

**Tuesday 2 November 2021 – 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

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Candidate number

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First name(s)

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Last name

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**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. If you need extra space, use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- 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  $\pi$  button on your calculator or take  $\pi$  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 **24** pages.

**ADVICE**

- Read each question carefully before you start your answer.

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.

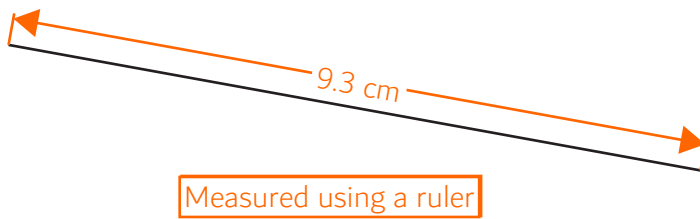
Anything written in green in a cloud doesn't have to be written in the exam.

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](mailto:curtis@cgmaths.co.uk)

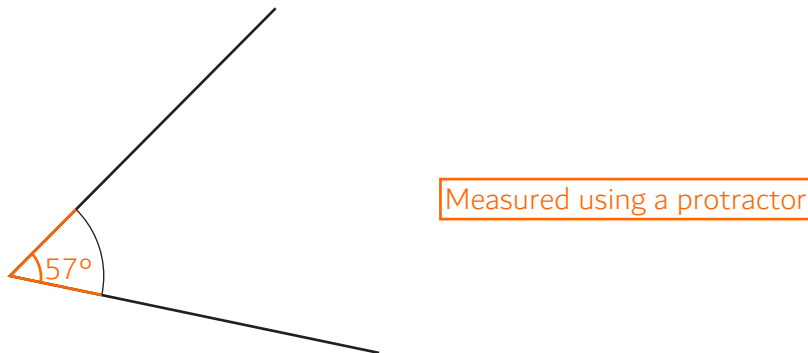
Answer **all** the questions.

- 1 (a) Measure the length of this line.



(a) ..... 9.3 .....cm [1]

- (b) The diagram shows an angle.



- (i) Measure the angle.

(b)(i) ..... 57 .....° [1]

- (ii) Write down the mathematical name of this type of angle.

Acute angles are less than  $90^\circ$

(ii) ..... Acute ..... [1]

2 Write down each of the following.

(a) An odd number.

Odd numbers are integers (not decimals or fractions) which are not divisible by 2

(a) .....|..... [1]

(b) A square number.

$1^2 = 1 \times 1 = 1$ , so 1 is a square number as it is the result of a squared positive whole number

(b) .....|..... [1]

(c) A prime number between 30 and 40.

Prime numbers only have two factors: themselves and 1. Factors are whole numbers which a number can be divided by without getting decimals or fractions

The calculator can be used to check if a number is prime. When expressing it as a product of its prime factors, if it comes back as itself it must be prime

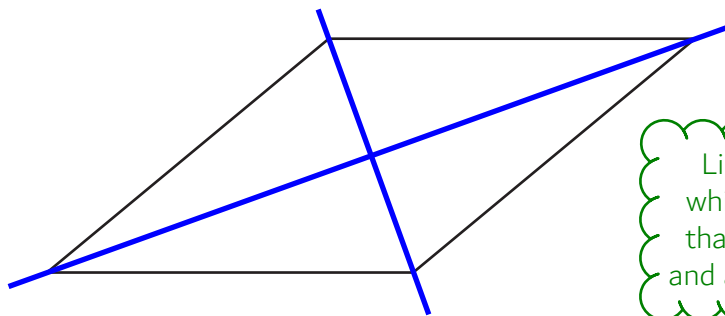
(c) .....31..... [1]

(d) A multiple of 8.

$1 \times 8 = 8$  so 8 is a multiple of 8

(d) .....8..... [1]

3 Here is a rhombus.



Lines of symmetry are lines which cut the shape in two so that both halves are the same and are reflections of each other

(a) On the diagram, draw **all** of the lines of symmetry. [2]

(b) Write down the order of rotation symmetry of the rhombus.

The rhombus can be rotated 2 times within  $360^\circ$  and look the same so it has a rotational symmetry of 2

(b) .....2..... [1]

4 Here is a list of numbers.

6 9 2 3 9 1

(a) Work out the range of the numbers.

$$9 - 1$$

Range = largest - smallest. The largest number is 9 and the smallest number is 1

(a) ..... 8 ..... [2]

(b) Work out the mean of the numbers.

$$\frac{6+9+2+3+9+1}{6}$$

Mean = total/number. Adding all the numbers together gives the total. The number is 6 as there are 6 numbers

(b) ..... 5 ..... [2]

5 (a) Round 564 to the nearest ten.

The 6 is in the tens place. The 4 after it causes it to round down. Then everything after the 6 is set to 0 and ignored

(a) ..... 560 ..... [1]

(b) Round 438749 to 3 significant figures.

The 8 is the 3rd significant figure. The 7 after it causes it to round up. Then everything after it is set to 0 and ignored

(b) ..... 439000 ..... [1]

6 Write the following numbers in order of size, smallest first.

0.529

0.54

0.51

0.502

0.540

0.510

Considering the numbers to three decimal places makes them easier to compare. Otherwise, they all have 5 tenths then the hundredths can be compared to put them in order

.....0.502....., .....0.51....., .....0.529....., .....0.54.....  
*smallest* [2]

7 Solve.

(a)  $x - 14 = 30$

$x = 30 + 14$

Adding 14 to both sides eliminates the -14 on the left and gets x on its own

(a)  $x = \dots\dots\dots 44 \dots\dots\dots$  [1]

(b)  $6y + 7 = 28$

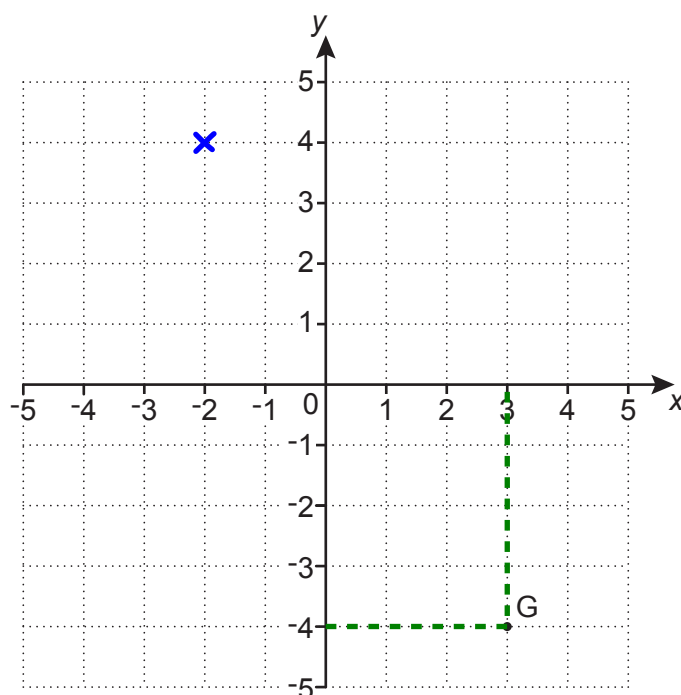
$6y = 28 - 7$

Subtracting 7 from both sides eliminates the +7 on the left and gets the y term on its own

Then dividing both sides by 6 eliminates the 6 on the left and get y on its own. 21 cannot be divided by 6 to give an integer so can be left as an unsimplified fraction

(b)  $y = \dots\dots\dots \frac{21}{6} \dots\dots\dots$  [2]

- 8 Point G is shown on this grid.



- (a) Write down the coordinates of point G.

G has an x-coordinate of 3 and a y-coordinate of -4

(a) ( ..... 3 ..... , ..... -4 ..... ) [1]

- (b) Plot point H on the grid at (-2, 4). [1]

- 9 A student thinks of a number.  
They square it and then add 6.  
Their answer is 295.

What number is the student thinking of?

$$\begin{array}{r} 295 - 6 \\ \hline \sqrt{289} \end{array}$$

Doing the exact opposite operations in the opposite order to go from the answer to the original number. The opposite of adding 6 is subtracting 6. Then the opposite of squaring is square rooting

..... 17 ..... [2]

10 (a) Simplify.

$$3c^2d \times 2d$$

Multiplication can be done in any order. So multiplying the 3 and 2 first to get 6. Then multiplying the  $d$  and  $d$  to get  $d^2$ . Writing them all next to each other means they are multiplied

(a) .....  $6c^2d^2$  ..... [2]

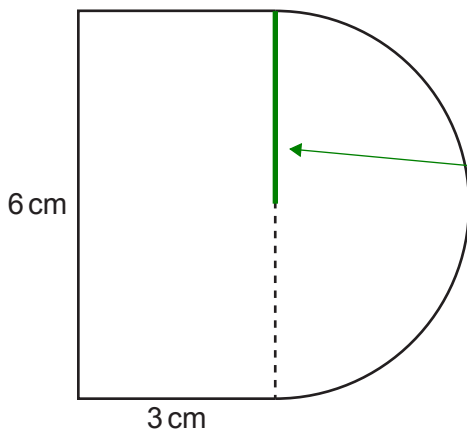
(b) Factorise.

$$35x + 7x^2$$

7 is the highest common factor of 35 and 7.  $x$  is the highest common factor of  $x$  and  $x^2$ . So bringing  $7x$  out as a factor, dividing both terms by this and leaving the result in a bracket

(b) .....  $7x(5+x)$  ..... [2]

11 A rectangle, 6 cm by 3 cm, and a semi-circle are joined to make this shape.



Not to scale

The radius of the semicircle is half of its diameter. Its diameter is 6cm so the radius is  $6/2 = 3\text{cm}$

Work out the area of the shape.

$$\underline{6 \times 3} + \frac{\pi \times 3^2}{2}$$

Area of rectangle = length  $\times$  width

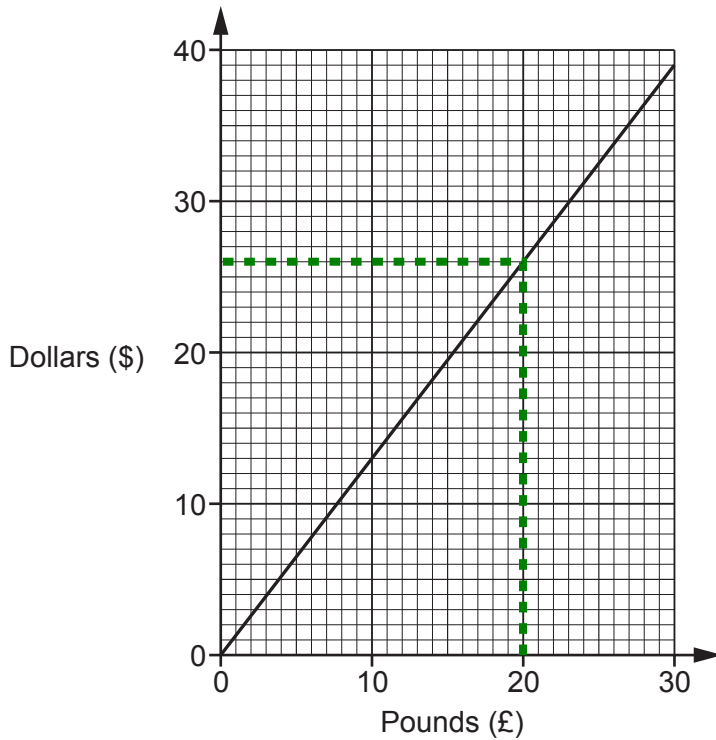
Area of circle =  $\pi \times \text{radius}^2$ . Dividing this by 2 gives the area of a semicircle

Adding the area of the rectangle and semicircle gives the area of the shape

.....  $32.1$  .....  $\text{cm}^2$  [4]



12 A conversion graph between pounds (£) and dollars (\$) is shown below.



- (a) Explain fully how the graph shows that the number of dollars is directly proportional to the number of pounds.

It is a straight line going through the origin

[2]

- (b) Use the conversion graph to change £20 into dollars.

Reading up from £20 to the line  
then across converts it into dollars

(b) \$ ..... 26 ..... [1]

- (c) Some trainers cost £170 in the UK.  
The same trainers cost \$195 in the USA.

Show that the trainers cost less in the USA.

$$\frac{170}{20} \times 26 = 221$$

£170 cannot be read directly off the graph. Instead using the conversion from part (b). Dividing the £170 by £20 works out how many lots of £20 it is. Each lot is \$26 so multiplying by \$26 works out how many dollars it is

$$\$195 < \$221$$

Stating that the \$195 is less than \$221

.....  
..... [4]

- (d) If the trainers are brought from the USA there is an extra charge for tax and delivery.

Alex wants to pay the lowest total amount for the trainers.

Write down the maximum extra charge for tax and delivery that Alex should be willing to pay.  
Give your answer in dollars.

$$221 - 195$$

This works out how much more the trainers cost in the UK in dollars and therefore the maximum extra charge

(d) \$ ..... 26 ..... [1]

- 13 A biased five-sided spinner is numbered 1, 2, 3, 4 and 5.

The table shows the probability of the spinner landing on 1, 2 and 4.

Number	1	2	3	4	5
Probability	0.10	0.10	0.12	0.20	0.48

The spinner is four times more likely to land on 5 than on 3.

Complete the table.

[4]

$$0.10 + 0.10 + x + 0.20 + 4x = 1$$

Let  $x$  be the probability of landing on a 3. The probability of landing on a 5 must be  $4x$ . It is certain to land on one of the numbers so adding all the probabilities together must add to 1

$$5x + 0.4 = 1$$

$$5x = 1 - 0.4$$

$$x = \frac{0.6}{5} = 0.12$$

$$0.12 \times 4 = 0.48$$

Simplifying the equation by collecting like terms. Rearranging to find  $x$  by subtracting 0.4 from both sides then dividing by sides by 5.  $x = 0.12$  so the probability of landing on a 3 is 0.12 The probability of landing on a 5 is 4 times this

- 14 (a) Here are the first four terms of a sequence.

8      15      22      29

- (i) Write down the next term in the sequence.

It increases by 7 between each term.  $29 + 7 = 36$

(a)(i) ..... 36 ..... [1]

- (ii) Explain how you worked out your answer.

.....  $29 + 7$  ..... [1]

- (b) The  $n$ th term of a **different** sequence is given by  $4n + 2$ .

Explain why 32 is **not** a term in this sequence.

$$4n + 2 = 32$$

$$4n = 32 - 2$$

$$n = \frac{30}{4}$$

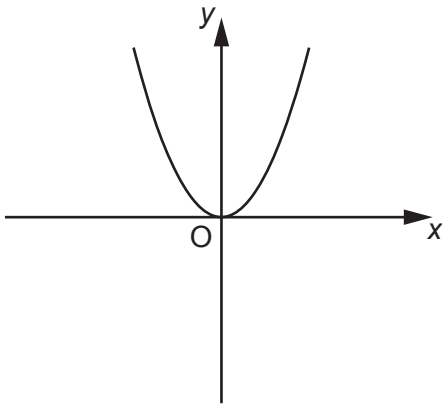
Setting the  $n$ th term equal to the 32 and rearranging to find  $n$  works out what term number it would be

.....  $n$  cannot be a fraction ..... [2]

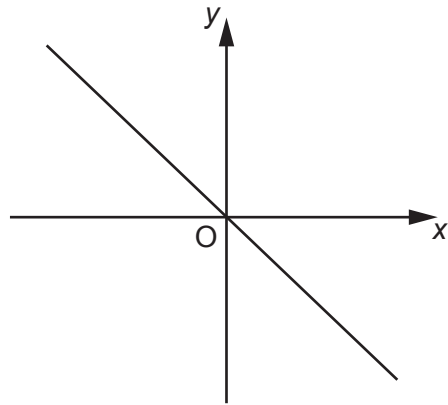
15 For each graph below, select its possible equation from this list.

- A**  $y = x^3$       **B**  $y = -2$       **C**  $y = -x$   
**D**  $x = -2$       **E**  $y = x^2$       **F**  $y = 2x + 1$

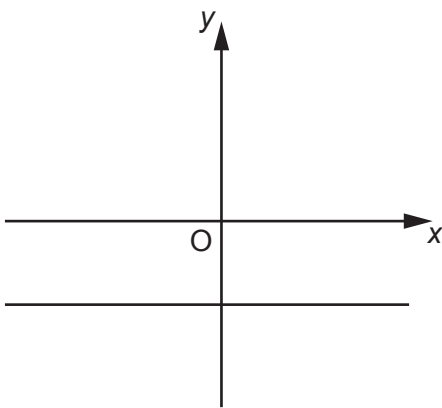
Write the letter of the equation beneath each graph.



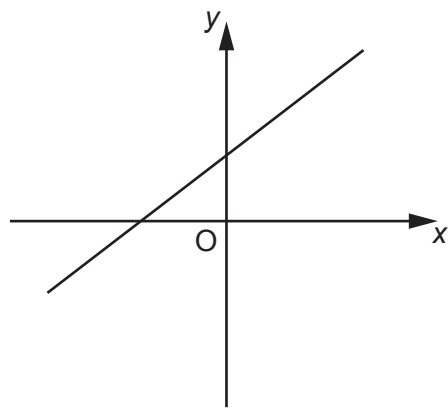
E



C



B



F

[4]

Table mode can be used on the calculator to do a table of values for each equation. Roughly imagining what they each look like enables them to be matched to the graphs

16 Harper's wage is £1200 each month.

They spend  $\frac{1}{4}$  of their wage on rent.

They spend £460 of their wage on other items.

What fraction of their wage does Harper have left?

Give your answer in its simplest form.

$$\frac{1200 - \frac{1}{4} \times 1200 - 460}{1200}$$

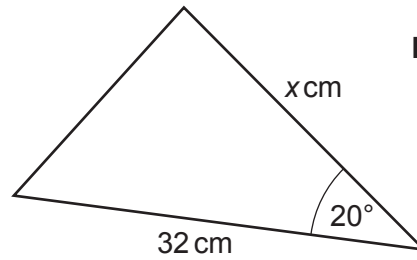
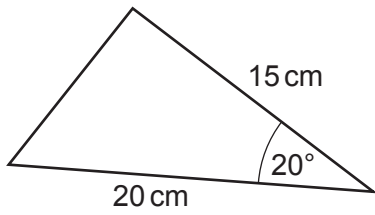
'Of' means to multiply so  $\frac{1}{4} \times 1200$  works out the rent. Subtracting the rent and what is spent on other items leaves the wage left over. Putting this over the 1200 expresses it as a fraction of their their wage

The calculator gives it as a fraction in its simplest form

$$\frac{11}{30}$$

[4]

17 These two triangles are mathematically similar.



Not to scale

Work out the value of  $x$ .

$$\frac{32}{20} \times 15$$

The 20cm is scaled up to get the 32cm. So  $32/20$  expresses the scale factor. Multiplying this by the 15cm works out  $x$

$$x = \dots\dots\dots 24 \dots\dots\dots [2]$$

- 18 Li throws two fair four-sided dice, each numbered 1, 2, 3 and 4.  
Li multiplies together the two numbers that the dice land on to produce a score.

Find the probability that Li's score is a prime number.

$$1 \times 2, 1 \times 3, 2 \times 1, 3 \times 1$$

Listing out the possible outcomes which will give a prime number when multiplied. For example, getting a 1 on the first dice and a 2 on the second dice will give a score of 2 (which is prime) as  $1 \times 2 = 2$

$$\frac{1}{4} \times \frac{1}{4} \times 4$$

1 AND 2 OR 1 AND 3 OR 2 AND 1 OR 3 AND 1. AND means to multiply, OR means to add. 1 out of the 4 outcomes is a 1 so the probability of getting a 1 is  $\frac{1}{4}$ . The probability of any of the numbers is the same. As the probability of each pair of outcomes is the same (they are all  $\frac{1}{4} \times \frac{1}{4}$ ), the probability of one of the pairs of outcomes can be multiplied by 4

$$\frac{1}{4}$$

[4]

- 19 (a) Fountain A squirts water every 24 minutes.  
Fountain B squirts water every 42 minutes.  
They squirt water together at 15:19.

Find the next time they squirt water together.

$2^3 \times 3$   
 $2 \times 3 \times 7$  ← Expressing 24 and 42 as a product of prime factors → The calculator can be used to do this

$2^3 \times 3 \times 7 = 168$  ← Working out the lowest common multiple by multiplying the highest power of each prime factor of both numbers. This means that they both squirt water together after 168 minutes

$15:19 + 0:168$  ← Adding the time taken for them both to squirt water together to the time they squirt water together works out the time they next squirt water together

Time can be put into the calculator in the form hh°mm°ss°, where hh is the hours, mm is the minutes and ss is the seconds

The answer of 18°7'0" means 18:07

Newer models of the Casio calculator can calculate the lowest common multiple of two numbers

(a) ..... 18:07 [4]

- (b) A school sends 60 students from Year 8 and 105 students from Year 9 to a museum.

The school divides these students into groups using the following rules.

- The groups must all be the same size.
- All students in any group must be from the same year.
- There should be as few groups as possible.

Find the size of each group and the total number of groups.

$2^2 \times 3 \times 5$   
 $3 \times 5 \times 7$  ← Expressing 60 and 105 as a product of prime factors → The calculator can be used to do this

$3 \times 5 = 15$  ← Working out the highest common factor by multiplying the lowest power of each prime factor of both numbers. This means that the greatest number of students in a group (which leads to the fewest number of groups) is 15

$\frac{60}{15} + \frac{105}{15}$  ← 60/15 works out how many groups of Year 8 and 105/15 works out how many groups of Year 9 there are. Adding these together works out the total number of groups

Newer models of the Casio calculator can calculate the highest common factor of two numbers

Size of each group = ..... 15 .....

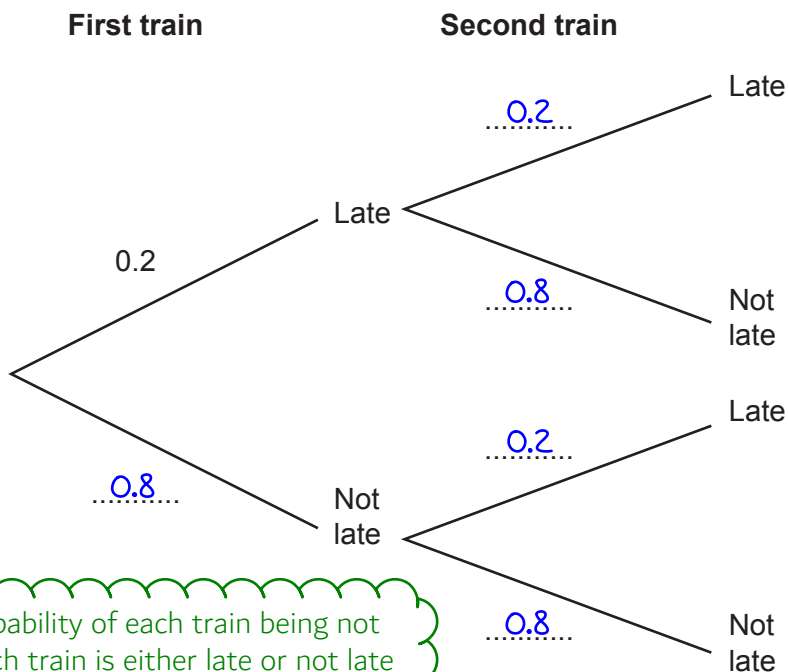
Total number of groups = ..... 11 ..... [4]



20 (a) Over a long period of time, it is found that the probability of a train from Bewford to London being late is 0.2.

(i) One morning there are two trains from Bewford to London.

Use the information to complete the tree diagram.



$1 - 0.2 = 0.8$

This works out the probability of each train being not late. It is certain that each train is either late or not late so the probabilities of each set of branches must add to 1

[2]

(ii) Work out the probability that both trains are **not late**.

$0.8 \times 0.8$

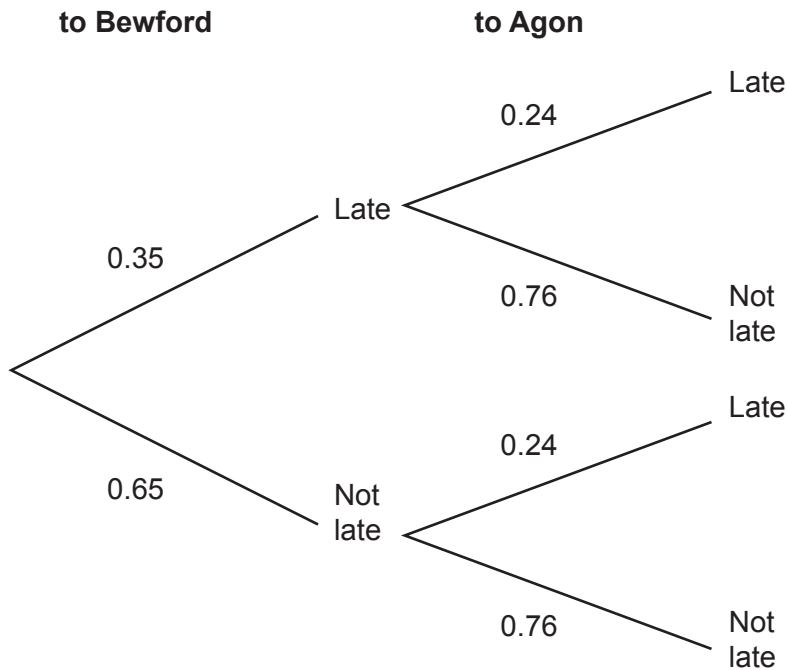
Not late AND not late. Assuming the two events are independent, AND means to multiply the probabilities

(a)(ii) ..... 0.64 ..... [2]

(iii) Give a reason why the probabilities used in the tree diagram for the second train may **not** be reliable.

The first train being late may have an effect on the second train  
 .....  
 ..... [1]

- (b) Morgan takes a train from London to Bewford and then another train to Agon. The tree diagram shows the probabilities of Morgan's trains being late or not late.



Morgan will **not catch** the train to Agon if the train to Bewford is late and the train to Agon is not late.

Work out the probability that Morgan will **catch** the train to Agon.

$1 - 0.35 \times 0.76$

It is certain that Morgan will either catch the train to Agon or not catch the train to Agon. Therefore the probabilities must add to 1 and subtracting the probability of not catching the train to Agon from 1 leaves the probability of catching the train to Agon. The probability of not catching the train to Agon is found with  $0.35 \times 0.76$  as this is the probability of the train to Bewford being late AND the train to Agon not being late. AND means to multiply the probabilities

(b) .....  $0.734$  ..... [3]

- 21 The price of a plane ticket is increased by 15% to £1426.

Find the original price of the plane ticket.

$$\frac{1426}{100+15} \times 100$$

Reducing the £1426 by 15% does not work as the 15% is of the original price, not of the £1426. Let 100% be the original price. 100% + 15% expresses the percentage of the original price the ticket has increased to.

Dividing the £1426 by this works out 1% of the original price.

Multiplying this by 100 works out 100%, which is the original price

£ ..... 1240 ..... [3]

- 22 Kai buys 5 drinks and 3 cakes for £16.35.  
Azmi buys 2 drinks and 6 cakes for £14.70.

Assume that each drink costs the same and that each cake costs the same.

Calculate the cost of one drink and the cost of one cake.  
You must show your working.

$$\begin{aligned} 5d + 3c &= 16.35 \\ 2d + 6c &= 14.70 \end{aligned}$$

Let  $d$  be the cost of one drink and  $c$  be the cost of one cake. Making two equations using the statements about what Kai and Azmi buy

$$10d + 6c = 32.70$$

Multiplying all terms on both sides of the first equation by 2 makes a third equation which has the same number of  $c$  as the second equation

$$8d = 18$$

Subtracting the second equation from the third equation eliminates the  $c$  terms and leaves an equation just in terms of  $d$

$$d = \frac{18}{8} = 2.25$$

Rearranging this equation to make  $d$  the subject works out the cost of one drink

$$3c = 16.35 - 5 \times 2.25$$

Subtracting  $5d$  from both sides of the first equation gets the  $c$  term on its own. Substituting in 2.25 for  $d$

$$c = \frac{5.10}{3} = 1.7$$

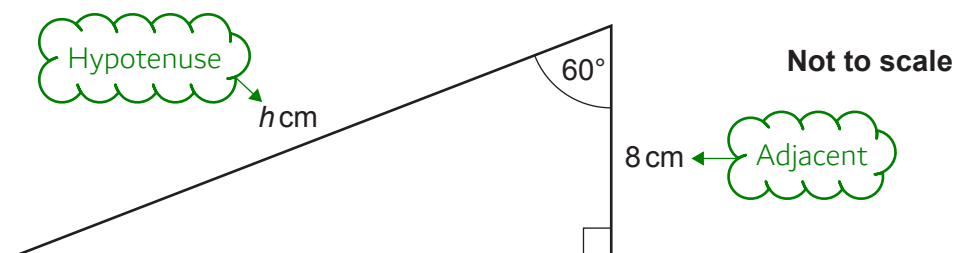
Dividing both sides by 3 works out  $c$ , the cost of one cake

Cost of one drink £ ..... 2.25 .....

Cost of one cake £ ..... 1.70 ..... [5]

1.7 should be quoted as 1.70 as it is in pounds and pence

23 Here is a right-angled triangle.



Work out the value of  $h$ .

S<sup>O</sup> H<sup>Á</sup> C<sup>Á</sup> T<sup>O</sup> A<sup>Á</sup>

Writing SOH CAH TOA as formula triangles. Ticking A as we have the adjacent and H as we are looking for the hypotenuse. There are two ticks on the CAH formula triangle so this one can be used

$$\frac{8}{\cos 60}$$

By covering H, the CAH formula triangle tells us that hypotenuse = adjacent / (cos of the angle). 8cm is the adjacent and 60 is the angle

$$h = \dots\dots\dots 16 \dots\dots\dots [3]$$

- 24 Charlie invests £9000 at a rate of 0.7% per year compound interest.

Calculate the total amount of **interest** Charlie will have earned after 5 years.  
Give your answer correct to the **nearest penny**.

$$9000 \times \left( \frac{100 + 0.7}{100} \right)^5 - 9000$$

100% + 0.7% expresses the percentage the amount increases to each year. Putting this over 100 converts it into a fraction, which increases by 0.7% when multiplied by. Raising it to the power of 5 as it needs to be increased by 5 times. Multiplying the £9000 by this increases it by 0.7% 5 times and gives the amount of money there will be after 5 years. Subtracting the original £9000 leaves the interest

The answer of 319.4409782 is rounded to the nearest penny

£ ..... 319.44 ..... [4]

25 Frankie and Taylor travel the same distance from town A to town B.

Frankie travels at an average speed of 52 kilometres per hour (km/h).

Taylor travels at an average speed of 15 metres per second (m/s).

The journey takes Frankie 4 hours.

Calculate how long the journey takes Taylor.

Give your answer in hours and minutes, correct to the **nearest minute**.

You must show your working.

$s^d_t$  ←

Writing the formula triangle for speed, distance, time

$$\frac{52 \times 4 \times 1000}{15} \div (60 \times 60)$$

From the formula triangle, time = distance/speed. The speed is 5m/s. The distance is the same as what Frankie did and distance = speed x time. The speed is 52km/h and the time is 4 hours for Frankie. So 52 x 4 gives the distance in kilometres. This needs to be converted into metres as Taylor's speed is in m/s. There are 1000 metres in a kilometre so multiplying the distance in kilometres by 1000 converts it into metres. Dividing this by the 5m/s gives the time taken in seconds. There are 60 seconds in a minute and 60 minutes in an hour so dividing this by 60 twice converts it into hours

The calculator can be used to convert the time in hours into time. It gives the answer of 3°51'6.67", which can be read as 3 hours, 51 minutes and 6.67 seconds. This is 3 hours and 51 minutes to the nearest minute

.....3..... hours .....51..... minutes [6]

**END OF QUESTION PAPER**