*, *CD* and *YZ* are straight lines.

All angles are in degrees.

Not drawn accurately



Show that *AB* is parallel to *CD*.

[4 marks]

17 To complete a task in 15 days a company needs

4 people each working for 8 hours per day.

The company decides to have

5 people each working for 6 hours per day.

Assume that each person works at the same rate.

17 (a) How many days will the task take to complete?

You **must** show your working.

[3 marks]

Answer _____

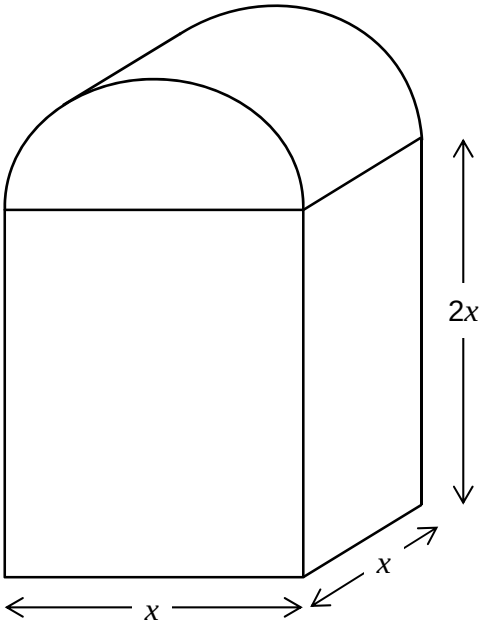
17 (b) Comment on how the assumption affects your answer to part (a).

[1 mark]

18 In this question all dimensions are in centimetres.

A solid has uniform cross section.

The cross section is a rectangle and a semicircle joined together.



Work out an expression, in cm^3, for the **total** volume of the solid.

Write your expression in the form $ax^3 + \frac{1}{b}\pi x^3$ where a and b are integers.

[4 marks]

Answer _____ cm^3

19 Show that $12 \cos 30° - 2 \tan 60°$ can be written in the form $\sqrt{k}$ where k is an integer.

[3 marks]

Turn over for the next question

20 On Friday, Greg takes part in a long jump competition.

He has to jump at least 7.5 metres to qualify for the final on Saturday.

- He has up to three jumps to qualify.
- If he jumps at least 7.5 metres he does **not** jump again on Friday.

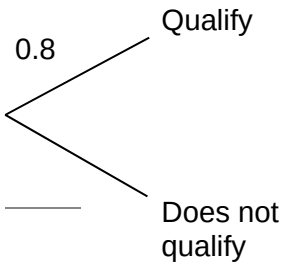
Each time Greg jumps, the probability he jumps at least 7.5 metres is 0.8

Assume each jump is independent.

20 (a) Complete the tree diagram.

[2 marks]

First jump **Second jump** **Third jump**



20 (b) Work out the probability that he does **not** need the third jump to qualify.

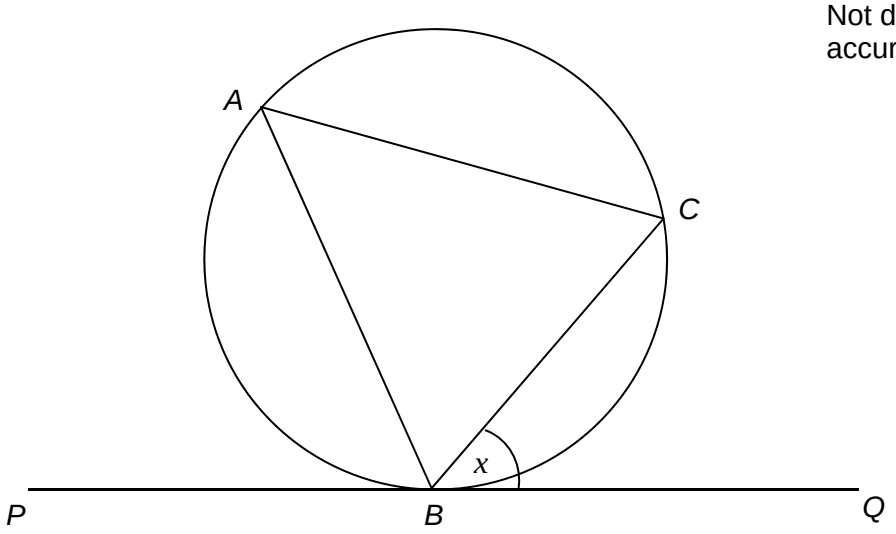
[2 marks]

Answer _____

21 *A*, *B* and *C* are points on a circle.

- *BC* bisects angle *ABQ*.
- *PBQ* is a tangent to the circle.

Not drawn accurately



Angle *CBQ* = *x*

Prove that *AC* = *BC*

[3 marks]

Turn over for the next question

22 Steph is solving a problem.

Cube A has a surface area of 150 cm^2

Cube B has sides half the length of cube A

What is the volume of cube B?

To solve this problem, Steph decides to

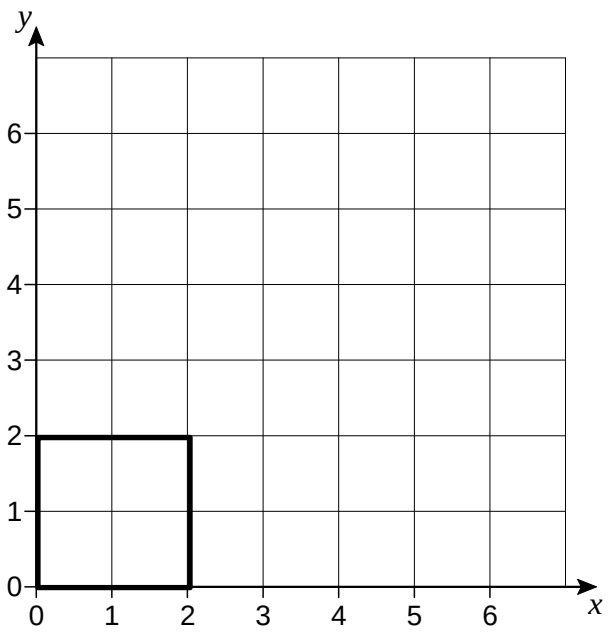
- halve the surface area
- calculate the square root of the answer
- then divide by 6
- then cube this answer to work out the volume.

Evaluate Steph's method.

[2 marks]

23 Square *OABC* is drawn on a centimetre grid.

O is (0, 0) *A* is (2, 0) *B* is (2, 2) *C* is (0, 2)



23 (a) *OABC* is translated by the vector $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$

Circle the number of invariant points on the perimeter of the square.

[1 mark]

0 1 2 4

23 (b) *OABC* is enlarged, scale factor 2, centre (0, 0)

Circle the number of invariant points on the perimeter of the square.

[1 mark]

0 1 2 4

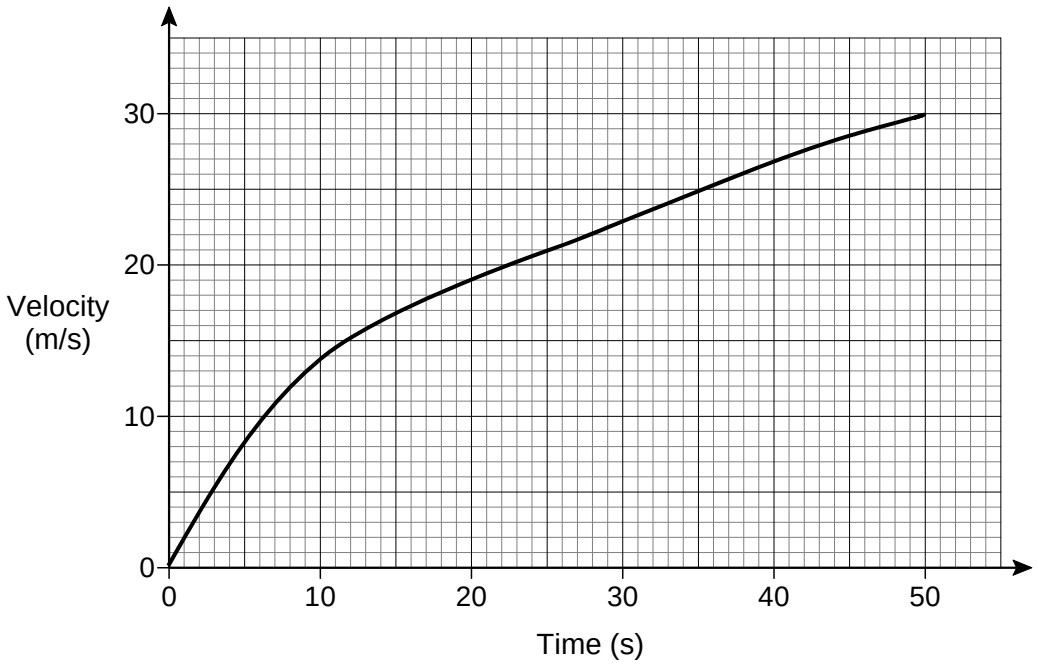
23 (c) *OABC* is reflected in the line $y = x$

Circle the number of invariant points on the perimeter of the square.

[1 mark]

0 1 2 4

24 Here is the velocity-time graph of a car for 50 seconds.



24 (a) Work out the average acceleration during the 50 seconds.
Give the units of your answer.

[2 marks]

Answer _____

24 (b) Estimate the time during the 50 seconds when

the instantaneous acceleration = the average acceleration

You **must** show your working on the graph.

[2 marks]

Answer _____ seconds

25 $f(x) = 2x + c$

$g(x) = cx + 5$

$fg(x) = 6x + d$

c and d are constants.

Work out the value of d.

[3 marks]

Answer _____

Turn over for the next question

26 Rationalise the denominator and simplify $\frac{10}{3\sqrt{5}}$

[2 marks]

Answer _____

27 Convert $0.1\dot{7}\dot{2}$ to a fraction in its lowest terms.

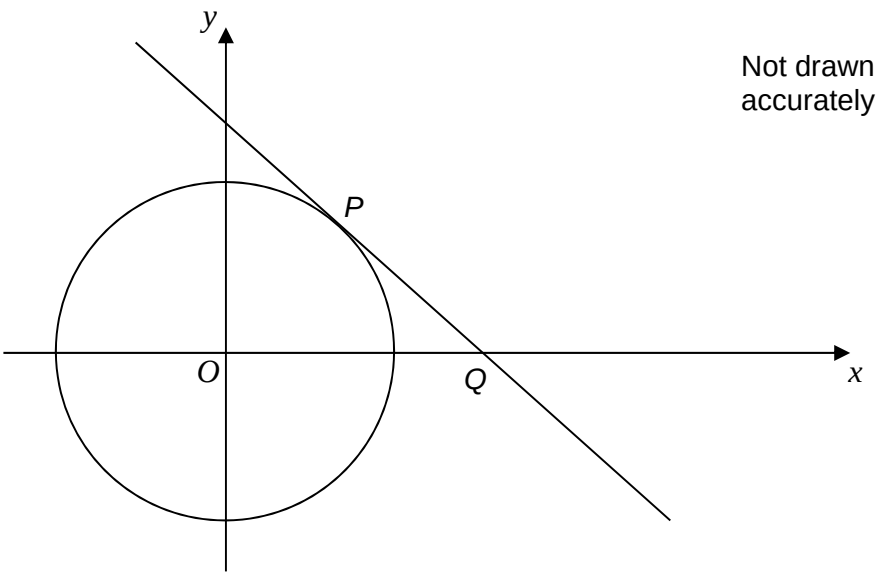
[3 marks]

Answer _____

28 The diagram shows the circle $x^2 + y^2 = 10$

P lies on the circle and has x-coordinate 1

The tangent at P intersects the x-axis at Q.



Not drawn accurately

Work out the coordinates of Q.

[5 marks]

Answer (_____ , _____)

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

GCSE
MATHEMATICS

New Specimen Papers published June 2015
Paper 1 Higher - Mark Scheme

8300/1H

Version 1.0

Principal Examiners have prepared these mark schemes for specimen papers. These mark schemes have not, therefore, been through the normal process of standardising that would take place for live papers.

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[*a*, *b*]	Accept values between *a* and *b* inclusive.
3.14 …	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Q	Answer	Mark	Comments
1	400×1.07	B1	
2	3^8	B1	
3	55 000 cm^2	B1	
4	B	B1	
5	Straight ruled line of best fit	B1	Through (1, 9000) to (1, 10 000) and (8, 800) to (8, 1800)
	3400	B1ft	Reads correctly from their straight line of best fit with negative gradient Within $\frac{1}{2}$ square SC1 [3200, 3800] with no straight line of best fit drawn
6	$3 \times 1 - 1^3 = 3 - 1$ $= 2$ and correct	B1	Condone No, they should be 1 and -2 for B1B1 SC1 $w = -2$
	$3 \times (-1) - (-1)^3 = -3 + 1$ $= -2$ and incorrect	B1	
7	$\frac{11}{4}$ (×) $\frac{12}{7}$	M1	Converts both fractions to improper with at least one correct
	$\frac{\text{their } 11 \times \text{their } 12}{\text{their } 4 \times \text{their } 7}$ or $\frac{132}{28}$ or $4\frac{20}{28}$ or $\frac{33}{7}$	M1dep	oe fraction
	$4\frac{5}{7}$	A1	

Q	Answer	Mark	Comments
8	$5x - 3x > 11 + 2$ or $2x > 13$	M1	
	$x > 6.5$	A1	oe SC1 6.5
9	Lists at least three terms from first sequence between 20 and 40	M1	eg 21, 23, 25, ...
	Lists at least three terms from second sequence between 20 and 40	M1	eg 20, 23, 26,...
	23 29 35	A1	SC2 for any two correct with at most one incorrect SC1 for any one correct with at most two incorrect

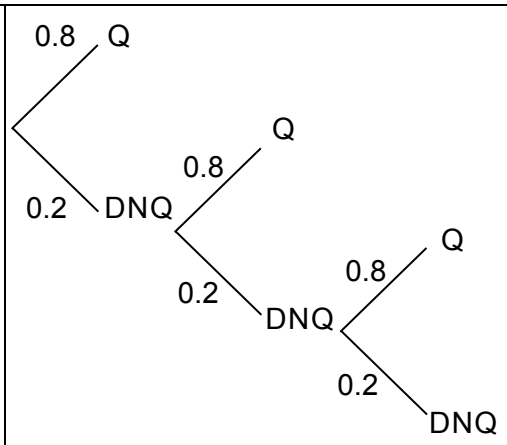
Q	Answer	Mark	Comments
10	**Alternative method 1**		
	18 ÷ (3 + 2) or 3.6	M1	
	their 3.6 × 3 × 2.8(0) or 30.24(0)	M1dep	
	their 3.6 × 2 × 3.5(0) or 25.2(0)	M1dep	dep on first M1
	55.44	A1	
	Alternative method 2		
	3 × 2.8(0) + 2 × 3.5(0) or 15.4(0)	M1	
	18 ÷ (3 + 2) or 3.6	M1	
	their 3.6 × their 15.4(0)	M1dep	dep on M1 M1
	55.44	A1	
	Alternative method 3		
	3 × 2.8(0) + 2 × 3.5(0) or 15.4(0)	M1	
	their 15.4(0) ÷ 5 or 3.08	M1dep	
	their 3.08 × 18	M1dep	
	55.44	A1	
11	$\frac{29+1}{2}$ or 15th value identified	M1	
	6	A1	

Q	Answer	Mark	Comments
12	**Alternative method 1**		
	$(x + 3)^2$	M1	oe
	$x^2 + 3x + 3x + 9$	A1	oe
	$3 \times (x + 3)$	M1	oe
	$x^2 + 3x + 3x + 9 + 3x + 9 + 9$ $= x^2 + 9x + 27$	A1	
	Alternative method 2		
	$(x + 6)(x + 3)$	M1	oe
	$x^2 + 6x + 3x + 18$	A1	oe
	their $(x^2 + 6x + 3x + 18) + 3 \times 3$	M1	oe
	$x^2 + 6x + 3x + 18 + 9$ $= x^2 + 9x + 27$	A1	
	Alternative method 3		
	$(x + 3)^2$	M1	oe
	$x^2 + 3x + 3x + 9$	A1	oe
	$3 \times (x + 6)$	M1	oe
	$x^2 + 3x + 3x + 9 + 3x + 18$ $= x^2 + 9x + 27$	A1	
	Alternative method 4		
	$(x + 6)^2$	M1	oe
	$x^2 + 6x + 6x + 36$	A1	oe
	$3 \times (x + 3)$	M1	oe
	$x^2 + 6x + 6x + 36 - 3x - 9$ $= x^2 + 9x + 27$	A1	

Q	Answer	Mark	Comments
13(a)	0.64	B1	
13(b)	$\frac{x}{4} = \cos 50°$ or $\frac{x}{4}$ = their 0.64 or 4 × their 0.64	M1	oe their 0.64 from (a)
	2.6	A1ft	oe ft their 0.64 from (a)
14(a)	0.16 + 0.24 + 0.16 + 0.24 or 0.8(0)	M1	
	0.2	A1	oe
14(b)	0.4(0)	B1	
14(c)	**Alternative method 1**		
	4 ÷ 0.16 or 1 number ↔ 0.04	M1	oe
	25	A1	oe
	Alternative method 2		
	$\frac{0.24}{0.16} \times 4$ or 6 or $\frac{\text{their } x}{0.16} \times 4$ or 5	M1	oe Attempt to work out how many prime numbers in the range $361 \leqslant n < 390$ or $421 \leqslant n < 450$ or $331 \leqslant n < 360$
	25	A1	
15	2.376×10^4	B2	B1 $(a =)$ 2.4 or 24 000 and 240 or 23 760 or value calculated that is correctly converted to standard form

Q	Answer	Mark	Comments
16	**Alternative method 1**		
	$x + 25 + 2x + 35 = 180$	M1	oe
	$x = 40$	A1	
	2 × their 40 + 35 and 5 × their 40 – 85	M1dep	
	2 × 40 + 35 = 115 and 5 × 40 – 85 = 115 and corresponding angles	A1	
	Alternative method 2		
	$5x - 85 = 2x + 35$	M1	oe
	$x = 40$	A1	
	2 × their 40 + 35 and their 40 + 25	M1dep	
	2 × their 40 + 35 = 115 and their 40 + 25 = 65 and angles on a straight line	A1	

Q	Answer	Mark	Comments
17(a)	**Alternative method 1**		
	$15 \times \frac{4}{5}$ or 12 or $15 \times \frac{8}{6}$ or 20 or $\frac{4}{5} \times \frac{8}{6}$ or $\frac{32}{30}$ or $\frac{16}{15}$	M1	oe
	their $12 \times \frac{8}{6}$ or their $20 \times \frac{4}{5}$ or their $\frac{16}{15} \times 15$	M1dep	
	16	A1	
	Alternative method 2		
	$4 \times 15 \times 8$ or 480	M1	
	their $480 \div 5 \div 6$	M1dep	
	16	A1	
17(b)	If one person works at a slower rate the answer will be higher or If some of the people work at a faster rate the task will take less time to complete	B1	oe

Q	Answer	Mark	Comments
18	$x \times x \times 2x$ or $2x^3$	M1	oe
	$\frac{x}{2}$ used as radius	M1	eg $\pi \times \frac{x}{2} \times \frac{x}{2}$ seen
	$\frac{1}{2} \times \pi \times \frac{x}{2} \times \frac{x}{2} \times x$ or $\frac{1}{8}\pi x^3$	M1	oe
	$2x^3 + \frac{1}{8}\pi x^3$	A1	Accept $a = 2$ and $b = 8$ Condone if subsequently factorised to $(2 + \frac{1}{8}\pi)x^3$
19	$\cos 30° = \frac{\sqrt{3}}{2}$ or $\tan 60° = \sqrt{3}$	M1	
	$4\sqrt{3}$	A1	
	$\sqrt{48}$ or $k = 48$	B1ft	ft value seen in the form $a\sqrt{b}$ where a and b are integers > 1
20(a)		B2	Q = Qualifies DNQ = Does not qualify B1 0.2 on DNQ branch or All branches included labelled correctly with Q and DNQ but probabilities not all correct

Q	Answer	Mark	Comments
20(b)	**Alternative method 1**		
	their 0.2 × their 0.8 or 0.16	M1	Look on tree diagram for working
	0.96	A1	
	Alternative method 2		
	(their 0.2)^2 or 0.04	M1	Look on tree diagram for working
	0.96	A1	
21	angle $ABC = x$	M1	
	angle $BAC = x$ and alternate segment theorem	M1	
	angle $ABC = x$ and angle $BAC = x$ and alternate segment theorem and two equal angles so isosceles ($AC = BC$)	A1	
22	Full evaluation	B2	Either gives a correct solution eg divide area by 6 (to work out area of one face of cube A) calculate the square root of the answer (to work out length of one edge of cube A) halve this length (to work out length of edge on cube B) then cube this answer (to work out the volume of cube B) or states or implies that if Steph's order is maintained eg would need to quarter the surface area (to work out surface area of cube B) B1 for partial evaluation eg order is incorrect or 1st line is incorrect

Q	Answer	Mark	Comments
23(a)	0	B1	
23(b)	1	B1	
23(c)	2	B1	
24(a)	0.6 or $\frac{3}{5}$	B1	oe fraction Accept 36 m/s per min
	m/s^2	B1	oe Accept m/s per min only if their acceleration is 36 m/s per min
24(b)	Chord from (0, 0) to (50, 30) and attempt at tangent to curve that is parallel to chord	M1	
	[11, 14]	A1	Must see working on the graph
25	$2(cx + 5) + c$ or $2cx + 10 + c$	M1	
	their $2cx = 6x$ or their $2c = 6$ or $c = 3$	M1	Must have attempted fg(x)
	13	A1	SC2 for 11

Q	Answer	Mark	Comments
26	$\frac{10}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ or $\frac{10\sqrt{5}}{15}$ $\frac{10}{3\sqrt{5}} \times \frac{3\sqrt{5}}{3\sqrt{5}}$ or $\frac{30\sqrt{5}}{45}$ or $\frac{\sqrt{20}}{3}$	M1	oe Must multiply numerator and denominator eg $\frac{10}{\sqrt{45}}$ is M0 $\frac{10}{\sqrt{45}} \times \frac{\sqrt{45}}{\sqrt{45}}$ is M1
	$\frac{2\sqrt{5}}{3}$	A1	
27	**Alternative method 1**		
	($n = 0.17272\ldots$ and) $100n = 17.272\ldots$	M1	oe eg $10n = 1.7272\ldots$ and $1000n = 172.72\ldots$
	$99n = 17.272\ldots - 0.17272\ldots$ or $99n = 17.1$ or $\frac{17.1}{990}$ or $\frac{171}{990}$ or $\frac{57}{330}$	M1dep	oe eg $990n = 172.72\ldots - 1.7272\ldots$ or $990n = 171$
	$\frac{19}{110}$	A1	
	Alternative method 2		
	$0.07272\ldots = \frac{72}{990}$	M1	
	$(\frac{1}{10} + \frac{72}{990} =)$ $\frac{99}{990} + \frac{72}{990}$ or $\frac{171}{990}$ or $\frac{57}{330}$	M1dep	
	$\frac{19}{110}$	A1	

Q	Answer	Mark	Comments
28	**Alternative method 1**		
	P (1, 3) or $y = 3$ or grad $OP = 3$	B1	
	grad $PQ = -\frac{1}{\text{their } 3}$ or $-\frac{1}{3}$	M1	
	$y = (\text{their } -\frac{1}{3})\,x + c$ and substitutes (1, their 3) or $y - \text{their } 3 = (\text{their } -\frac{1}{3})(x - 1)$	M1dep	oe $\frac{\text{their } 3}{x-1}$ or $-\frac{\text{their } 3}{x-1}$
	Substitutes $y = 0$ in their equation	M1dep	$-\frac{\text{their } 3}{x-1} = \text{their } -\frac{1}{3}$
	(10, 0)	A1	
	Alternative method 2		
	P (1, 3) or $y = 3$ or grad $OP = 3$	B1	
	$\frac{\text{their } 3}{1} = \frac{QN}{\text{their } 3}$	M1dep	
	their 3 × their 3 or 9	M1dep	
	tan $PON = \frac{\text{their } 3}{1}$	M1	N is on the x-axis PN is perpendicular to the x-axis
	(10, 0)	A1	

SP/02/15