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Worked Solutions

F

Tuesday 03 November 2020 – Morning

GCSE (9–1) Mathematics

J560/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You can use:
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Use the π button on your calculator or take π to be 3.142 unless the question says something different.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **20** pages.

ADVICE
- Read each question carefully before you start your answer.

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Please note that these worked solutions have neither been provided nor approved by OCR and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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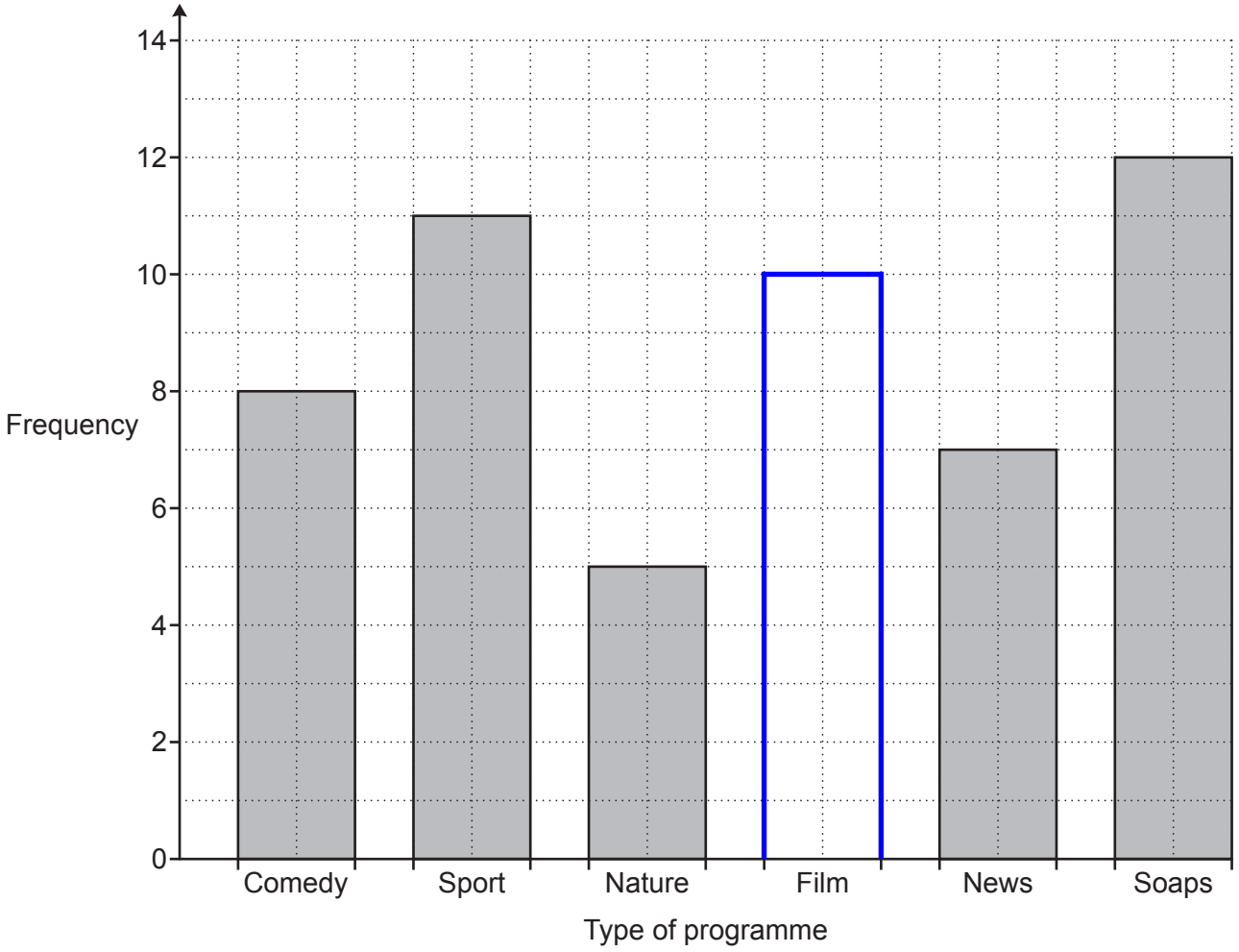
Answer **all** the questions.

1 Reece asked some friends what type of programme they watch most on television.
The bar chart shows some of his results.



(a) 10 people answered Film.

Complete the bar chart to show this information. **[1]**

(b) Complete these sentences.

The Soaps bar was tallest

(i) ..... Soaps ..... was chosen by the most people. **[1]**

(ii) ..... 7 ..... people chose News. **[1]**

The bar for News is 7 tall

(iii) ..... 3 ..... **fewer** people chose Nature than Comedy. **[1]**

The 5 for Nature is 3 fewer than the 8 for Comedy

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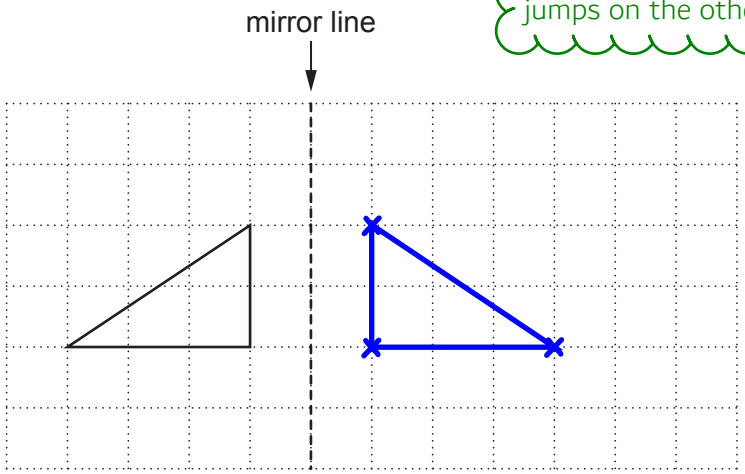
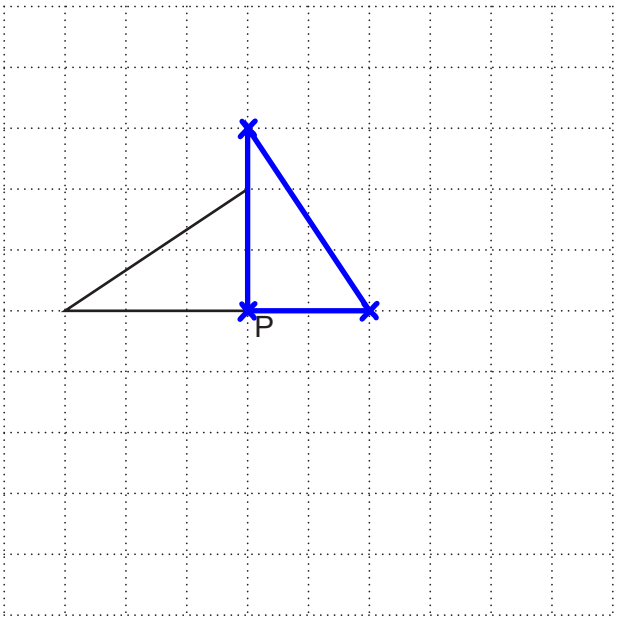
2 **(a)** Reflect the triangle in the mirror line.

Counting the number of jumps to the line and doing the same amount of jumps on the other side for each corner



[2]

(b) Rotate the triangle 90° clockwise about the point P.



Using tracing paper, sketch around the triangle. Put something sharp in at point P then rotate the tracing paper 90° clockwise

[2]

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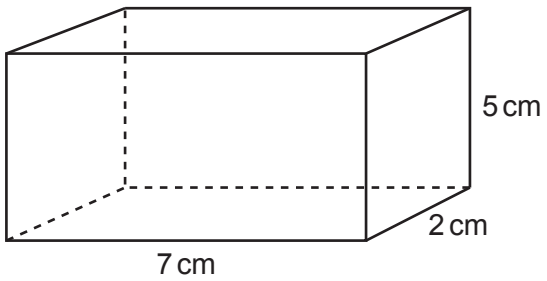
3 Work out the volume of this cuboid.



7x2x5 ← Volume of cuboid = length x width x height. The length is 7cm, the width is 2cm and the height is 5cm

..... 70 ..... cm^3 **[2]**

4 **(a)** Write 2% as a decimal.

Percent is out of 100 so dividing by 100 converts it into a decimal

2/100 = 0.02

(a) ..... 0.02 ..... **[1]**

(b) Write $\frac{11}{20}$ as a percentage.

11/20 x 100 = 55 ← Multiplying any fraction by 100 converts it into a percentage

(b) ..... 55 ..... % **[1]**

5 Use one of the symbols $<$, $=$ or $>$ to make each statement true.

(a) 0.7 ..... > ..... $\frac{2}{3}$ **[1]**

2/3 = 0.6̇ ← 0.7 is greater than 2/3

(b) 27.06 ..... < ..... 27.59 **[1]**

27.06 is less than 27.59

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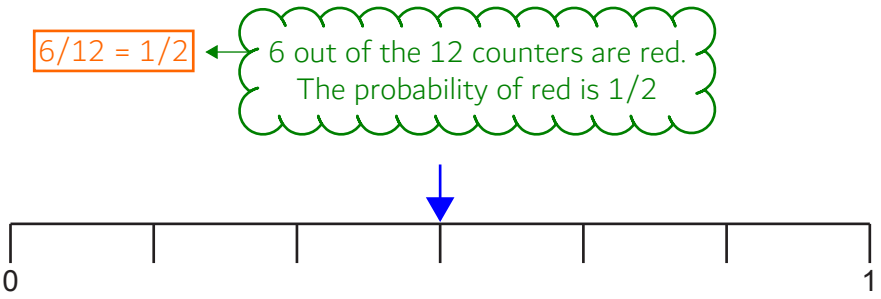
6 A bag contains 12 counters.
6 are red, 4 are blue and 2 are yellow.
A counter is taken from the bag at random.

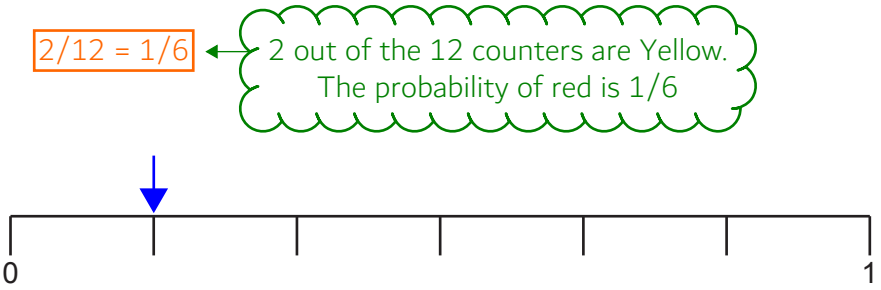
Mark with an arrow (↓) the probability the counter is

(a) red,



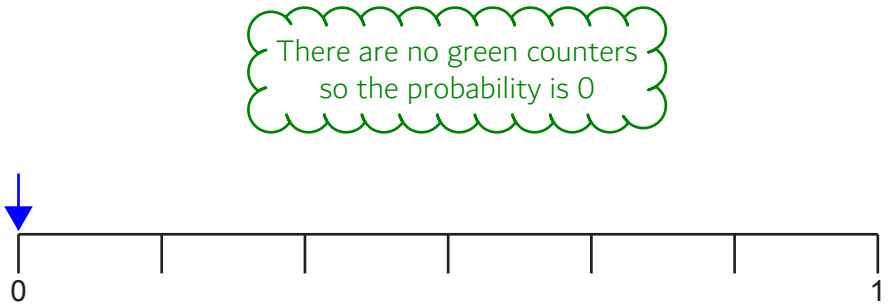
[1]

(b) yellow,



[1]

(c) green.



[1]

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7 **(a)** Divide 72 in the ratio 4 : 5.

$\frac{72}{4+5}$
8×4
8×5

4 + 5 works out how many parts there are in total in the ratio. This many parts represent the 72. So dividing 72 by (4 + 5) works out that the value of 1 part is 8. Multiplying the value of 1 part by 4 and 5 works out the value of the 4 and 5 parts

(a) ..... 32 ..... : ..... 40 ..... **[2]**

(b) In one year, Clara and Dave borrowed books from a library in the ratio 3 : 7.
Dave borrowed 35 books.

Work out the number of books borrowed by Clara.

$\frac{35}{7} \times 3$

7 parts of the ratio represent the 35 books Dave borrowed. Dividing the 35 by 7 works out the value of 1 part. Multiplying this by 3 works out the value of the 3 parts which represent the number of books borrowed by Clara

(b) ..... 15 ..... **[2]**

8 Yoghurts are packed in trays.
Each tray holds 12 yoghurts.

What is the smallest number of trays needed to pack 460 yoghurts?

$\frac{460}{12}$

This works out that the 460 is 38.3̇ lots of the 12

The number of trays needs to be rounded up to the next whole number as it cannot be a decimal

..... 39 ..... **[2]**

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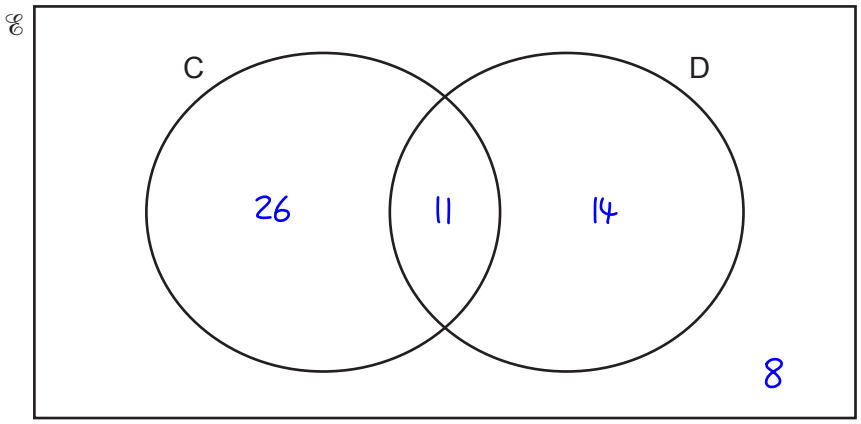
9 59 families are asked whether they have a cat (C) or a dog (D).

- 26 only have a cat.
- 14 only have a dog.
- 11 have both a cat and a dog.

(a) Show this information on the Venn diagram.



[1]

(b) (i) How many of the families do not have a cat or a dog?

59−26−11−14 ← Subtracting the number who only have a cat, the number who only have a dog and the number who have both from the 59 families leaves the number who do not have a cat of a dog

(b)(i) ..... 8 ..... **[1]**

(ii) Write your answer in the correct place on the Venn diagram. **[1]**

(c) One of the families is chosen at random.

Write down the probability that they have a dog.

11+14 ← Adding the number who have only a dog and the number who have both (everything in the D ring) works out that 25 families have a dog. 25 out of the 59 families have a dog

(c) ..... $\frac{25}{59}$ ..... **[2]**

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10 Nadia thinks of a number.
She finds the square root and then divides by 5.
Her answer is 20.

What number is she thinking of?

20×5 ← Doing the opposite operations in the opposite order takes us from the answer to the starting number. The opposite of dividing by 5 is multiplying by 5

100^2 ← The opposite of square rooting is squaring

..... 10000 ..... **[2]**

11 The scale on a map is 1 : 50 000.

How many kilometres on the ground are represented by 8 cm on the map?

$\frac{8 \times 50000}{100 \times 1000}$ ← The 50000 is 50000 time greater than the 1. Therefore multiplying the 8cm on the map by 50000 works out how many centimetres it represents in real life. There are 100cm in 1m so dividing this by 100 converts it into metres. There are 1000m in 1km so dividing by another 1000 converts it into kilometres

..... 4 ..... km **[3]**

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12 **(a)** A train is travelling with a velocity of 15 m/s.
It then accelerates at 0.5 m/s^2 for 6 seconds.

Use the formula $v = u + at$ to calculate the velocity of the train after the 6 seconds.

15+0.5×6

v represents the final velocity, which we are trying to work out. Therefore the formula tells us how to work out the final velocity. Substituting 15 for u (the initial velocity), 0.5 for a (the acceleration) and 6 for t (the time in seconds)

(a) ..... 18 ..... m/s **[2]**

(b) Rearrange the formula $v = u + at$ to make a the subject.

v−u=at ← Subtracting u from both sides get the term involving a on its own

Then dividing both sides by t gets a on its own → $\frac{v-u}{t} = a$

(b) ..... **[2]**

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13 Choose a word from this list that best describes each statement.

Identity Expression Formula Term Equation

(a) $8 = n + 2$ **(a)** Equation **[1]**

(b) $3x + 2y$ **(b)** Expression **[1]**

(c) $(a + b)(a - b) = a^2 - b^2$ **(c)** Identity **[1]**

14 Harry is paid £8.60 per hour for the first 30 hours he works each week.
After 30 hours he is paid $1\frac{1}{2}$ times the hourly rate.

Last week, Harry worked for 33 hours.
He was also paid a bonus of $\frac{1}{10}$ of his earnings for that week.

Calculate how much Harry was paid **in total** last week.

$(8.60 \times 30 + 8.60 \times 1\frac{1}{2} \times 3) \times 1\frac{1}{10}$

Adding the amount earned for the first 30 hours and the amount earned for the next 3 hours expresses the earnings for that week before the bonus. Multiplying this by $1^1/_{10}$ increases the amount by 1/10 so includes the bonus

Expressing the amount earned for working the first 30 hours at £8.60 per hour

Expressing the amount earned for working the next 3 hours

£ 326.37 **[6]**

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15 **(a)** Solve.

$\frac{x}{2} + 5 = 15$

$\frac{x}{2} = 10$ ← Subtracting 5 from both sides to get the x term on its own

Multiplying both sides by 2 to get x on its own

(a) $x =$ ..... 20 ..... **[2]**

(b) Factorise.

$5a^2 - 10a$

The highest common factor of 5 and -10 is 5. The highest common factor of a^2 and a is a. Bringing both of these out as a factor and leaving the remainder in a bracket

(b) ..... 5a(a-2) ..... **[2]**

(c) Solve by factorising.

$x^2 + 15x + 56 = 0$

$(x+7)(x+8)=0$ ← 7 and 8 multiply to the 56 and add to the 15. Putting these in brackets with x factorises the left side

To find the numbers which multiply to the 56 and add to the 15, table mode can be used. f(x) = 56/x. Start: 1. End: 30. Step: 1. This lists out the factor pairs of 56. Going through the list until a pair add to 15

One of the brackets must be 0 in order to multiply to 0. If x + 7 = 0, x = -7. If x + 8 = 0, x = -8

(c) $x =$ ..... -7 ..... or $x =$ ..... -8 ..... **[3]**

16 The height, *h*, of a lorry is 4.3 metres, correct to 1 decimal place.

Complete the error interval for the height, *h*.

$4.3 \pm \frac{0.1}{2}$ ← Adding and subtracting half of the resolution (the amount it goes up in) works out the upper and lower bound. The resolution is 0.1 as it is correct to 1 decimal place

..... 4.25 ..... $\leqslant h <$ ..... 4.35 ..... **[2]**

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17 The table below shows the number of barrels of oil produced per day by some countries.

Country	Barrels of oil produced per day
USA	1.17×10^7
China	3.98×10^6
UK	9.39×10^5
Cameroon	9.32×10^4
Japan	3.92×10^3

(a) Write the number of barrels of oil produced per day by Cameroon as an ordinary number.

$9.32 \times 10^4 = 93200$

(a) ..... 93200 ..... **[1]**

(b) How many more barrels of oil per day did China produce than the UK?
Give your answer in standard form, correct to 3 significant figures.

$3.98 \times 10^6 - 9.39 \times 10^5$ ← Subtracting the amount the UK produced from the amount China produced works out how many more China produced more than the UK

Using the calculator to put the answer in ENG notation puts it into standard form in this case

3.041×10^6 is 3.04×10^6 to 3 significant figures

(b) ..... 3.04×10^6 ..... **[4]**

(c) Jamal says the USA produced approximately three times more barrels of oil than Japan.

Is he correct?
Show how you decide.

$\frac{1.17 \times 10^7}{3.92 \times 10^3} = 2984.6...$ ← This works out how many times more barrels the USA produces than Japan

Jamal is ..... wrong ..... because ..... USA produced approximately 3000 times more .....

..... **[2]**

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18 A triangle has sides of length 14.1 cm, 14.8 cm and 19.5 cm.

Is this a right-angled triangle?
Show how you decide.

$a^2+b^2=c^2$ ← The sides of a right angled triangle will be such that Pythagoras' Theorem works. Writing down the theorem where a and b are the shorter sides and c is the longest side

$c=\sqrt{a^2+b^2}$ ← Rearranging to make c the subject by square rooting both sides

$=\sqrt{14.1^2+14.8^2}$ ← Substituting the two shortest sides for a and b

$=20.4$ ← The longest side should be 20.4... if it is a right angled triangle

No because Pythagoras' Theorem does not hold

[4]

19 One morning Kai records the colour of the cars passing his house.
He then works out the relative frequency of each colour.
Some of his results are shown in this table.

Colour	Silver	Red	Green	Black	Other
Relative frequency		0.16	0.10	0.24	0.32

The following morning, Kai is going to record the colour of the first 200 cars to pass his house.

Work out an estimate for the total number of cars, coloured silver or red, that he should expect to see.

$(1-0.10-0.24-0.32)\times 200$ ← The relative frequencies must all add to 1 as it is certain to be one of the colours. So subtracting the relative frequencies for green, black and other from 1 leaves the relative frequency of silver or red. This relative frequency is an estimate of the probability of silver or red cars seen so multiplying this by the 200 works out an estimate of how many will be silver or red

68

[4]

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20 James is taking three examination papers in Spanish.
Here are his first two results.

Paper 1: $\frac{43}{80}$ Paper 2: $\frac{38}{65}$

Paper 3 is out of 95.
The marks in each of the three papers are added together.

Find the lowest mark that James needs in Paper 3 to achieve 60% of the total marks.

$(95+80+65)\times\frac{60}{100}-43-38$

Paper 1 can be assumed to be out of 80 marks and Paper 2 can be assumed to be out of 65 marks. Adding together the number of marks each of the papers is out of works out the total number of marks the whole exam is out of. Putting the 60 over 100 converts the percentage into a fraction, which when multiplied by the total number of marks the whole exam is out of finds 60% of the total marks. Subtracting the 43 and 38 marks achieved so far on Paper 1 and Paper 2 leaves the number of marks needed on Paper 3 to get 60% of the total marks

63 **[4]**

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21 Three people take $2\frac{1}{2}$ hours to deliver leaflets to 270 houses.

Assuming all people deliver leaflets at the same rate, how long will it take five people to deliver leaflets to 405 houses?
Give your answer in hours and minutes.

$$\frac{\frac{3 \times 2\frac{1}{2}}{270} \times 405}{5}$$

Multiplying the 3 people by the $2^1/_2$ hours works out how many hours worth of work was done. Dividing this by the 270 houses works out how many hours worth of work are needed for each house. Multiplying this by the 405 works out how many hours worth of work are needed for 405 houses. Dividing this by the 5 people works out how long it will take in hours

The answer of 2.25 hours can be converted into hours and minutes using the calculator

.....2..... hours .....15..... mins **[4]**

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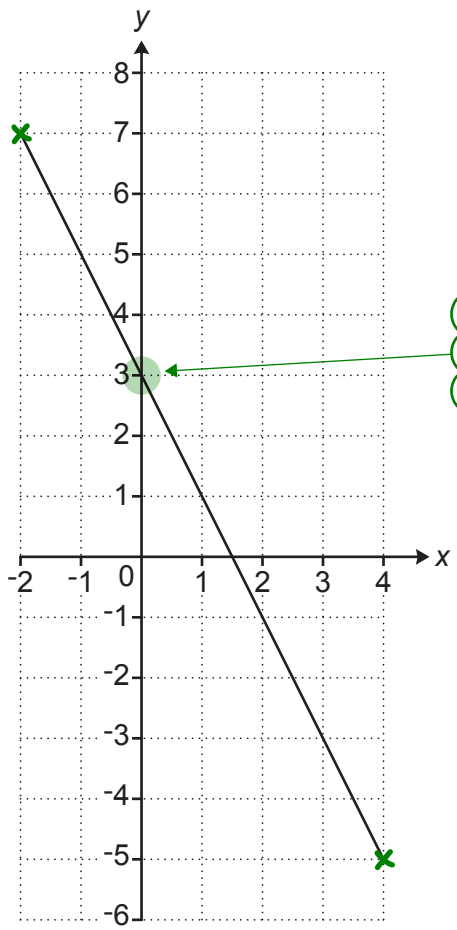
22 This graph shows part of a straight line.



The y-intercept is 3 as this is the y-coordinate where it crosses the y-axis

(a) Write down the *y*-intercept.

(a) ..... 3 ..... **[1]**

(b) Show that the gradient of the line is -2. **[1]**

$\frac{-5-7}{4--2} = -2$

Gradient = (change in y)/(change in x). Picking the two points at the ends of the line marked with green crosses. The change in y is found by subtracting the y-coordinate of the first point from the y-coordinate of the second point. The change in x is found by subtracting the x-coordinate of the first point from the x-coordinate of the second point

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(c) Write down the equation of the line.

The general equation of a straight line is y = mx + c, where m is the gradient and c is the y-intercept

(c) y=-2x+3 ..... **[1]**

(d) The line continues to the right.

Will this line pass through the point (50, ⁻103)?
Show how you decide.

-2x50+3=-97 ↔ Substituting the x-coordinate of 50 into the equation works out that the y-coordinate will be -97 on the line at that point

No ..... because the line goes through (50 , -97) .....

..... **[2]**

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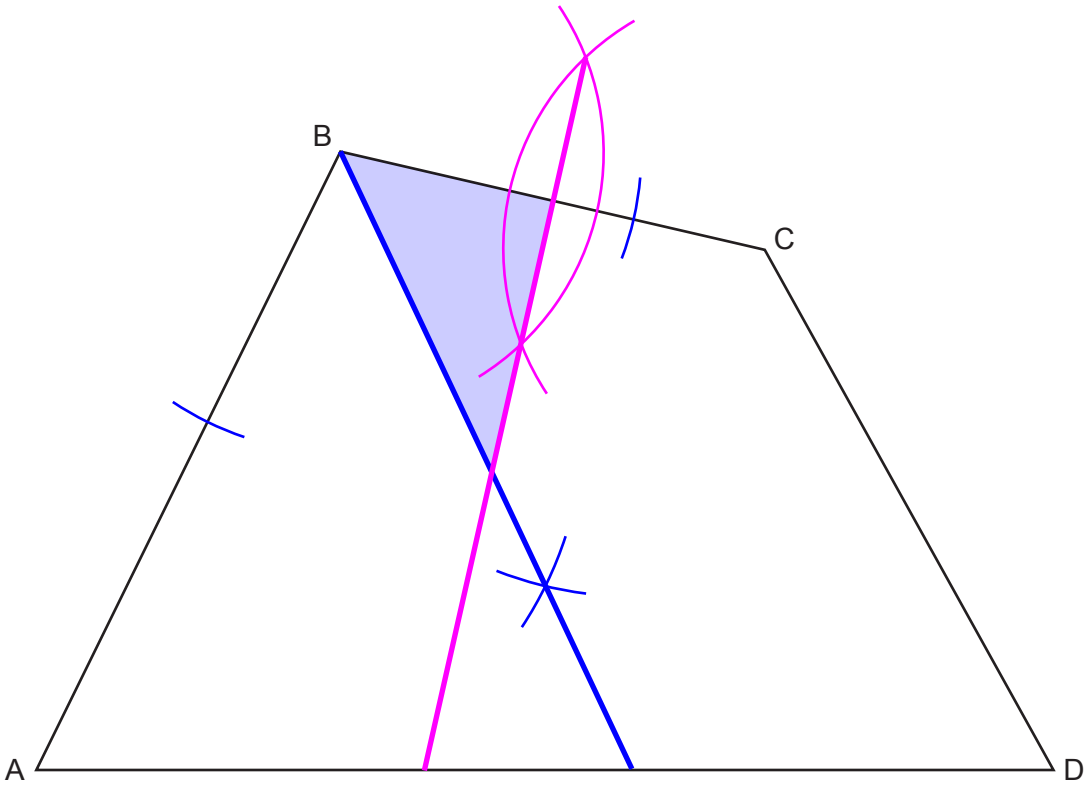
23 ABCD is a quadrilateral.



For (a): Scribe two arcs from B using a compass and the same radius. Scribe two arcs of the same radius from the points these arcs cross AB and BC. Draw a straight line from B through the cross where the two second arcs meet.

For (b): Scribe an arc from B which is at more than half of the length of BC. Scribe an arc from C using the same radius. Draw a straight line through the two points where these arcs meet

(a) Construct the bisector of angle ABC.
Show all your construction lines.

Shown in blue

[2]

(b) Construct the perpendicular bisector of BC.
Show all your construction lines.

Shown in pink

[2]

(c) Shade the region which is

- nearer to BC than to AB

and

- nearer to B than to C.

Shaded in blue

[1]

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24 Lily buys and sells microwaves.

She buys each one for £32 and sells it for £60.
She also pays £7 for the delivery of each microwave she sells.

If she sells a microwave that is faulty then Lily must pay for its repair and redelivery. This costs her another £25 for each faulty microwave.

Last month, 6 out of the 80 microwaves Lily sold were faulty.

This month she has orders for 133 microwaves.

Calculate her expected percentage profit on this month's order.
Showing your working in the boxes below may help you present your work.

Expected number of faulty microwaves:

$\frac{6}{80} \times 133 \rightarrow 10$

Expressing the fraction of the microwaves which were faulty last month gives 6/80. We can estimate that the same fraction of microwaves will be faulty this month. So doing 6/80 of the 133 gives 9.975, which rounds to 10 to the nearest whole number

Expected costs:

$(32+7) \times 133 + 10 \times 25 = 5437$

Adding the cost of buying each microwave (£32) and the delivery cost (£7) gives the total initial cost of each microwave sold. Multiplying this by the 133 orders works out the total initial cost of all of the microwaves. Multiplying the 10 faulty microwaves by the £25 cost to repair and redeliver each one gives the total cost of the faulty microwaves. Adding the total initial cost and the cost of the faulty ones gives the total expected costs

Income from sales:

$60 \times 133 = 7980$

Multiplying the price they are sold for (£60) by the number of orders (133) gives the total income from the sales

Expected percentage profit:

$\frac{7980 - 5437}{5437} \times 100$

Subtracting the costs from the income gives the profit. Expressing this as a fraction of the costs gives the fraction profit. Multiplying this by 100 converts it into a percentage profit

46.8 ..... % **[6]**

Turn over for Question 25

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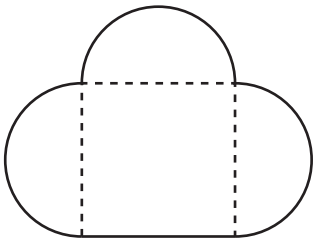
25 The diagram shows Jane's lawn.
It is in the shape of a square of side 36 m and three semi-circles.



Not to scale

She is going to spread fertiliser on the lawn at a rate of 30 g per square metre.
The fertiliser is only sold in 10 kg bags costing £15.80 each.

Calculate the cost of buying the bags of fertiliser for her lawn.
You must show all your working.

Area of square = length^2

Area of circle = π x radius^2. The radius is half of the diameter of 36m. Dividing the are of the full circle by 2 works out the area of each semicircle. Multiplying this by 3 as there are 3 semicircles

There are 1000g in 1kg. So dividing the 30g by 1000 converts it into kilograms

$$\frac{\left(36^2+3\left(\frac{\pi\times\left(\frac{36}{2}\right)^2}{2}\right)\right)\times\frac{30}{1000}}{10}$$

Adding the area of the square and the 3 semicircles works out the total area of the garden. Multiplying this by the 30/1000 kg works out how much fertiliser is needed. Dividing this by the 10kg bags works out how many bags are needed

9×15.80

8.46... bags is rounded up to 9 bags. Multiplying this by the cost of each bag works out the cost of buying the fertiliser

£ ..... 142.20 ..... **[6]**

END OF QUESTION PAPER

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