AQA

NEW SPECIMEN PAPERS
PUBLISHED JUNE 2015

GCSE
Mathematics
Specification (8300/1H)

H

Paper 1 Higher tier

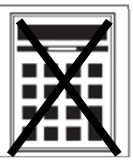
Date Morning 1 hour 30 minutes

Just Maths
Worked Solutions

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%

107%

[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

I know it's not a circle!

1m 100cm

5.5m 550cm

[1 mark]

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

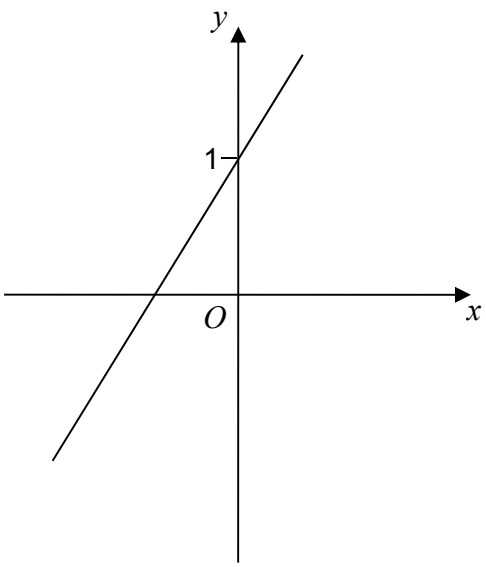
4 One of these graphs is a sketch of $y = 1 - 2x$

Which one?

Circle the correct letter.

[1 mark]

A



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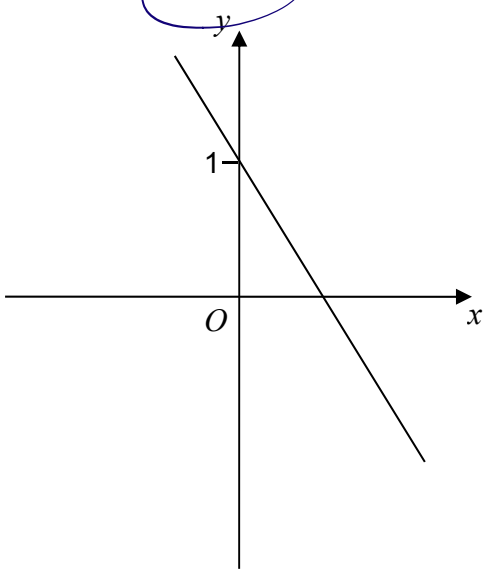

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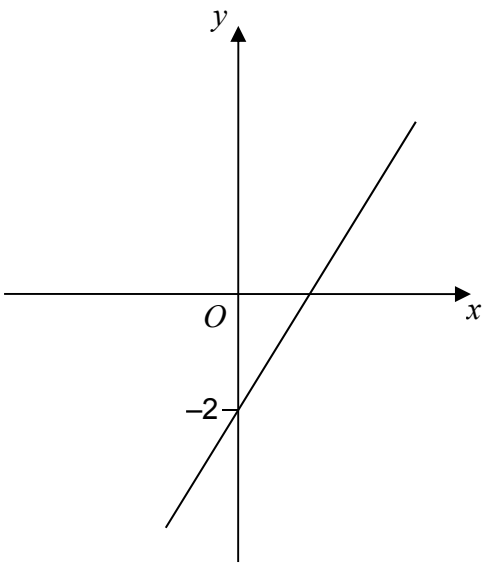

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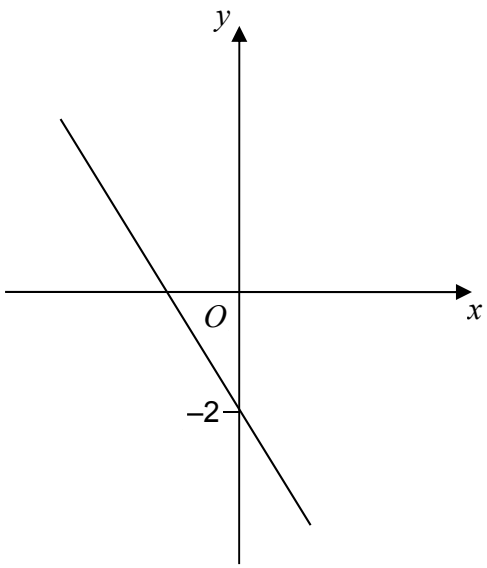
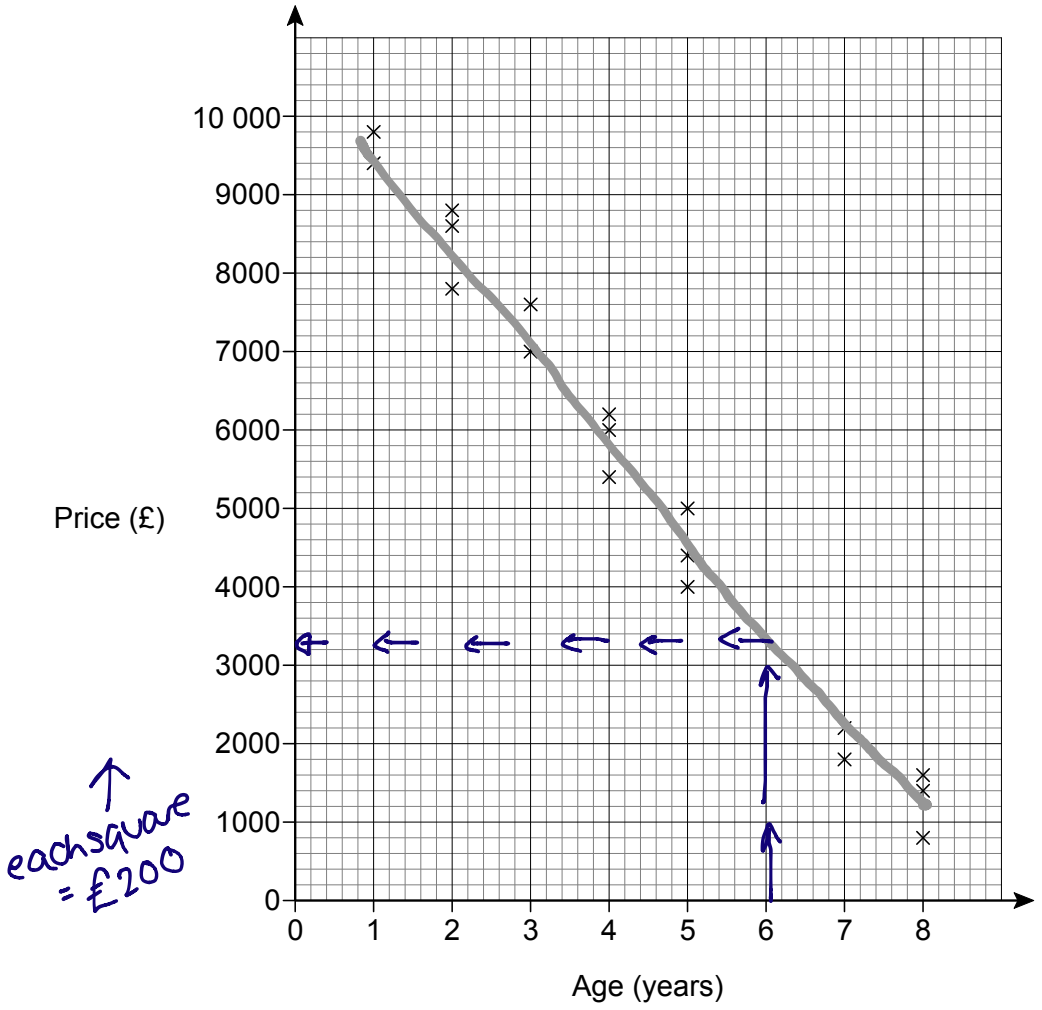


5 The scatter graph shows the age and the price of 18 cars.

The cars are all the same make and model.

you will use a ruler!



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

[2 marks]

Answer £ 3400

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]

when $w = 1$ $3 \times 1 - 1^3 =$

$3 - 1 = 2$ ✓

when $w = -1$ $3 \times -1 - (-1)^3$

$-3 - -1 = -3 + 1 = -2$ ×

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]

$\frac{11}{4_1} \times \frac{12^3}{7} = \frac{33}{7}$ $4\frac{5}{7}$

Answer $4\frac{5}{7}$

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

[2 marks]

$-3x \quad -3x$

$2x - 2 > 11$

$+2 \quad +2$

$\frac{2x}{2} > \frac{13}{2}$

Answer $x > 6.5$

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]

$n =$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
$2n+1$	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39
$3n-1$	2	5	8	11	14	17	20	23	26	29	32	35	38	41					

Answer 23 , 29 , 35

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]

$$5\overline{)18.30} = 3.6$$

W B
3 : 2
18 litres

18 ÷ 5 = 3.6 litres

3.6 × 3 = 10.8
3.6 × 2 = 7.2

3 × 3.6 = 10.8 × £2.80
2 × 3.6 = 7.2 × £3.50

108 × 28 = 3024
72 × 35 = 2520

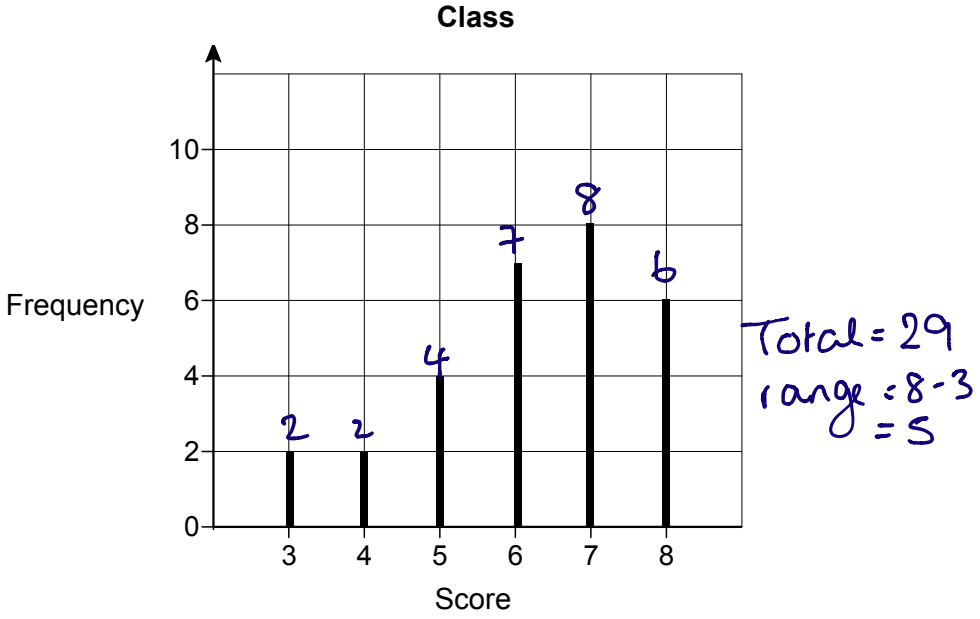
£30.24 + £25.20

Answer £ 55.44

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]

median = $\frac{29+1}{2}$ = 15th

Answer 6

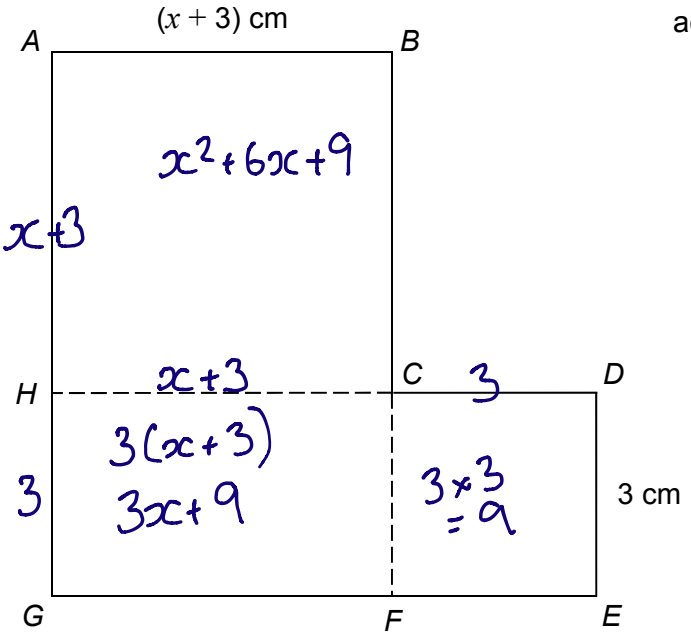
12 *ABCH* is a square.

HCFG is a rectangle.

CDEF is a square.

They are joined to make an L-shape.

Not drawn accurately



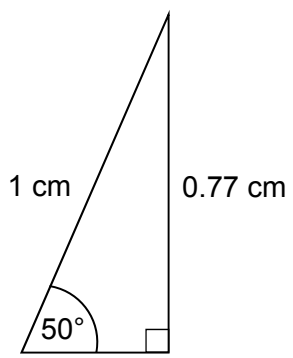
Show that the total area of the L-shape, in cm^2, is $x^2 + 9x + 27$

[4 marks]

area = $x^2 + 6x + 9 + 3x + 9 + 9$

$= x^2 + 9x + 27$

13 Here are sketches of four triangles.



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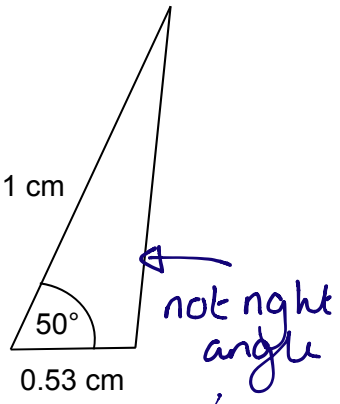
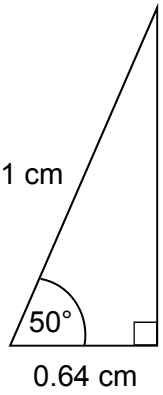
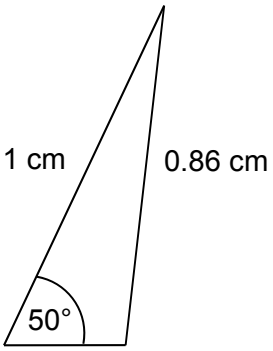


not right angle



cos 50 = 0·64 / 1



In each triangle

the longest side is **exactly** 1 cm
the other length is given to 2 decimal places.

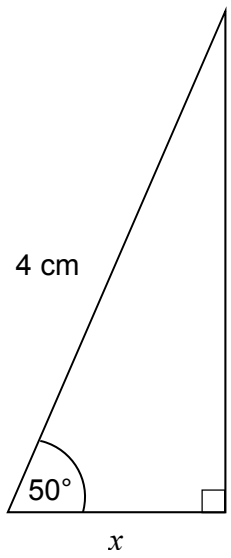
13 (a) Circle the value of cos 50° to 2 decimal places.

[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]

$\cos 50 = \frac{x}{4}$ $x = 4 \times 0.64$

$= 2.56$

Answer 2.6 (1dp) 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]

$1 - 0 \cdot 8 = 0 \cdot 2$

Answer $0 \cdot 2$

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

[1 mark]

$0 \cdot 16 + 0 \cdot 24 = 0 \cdot 4$

Answer $0 \cdot 4$

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

How many prime numbers are there between 300 and 450?

[2 marks]

4 => 0.16 1number = 0.04

1 ÷ 0.04

Answer 25

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]

10000a + 100a = 24240

10100a = 24240

$a = \frac{24240}{10100} = 2.4$

Answer 23760 = 2.376×10^4

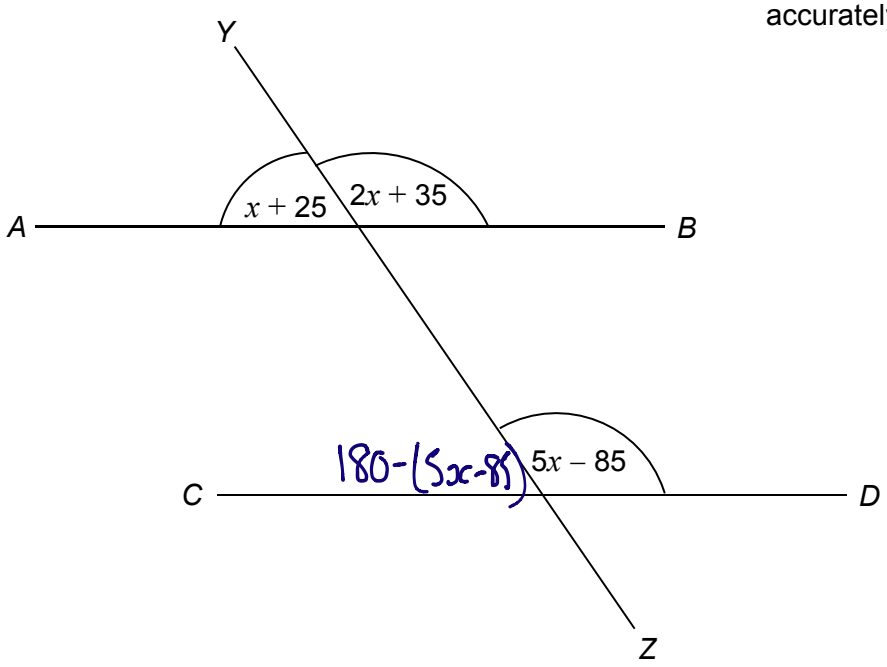
2.4×10^4 2.4×10^2

24000 − 240

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]

$(x+25)+(2x+35) = 180$

$3x + 60 = 180$

$3x = 120$

$x = 40$

$2x+35$

$2 \times 40 + 35 = 115$

$5x-85$

$5 \times 40 - 85 = 115$

∴ there are corresponding angles so the lines are parallel

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]

15days 4 people 8hours

15 x 8 = 120 hours

120 x 4 = 480 hours in total

5people 6hours

480 ÷ 5 = 96

÷ 6 = 16

Answer 16 days

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

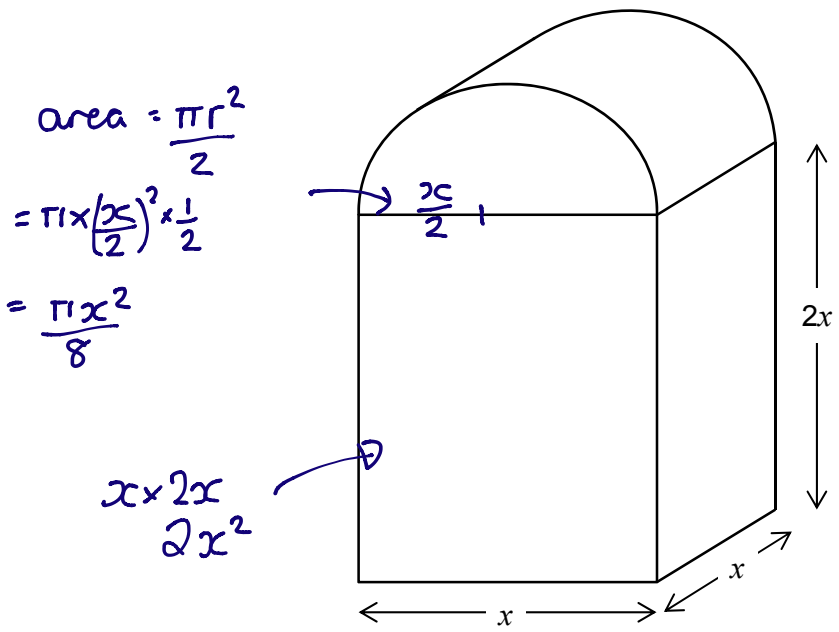
[1 mark]

if anyone works slower it would take longer

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]

Volume $= (\frac{\pi x^2}{8} + 2x^2) \times x$

$= \frac{\pi x^3}{8} + 2x^3$

$= 2x^3 + \frac{1}{8}\pi x^3$

$a = 2 \quad b = 8$

Answer $2x^3 + \frac{1}{8}\pi x^3$ 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]

$\cos 30 = \frac{\sqrt{3}}{2}$

$\tan 60 = \sqrt{3}$

$12 \times \frac{\sqrt{3}}{2} - 2 \times \sqrt{3}$

$= 6\sqrt{3} - 2\sqrt{3}$

$= 4\sqrt{3} \quad = \sqrt{16}\sqrt{3}$

$= \sqrt{48}$

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.

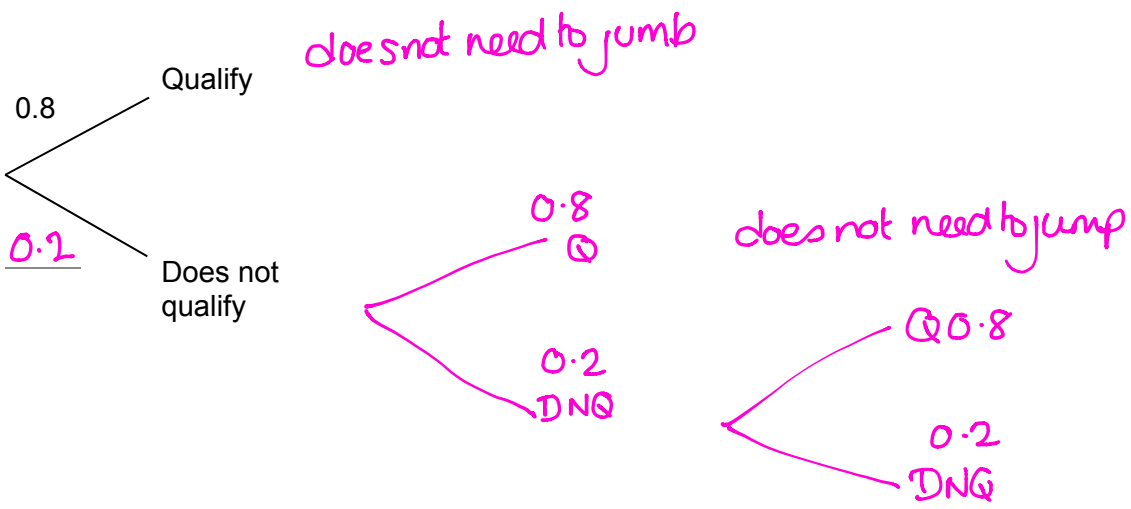
- He has up to three jumps to qualify.
- If he jumps at least 7.5 metres he does **not** jump again on Friday.

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]



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

[2 marks]

$0.2 \times 0.8 = 0.16$

$+ \ 0.8$

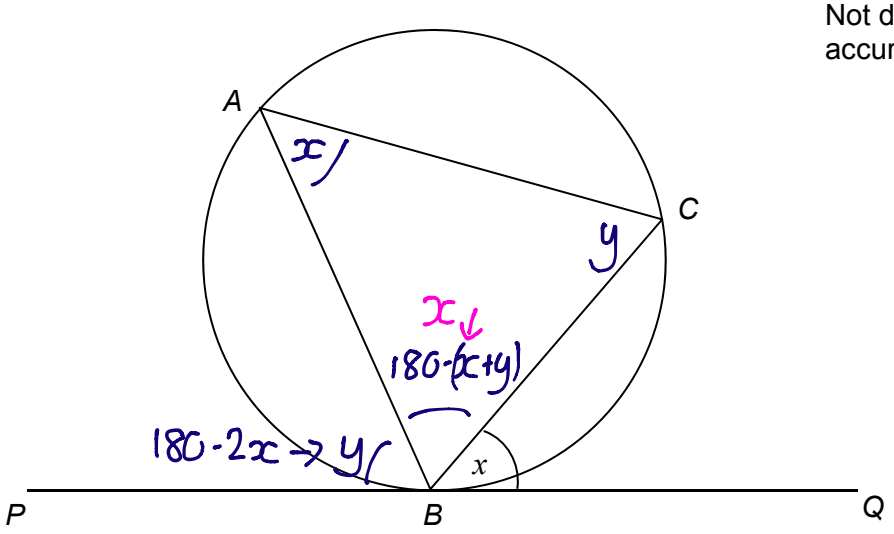
0.96

Answer 0·96

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]

$B\hat{A}C = C\hat{B}Q$ alternate segment theorem

$A\hat{C}B = A\hat{B}P$ alternate segment theorem

$ABC = 180 - (x + y)$

given BC bisects ABQ

$180 - (x+y) = x$

$180 - x - y = x$

$y = 180 - 2x$

so $A\hat{B}C = x$

ABC is an isosceles triangle $AC = BC$

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

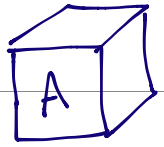
What is the volume of cube B?

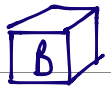
To solve this problem, Steph decides to

- halve the surface area → should be ÷ 6 as there are 6 faces
- calculate the square root of the answer ✓
- then divide by 6 should have been done as step 1
- then cube this answer to work out the volume. ✓

Evaluate Steph's method.

[2 marks]





surface area = 150cm^2

1 surface = 150 ÷ 6 = 25

side length = 5

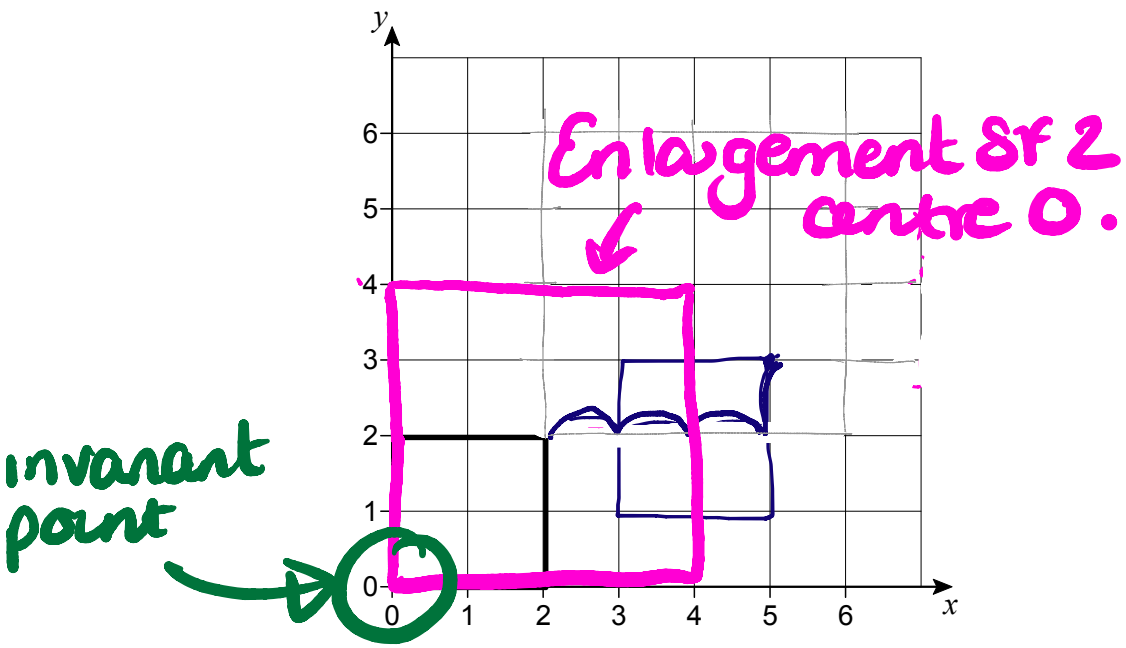
side length = 2.5

so volume

= 2.5 × 2.5 × 2.5

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

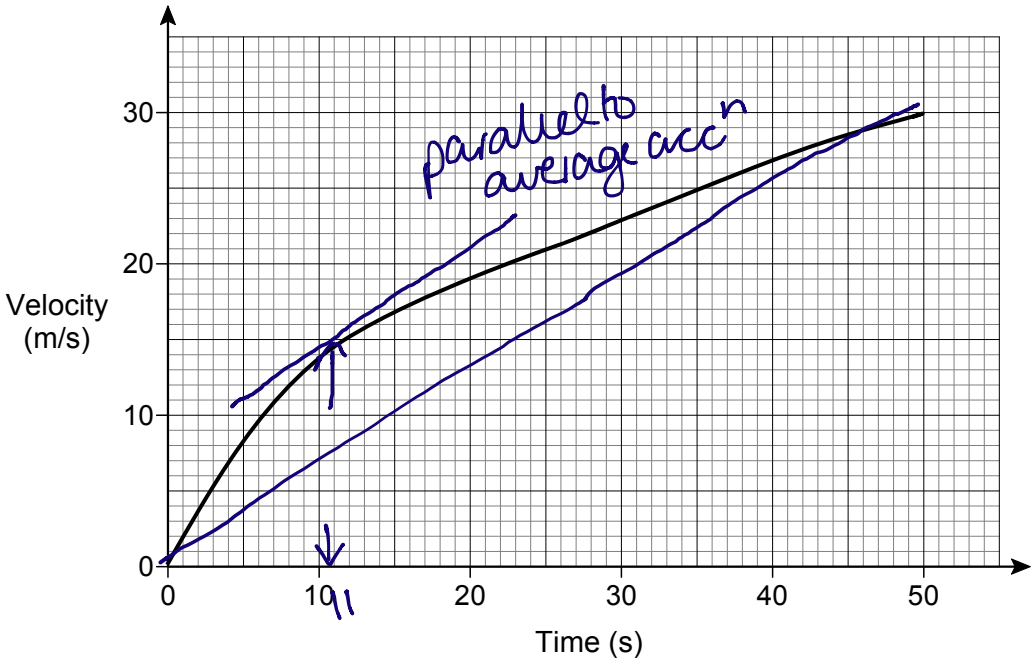
23 (c) *OABC* is reflected in the line $y = x$

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]

$\frac{30}{50} = \frac{3}{5}$

Answer 0·6 m/s²

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 11 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]

$fg(x) : 2(cx+5)+c$

$= 2cx + 10 + c$ given $fg(x) = 6x + d$

$2cx + 10 + c$

$6x + d$

$\therefore 2c = 6 \quad c = 3 \qquad 10 + c = d \quad d = 13$

Answer $d = 13$

Turn over for the next question

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

[2 marks]

$$\frac{10}{3\sqrt{5}} \times \frac{3\sqrt{5}}{3\sqrt{5}} = \frac{30\sqrt{5}}{9\times5} \quad \frac{30\sqrt{5}}{45} \;(\div 5) = \frac{6\sqrt{5}}{9} \;(\div 3) = \frac{2\sqrt{5}}{3}$$

Answer $\frac{2\sqrt{5}}{3}$

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

[3 marks]

$x = 0.1727272\ldots$

$100x = 17.2727272\ldots$

$99x = 17.1$

$x = \frac{17.1}{99} = \frac{171}{990}$

$= \frac{57}{330}$

$= \frac{19}{110}$

$17.2727\ldots$
$0.1727\ldots$
17.1000

$1+7+1 = 9$ so is divisible by 3

$3 \overline{)171} = 057$

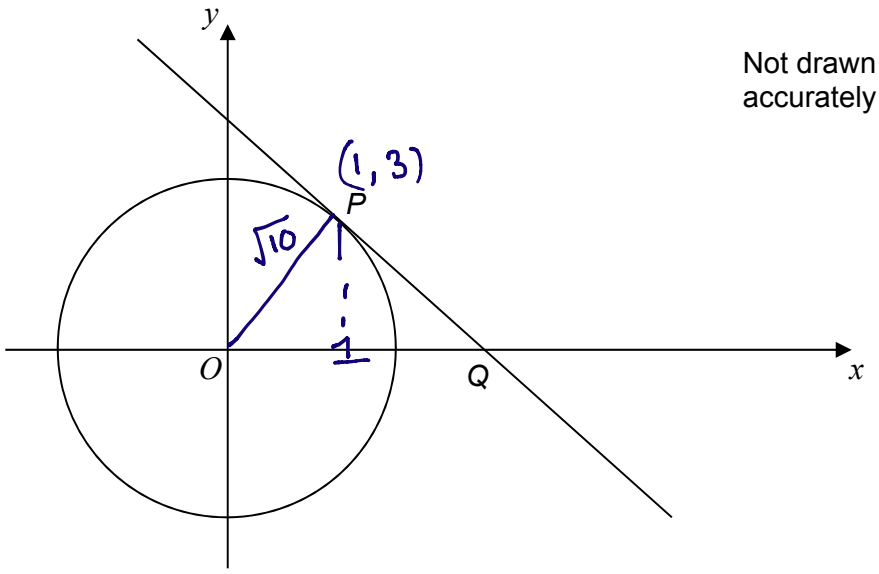
$3 \overline{)57} = 19$

Answer $\frac{19}{110}$

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*.



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Work out the coordinates of *Q*.

[5 marks]

$x^2 + y^2 = 10$ so radius $= \sqrt{10}$

$(\sqrt{10})^2 = 1^2 + y^2$

$10 - 1 = y^2$

$y^2 = 9$

$y = 3$

$y = mx + c$

gradient $OP = \frac{3}{1}$

Line PQ has gradient $-\frac{1}{3}$

$y = -\frac{1}{3}x + c$ passes through $(1, 3)$

$3 = -\frac{1}{3} \times 1 + c$ $\quad c = 3\frac{1}{3}$

$y = -\frac{1}{3}x + 3\frac{1}{3}$

when $y = 0$ $\quad \frac{x}{3} = \frac{10}{3}$ $\quad \therefore x = 10$

Answer (10 , 0)

END OF QUESTIONS

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