OCR
Oxford Cambridge and RSA

.CG Maths.
Worked Solutions

Tuesday 1 November 2022 – Morning

GCSE (9–1) Mathematics

J560/01 Paper 1 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You must have:
- the Formulae Sheet for Foundation Tier (inside this document)

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

F

* J 5 6 0 0 1 *

* 9 0 1 9 9 0 1 0 7 2 *

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 **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.

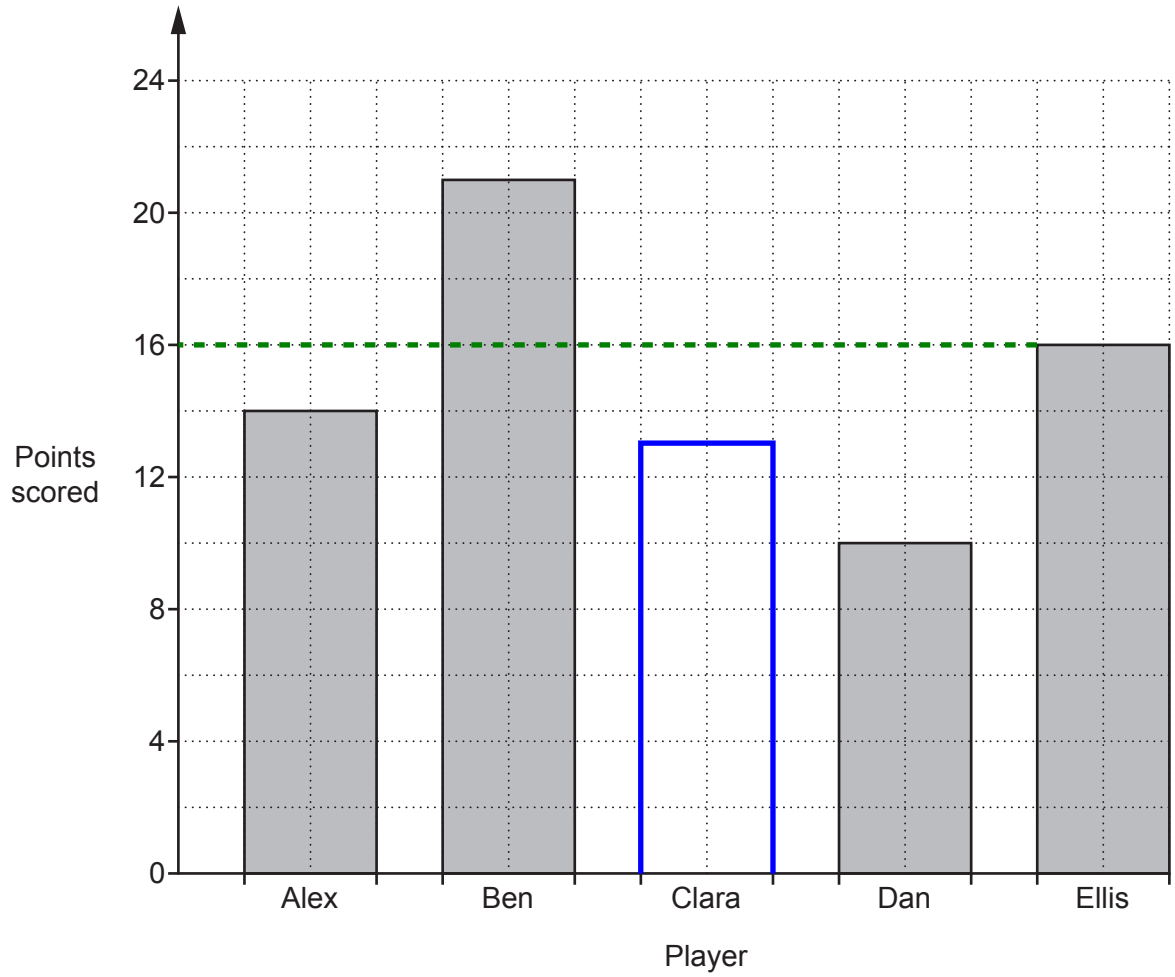
Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

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

.CG Maths.

Answer **all** the questions.

1 The bar chart shows the number of points scored by some quiz players.



(a) How many points were scored by Ellis?

Reading across from the top of the bar for Ellis finds that he had 16 points

(a) ..... 16 ..... **[1]**

(b) How many more points were scored by Alex than Dan?

The scale goes up 4 over 2 boxes. 4 ÷ 2 = 2 so each box is worth 2 points. The bar for Alex is 2 boxes higher than the bar for Dan so Alex has 4 more points as 2 x 2 = 4

(b) ..... 4 ..... **[1]**

(c) Clara scored 13 points.

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

Each box is worth 2 points so half a box is worth 1 point. 13 is 1 more point than 12 so the bar needs to reach half a box above 12

2 **(a)** Write down each of the following.

(i) An even number between 11 and 17.

Even numbers are divisible by 2. They end in 0, 2, 4, 6, 8

(a)(i) 12 ..... **[1]**

(ii) A square number between 15 and 35.

Square numbers are the result of squaring a whole number greater than 0. To square a number it can be multiplied by itself. 4 x 4 = 16 so 16 is a square number

(ii) 16 ..... **[1]**

(iii) The cube root of 64.

$\sqrt[3]{64} = 4$

(iii) 4 ..... **[1]**

(b) 3 is a factor of 51.

Find a factor of 51 between 10 and 20.

Using table mode set f(x) = 51/x. Start: 1. End: 30. Step: 1

This lists out all the factor pairs of 51 as it divides 51 by all the whole numbers from 1 to 30. 17 is a factor of 51 as 51 can be divided by 17 to get 3

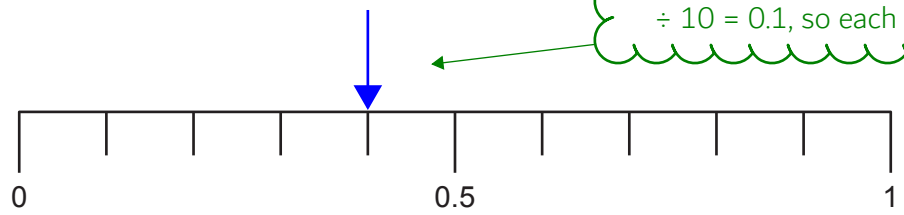
(b) 17 ..... **[1]**

3 Amit has 10 toy cars in a box.
4 are red, 3 are blue, 2 are white and 1 is black.
Amit takes a toy car at random.

Mark with an arrow (↓) the probability that the toy car is

(a) red,

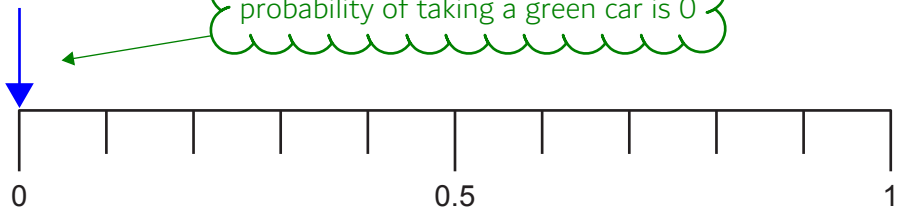
4 out of the 10 cars are red so the probability is 4/10, which is 0.4 as a decimal. The scale goes up 1 over 10 divisions and 1 ÷ 10 = 0.1, so each division is worth 0.1



[1]

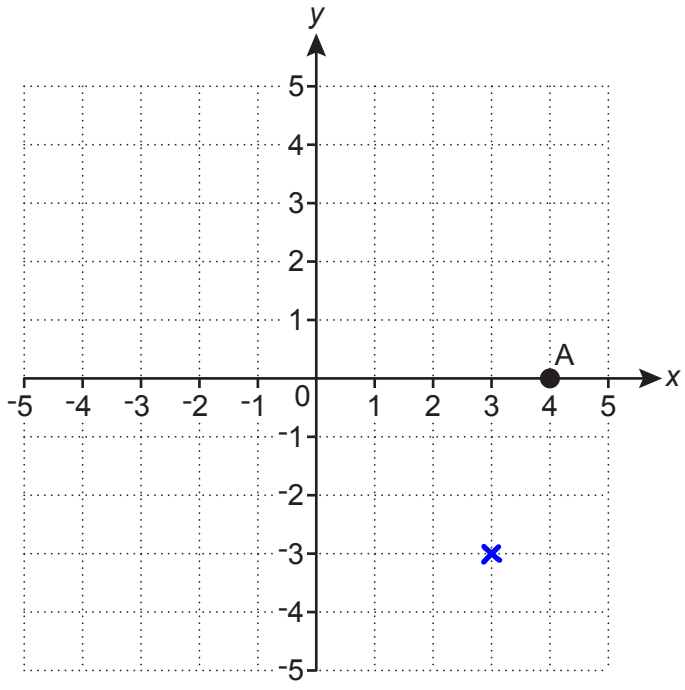
(b) green.

None of the cars are green so the probability of taking a green car is 0



[1]

4 Point A is shown on this grid.



(a) Write down the coordinates of point A.

(a) (4 , 0) **[1]**

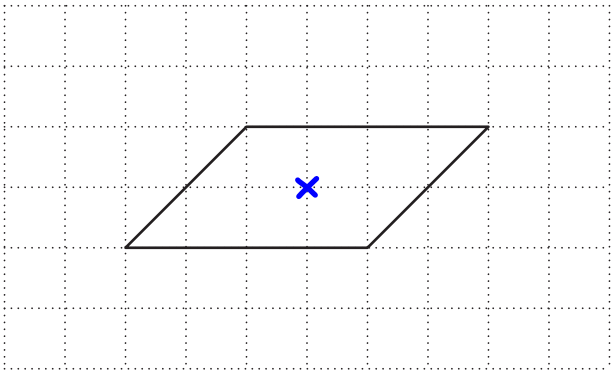
x-coordinate

y-coordinate

(b) Plot point B on the grid at (3, −3). **[1]**

The shape can rotate around the cross to look the same twice within a full turn

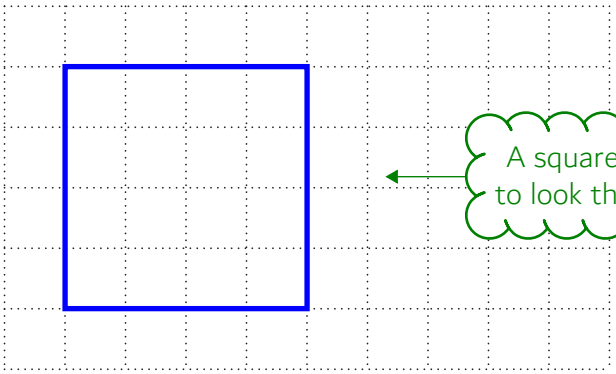
5 **(a)** The diagram shows a parallelogram.



The parallelogram has rotation symmetry of order 2.

Mark the centre of rotation with a cross (X). **[1]**

(b) On the grid below, draw a four-sided shape that has rotation symmetry of order 4.



A square can be rotated 4 times to look the same within a full turn

[1]

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

(a) 0.8 ..... $=$ ..... $\frac{4}{5}$ **[1]**

4/5 converts into 0.8 as a decimal so is equal to the 0.8

(b) 4^2 ..... $>$ ..... 9 **[1]**

$4^2 = 16$, which is greater than 9

7 Morgan makes 15 cakes.
Each cake needs a piece of ribbon 18 cm long for decoration.

Ribbon is only sold in rolls of 1.2 metres, which can then be cut into 18 cm pieces.
One roll of ribbon costs 92p.

Calculate the cost of the ribbon that Morgan must buy to decorate the 15 cakes.
You must show your working.

1.2×100 ← There are 100 cm in 1 m so multiplying the 1.2 metres by 100 converts it into 120 cm

120÷18 ← Dividing the 120 cm on each roll by the 18 cm of each piece of ribbon gives 6.6̇. A whole number of pieces are needed so it is rounded down. This means that 6 pieces of ribbon can be cut from each roll

15÷6 ← Dividing the 15 pieces of ribbon needed by the 6 pieces of ribbon which can be cut from each roll gives 2.76. A whole number of rolls are needed so it needs to be rounded up in order for there to be enough rolls. This means that 3 rolls of ribbon are needed

3×0.92 ← There is 100p in £1, so dividing the 92p by 100 converts it into £0.92. Multiplying this by the 3 rolls works out the cost of the ribbon that Morgan must buy

£ ..... 2.76 ..... **[4]**

8 Blake changes £450 into dollars.
£1 is worth 1.34 dollars.

Blake says

450 ÷ 1.34 = 335.82
Therefore, £450 is worth 335.82 dollars.

Is Blake correct or incorrect?
Give a reason for your decision.

Blake is ..... incorrect ..... because ..... the 450 should be multiplied by 1.34 .....

..... There is 450 lots of £1 therefore it is equivalent to 450 lots of $1.34 ..... **[1]**

9 **(a)** Simplify.

(i) $5r - 7t - 3r + 2t$

Collecting the like terms. 5r - 3r = 2r and -7t + 2t = -5t

(a)(i) ..... 2r-5t ..... **[2]**

(ii) $a \times a \times a \times a \times a$

There are 5 a multiplied together so it is a to the power of 5

(ii) ..... a^5 ..... **[1]**

(iii) $7b^5 \div b$

Dividing by b takes 1 off the power of b as there is 1 less b multiplied together

(iii) ..... $7b^4$ ..... **[1]**

(b) Factorise.

$4a - 12b$

The highest common factor of both terms is 4. Bringing this out as a factor and dividing both terms by 4 and leaving the result in a bracket

(b) ..... 4(a-3b) ..... **[1]**

10 **(a)** One morning Harper records the first 50 vehicles to pass the school gate.
Harper's results are shown in this table.

Type of vehicle	Number
Car	31
Lorry	3
Motorbike	7
Van	9

Use Harper's results to estimate the probability that the next vehicle will **not** be a motorbike.

31+3+9

Adding the number of cars, lorries and vans works out that 43 of the vehicles were not motorbikes. 43 out of the 50 vehicles were not motorbikes

$\frac{43}{50}$ ..... **[2]**

(b) One afternoon Reece records some vehicles that pass the school gate.
$\frac{2}{5}$ of the vehicles they record are cars.

For Reece's results, write down the ratio of cars to not cars.
Give your answer in its simplest form.

2/5 were cars so 3/5 must have not been cars. Multiplying both sides of the ratio by 5 eliminates the denominators and gives it in its simplest form

$\frac{2}{5} : \frac{3}{5}$

(b) ..... 2 ..... : ..... 3 ..... **[1]**

11 Write a number in each box to make each statement true.

(a) $\boxed{-4} - 7 = -11$ **[1]**

Adding 7 to both sides eliminates the -7 on the left and gets the box on its own. -11 + 7 = -4

(b) $\frac{3}{\boxed{5}} \div 2 = \frac{3}{10}$ **[1]**

Multiplying both sides by 2 eliminates the ÷ 2 on the left and gets the box on its own. 3/10 x 2 = 3/5

(c) $\frac{\boxed{9}}{\boxed{10}} \times \frac{2}{3} = \frac{3}{5}$ **[1]**

Dividing both sides by 2/3 eliminates the x 2/3 on the left and gets the box on its own. 3/5 ÷ 2/3 = 9/10

12 Here are the first four terms of a sequence.

7 15 23 31

(a) Write down the next term of the sequence.

8 is added between each term. 31 + 8 = 39

(a) 39 **[1]**

(b) Explain how you worked out your answer.

31+8 **[1]**

(c) Explain why 80 is **not** a term in this sequence.

All the terms in the sequence are odd **[1]**

Odd + even = odd. So as 8 is added between each term and this is even, all the numbers in the sequence must be odd

13 At the end of each day, a driver works out the mean distance they have driven so far that week.

At the end of 5 days, the mean distance they have driven is 185.5 miles per day.
At the end of 6 days, the mean distance they have driven is 190 miles per day.

Work out how many miles the driver drove on the sixth day of that week.

$m^t n$ ← Mean = total/number, where total is the total distance and number is the number of days. Writing this as a formula triangle

$185.5 \times 5 = 927.5$ ← From the formula triangle, total = mean x number. Multiplying the mean at the end of 5 days by the 5 days works out that the total distance in the first 5 days is 927.5 miles

$190 \times 6 = 1140$ ← From the formula triangle, total = mean x number. Multiplying the mean at the end of 6 days by the 6 days works out that the total distance in the first 6 days is 1140 miles

$1140 - 927.5$ ← Subtracting the total distance in the first 5 days from the total distance in all 6 days works out the distance driven on the sixth day

212.5 miles **[4]**

14 Box A contains 56 books.
Box B contains 75 books.

Ling has read $\frac{5}{7}$ of the books in box A.

Ling has also read the same number of books in box B.

Work out the fraction of the books in box B that Ling has read.
Give your answer as a fraction in its lowest form.

$\frac{5}{7} \times 56$ ← 'of' means to multiply so this works out that 5/7 of the 56 books in box A is 40

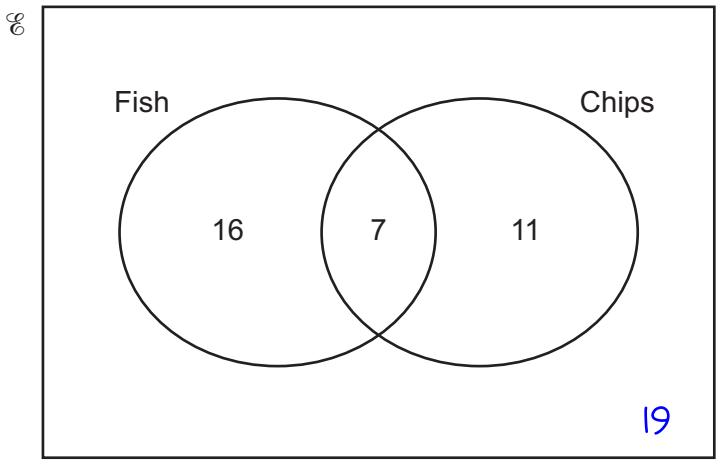
$\frac{40}{75}$ ← Expressing the fraction of the books in box B that have been read

Entering the fraction into the calculator simplifies it

$\frac{8}{15}$

..... **[3]**

15 A researcher asked 53 customers leaving a fish and chip shop what they had bought.
The Venn diagram shows some of the results.



(a) How many customers bought chips but not fish?

11 is in the ring for chips but not the ring for fish

(a) ..... 11 ..... **[1]**

(b) Complete the Venn diagram to show the number of customers who did not buy fish or chips.
[2]

53-16-7-11

Subtracting the 16 who bought only fish, the 7 who bought both fish and chips and the 11 who bought only chips from the 53 customers works out that 19 did not buy fish or chips

(c) One of the 53 customers is chosen at random.

Write down the probability that this customer bought fish.

16+7

Adding the 16 who bought only fish and the 7 who bought both fish and chips works out that 23 bought fish

23 out of the 53 customers bought fish → $\frac{23}{53}$

(c) ..... **[2]**

16 **(a)** Rearrange this formula to make d the subject.

$f = 5d + 4$

$f - 4 = 5d$ ← Subtracting 4 from both sides eliminates the +4 on the right and gets the d term on its own

Dividing both sides by 5 eliminates the 5 on the right and gets d on its own → $\frac{f-4}{5} = d$

(a) ..... **[2]**

(b) Use the formula

$v = u + at$

to find the final velocity, when

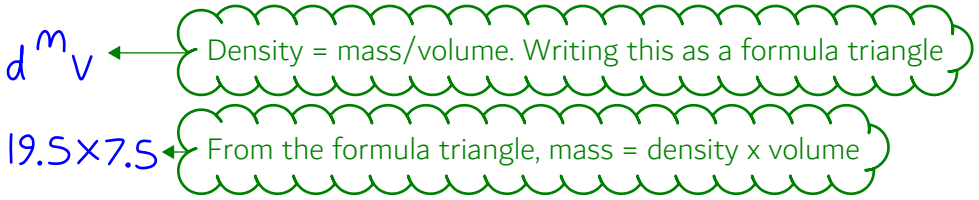
- the initial velocity is 5 m/s
- the acceleration is 7.5 m/s^2
- the time is 6 seconds.

$5 + 7.5 \times 6$ ← v is the final velocity, u is the initial velocity, a is the acceleration and t is the time. Substituting all the values into the formula finds v

(b) ..... 80 ..... m/s **[2]**

17 The density of gold is 19.3 g/cm^3.
Sam has a gold nugget of volume 7.5 cm^3.

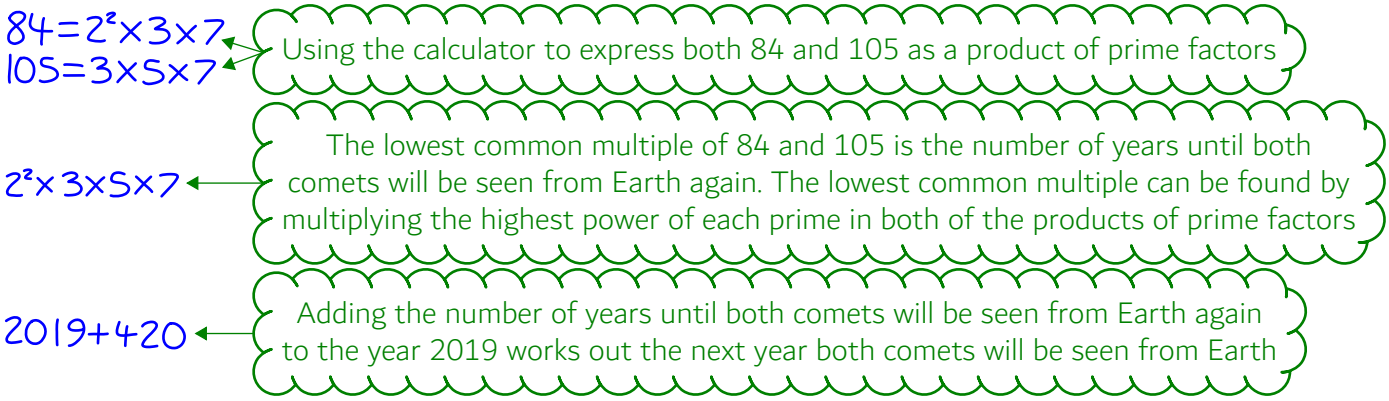
Calculate the mass of the gold nugget.



144.75 ..... g **[2]**

18 In 2019, comet A and comet B were both seen from Earth.
Comet A is seen from Earth every 84 years.
Comet B is seen from Earth every 105 years.

Find the next year when both comets will be seen from Earth.



Newer models of Casio calculators can work out the lowest common multiple of two numbers without having to do the method above

2439 ..... **[4]**

19 Eve is counting the photos on her phone.
The ratio of the number of photos of her family to photos of her friends is 3 : 7.
She has 450 photos of her family.
80% of the photos of her friends include Jack.

Work out how many of the photos of her friends include Jack.

$450 \div 3$ ← 3 parts of the ratio represent the 450 photos of her family. Dividing the 450 by 3 works out that 1 part of the ratio represents 150 photos

150×7 ← Multiplying the value of 1 part of the ratio by the 7 parts which represent photos of her friends works out that there are 1050 photos of her friends

$1050 \times \frac{80}{100}$ ← Percentage is out of 100 so 80% as a fraction is 80/100. Multiplying the 1050 photos of her friends by this fraction finds that 80% of the photos of her friends is 840

840 ..... **[4]**

20 Rowan invests £4000 at a rate of 3.5% per year compound interest.

Calculate the value of Rowan's investment after 5 years.
Give your answer correct to the **nearest penny**.

$4000 \times \left(\frac{100+3.5}{100}\right)^5$

The original amount is 100%. Adding 3.5% expresses the percentage it increases to each year. Putting this over 100 converts it into a fraction, which increases the £4000 by 3.5% when it is multiplied. Raising the fraction to the power of 5 as the £4000 needs to be increased by 3.5% 5 times

The answer of 4750.745... is rounded to the nearest penny

£ 4750.75 **[3]**

21 The table below shows the approximate population of three countries in 2020.

Country	Population
China	1.44×10^9
Kiribati	1.19×10^5
Tuvalu	1.18×10^4

(a) Calculate the approximate total population of Kiribati and Tuvalu in 2020.
Give your answer in standard form, correct to **3** significant figures.

$1.19\times10^5+1.18\times10^4=130800$

Adding the population of Kiribati and Tuvalu in 2020 works out the total

130800 rounds to 131000 to 3 significant figures. Dividing this by 10 5 times gives a decimal between 1 and 10 so it must be multiplied by 10^5 to keep it equal. This is now in standard form

1.31×10^5

(a) ..... **[4]**

(b) Show that in 2020 the population of China was approximately 120 000 times the population of Tuvalu. **[2]**

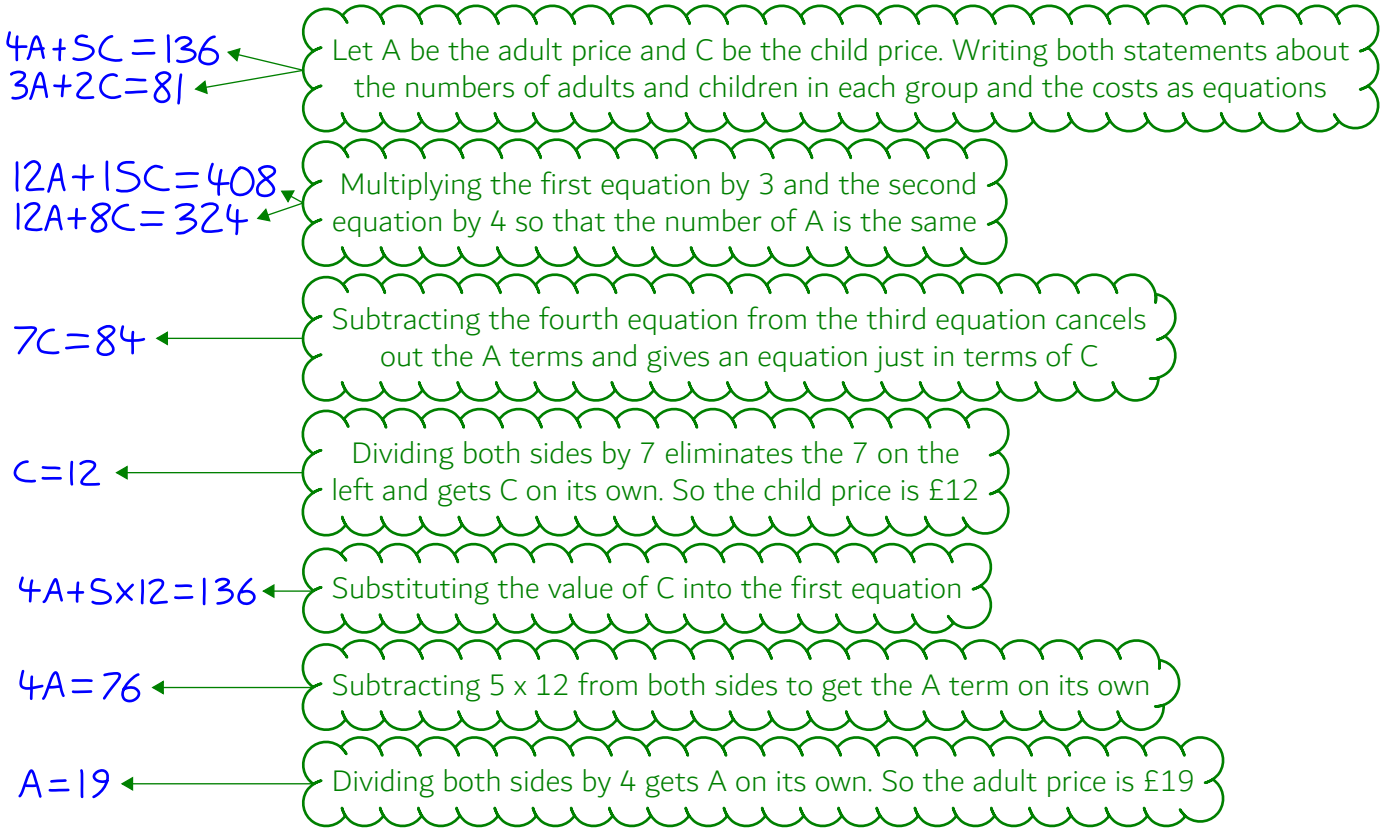
$\frac{1.44\times10^9}{1.18\times10^4}=122033.9$

Dividing the population of China by the population of Tuvalu works out how many times greater the population of China is than the population of Tuvalu

22 A theatre has an adult price and a child price for their shows.

A group of 4 adults and 5 children paid a total of £136.
A group of 3 adults and 2 children paid a total of £81.

Work out the price for one adult and the price for one child.
You must show your working.



Price for one adult £ ..... 19 .....

Price for one child £ ..... 12 ..... **[5]**

23 An examination has three papers.
Paper 1 is marked out of 60.
Paper 2 is marked out of 40.
Paper 3 is marked out of 100.
The three marks are added together to form the total mark out of 200.

A student scored 65% on Paper 1 and 70% on Paper 2.

Find the mark they need to get on Paper 3 to achieve 64% of the total marks.
You must show your working.

$60+40+100$ ← Adding together the number of marks on Paper 1, 2 and 3 works out that there are 200 marks in total

$\frac{64}{100} \times 200 = 128$ ← Percentage is out of 100 so putting the 64% over 100 converts it into a fraction. Multiplying the 200 by this fraction finds that 64% of the total marks is 128

$\frac{65}{100} \times 60 = 39$ ← Putting the 65% over 100 converts it into a fraction. Multiplying the 60 marks on Paper 1 by this fraction finds that 65% of the marks on Paper 1 is 39

$\frac{70}{100} \times 40 = 28$ ← Putting the 70% over 100 converts it into a fraction. Multiplying the 40 marks on Paper 2 by this fraction finds that 70% of the marks on Paper 2 is 28

$128-39-28$

61 ..... **[5]**

Subtracting the 39 marks scored on Paper 1 and the 28 marks scored on Paper 2 from the 128 marks needed to get 64% of the total marks works out that 61 marks are needed on Paper 3

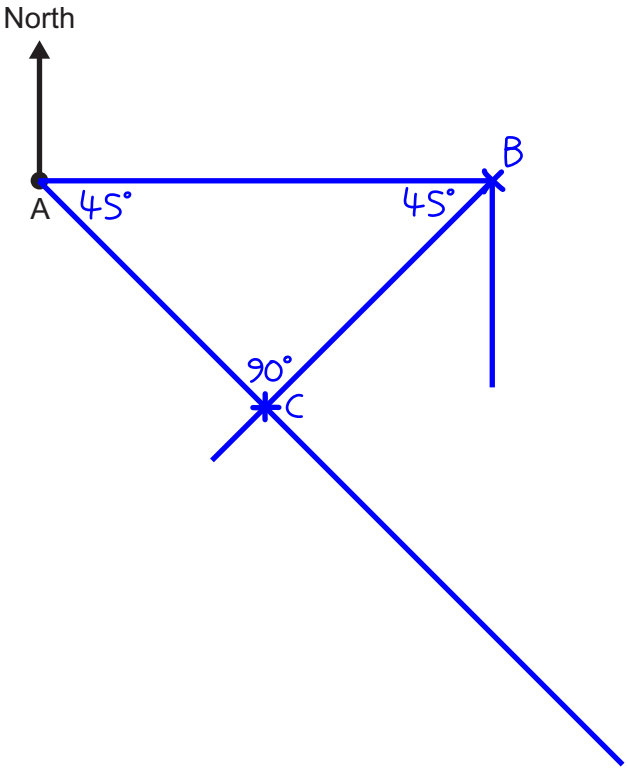
24 B is 12 km due east of A.
C is south-east of A and on a bearing of 225° from B.

Complete the diagram to show the positions of A, B and C.
Show clearly the values of all three angles in triangle ABC.

Scale: 1 cm represents 2 km

$12 \div 2 = 6$ ← Every 2 km is represented by 1 cm. Dividing the 12 km by 2 works out that it is 6 lots of 2 km and therefore should be represented by 6 cm

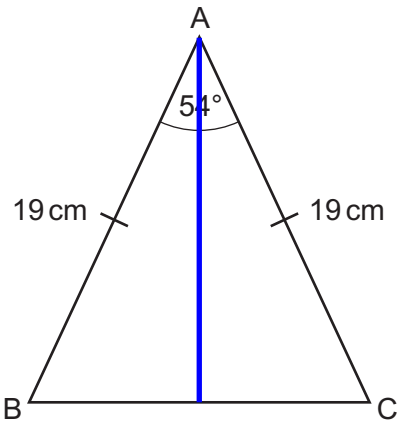
$225 - 180 = 45$ ← Working out that the 225° is 45° more than 180°



[4]

1. Use a protractor to measure 90° clockwise from north at point A.
2. Draw a 6 cm line from A in this direction.
3. Put a cross for point B at the end of the line.
4. Use a protractor to measure 135° clockwise from north at point A.
5. Draw a line from A in this direction to indicate all points which are south-east from A.
6. Draw a line going straight down from B to indicate which direction is south.
7. Use a protractor to measure 45° clockwise from south at point B.
8. Draw a line from B in this direction to indicate all points which are on a bearing of 225° from B.
9. Put a cross for point C where the two lines meet.
10. Measure the angles in the triangle ABC using a protractor and write in the angles.

25 The diagram shows an isosceles triangle, ABC.



Not to scale

Drawing the line of symmetry cuts the triangle in half to form two right-angled triangles

AB = AC = 19 cm.
Angle BAC = 54°.

Calculate the length of BC.
You must show your working.

54 ÷ 2 = 27 ← The 54° angle is bisected so that both halves are the same. Dividing it by 2 works out that each half of the angle is 27°

SOH CAH TOA ← Using right-angled trigonometry on one of the right-angled triangles. Writing SOH CAH TOA as formula triangles. Ticking O as we are looking for the opposite and H as we have the hypotenuse

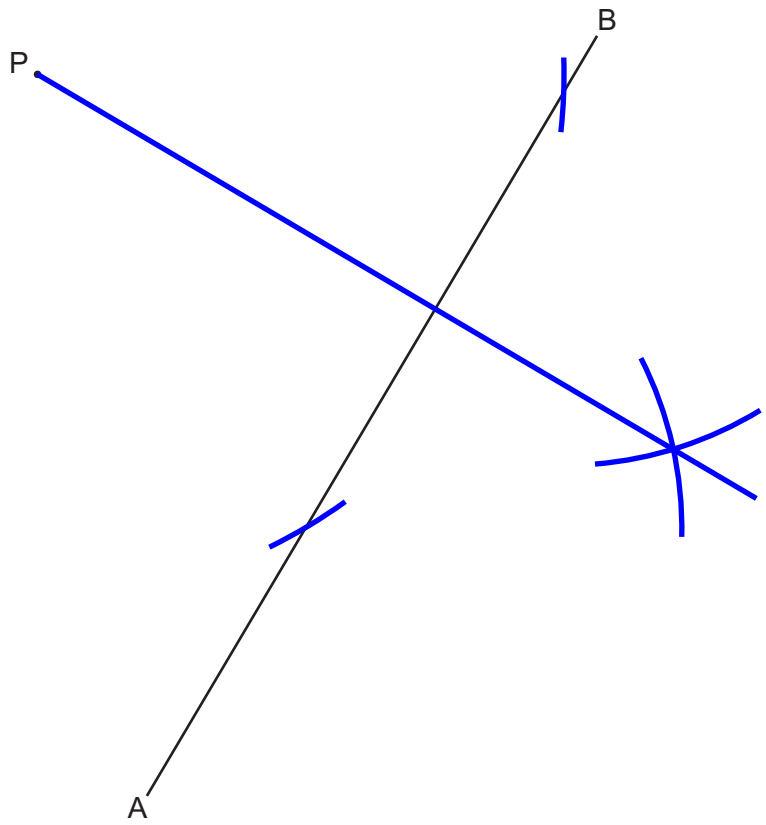
Sin27 x 19 ← There are two ticks on the SOH formula triangle so this one can be used. Covering O tells us that opposite = sin of the angle x hypotenuse

8.6...x2 ← The opposite in one of the right-angled triangles is half of length BC so it needs to be multiplied by 2 to work out BC

The answer of 17.251... can be rounded to 1 decimal place

17.3 ..... cm **[5]**

26 (a) Construct the perpendicular from the point P to the line AB.

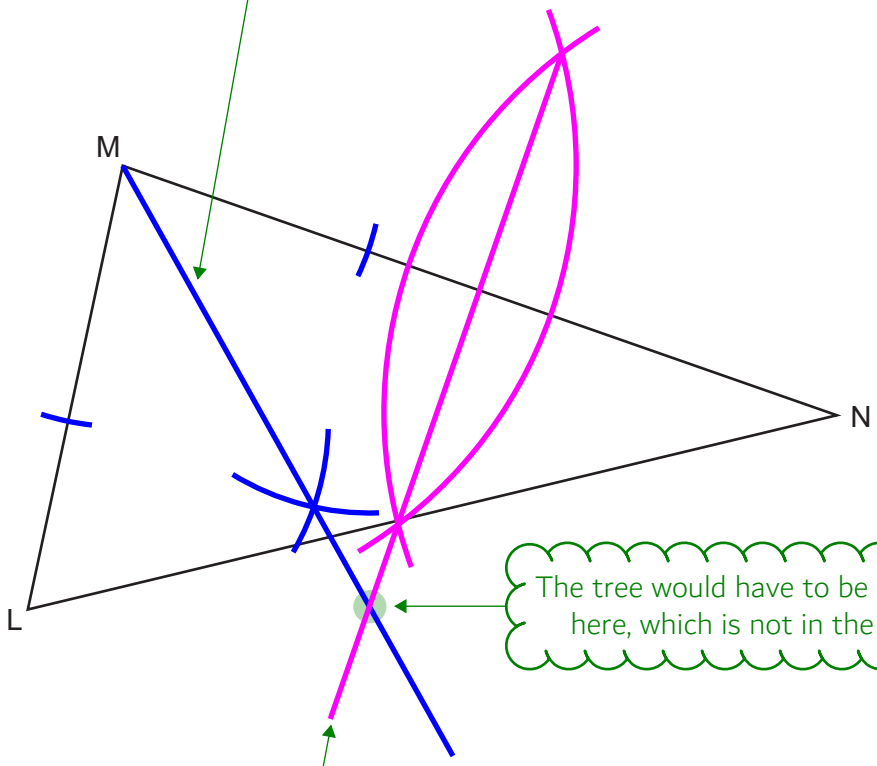


[2]

1. Using a compass, scribe two arcs from P on the line AB.
2. Using a compass, scribe an arc from where the first arc meets line AB and an arc from where the second arc meets AB which meet and form a cross on the right of line AB.
3. Using a ruler, draw a straight line from P through the cross.

(b) The diagram shows a field LMN.

Constructing an angle bisector of angle M (shown in blue) shows all points which are the same distance from MN and ML. To do this:
1. Using a compass, scribe two arcs from point M, one of which is on line MN and the other which is on line ML.
2. Using a compass, scribe an arc from the first arc and scribe an arc from the second arc which meet and form a cross.
3. Using a ruler, draw a straight line from point M through the cross.



The tree would have to be planted here, which is not in the field

Constructing a perpendicular bisector of line MN (shown in pink) shows all points which are the same distance from corner M and corner N. To do this:
1. Using a compass, scribe arcs from points M and N which meet and form two crosses.
2. Using a ruler, draw a straight line through both of the crosses.

A tree is to be planted in the field so that it is

- the same distance from the fences MN and ML

and

- the same distance from corner M as from corner N.

Show, by construction, whether this can be done or cannot be done.

This ..... cannot ..... be done. **[5]**

Turn over for Question 27

27 A bag contains 35 balls.
Each ball is either red or green.
The ratio of red balls to green balls is 3 : 2.

Work out the smallest number of balls of each colour that have to be added to the bag so that the ratio of red balls to green balls becomes 7 : 3.
You must show your working.

35÷5 ← There are 35 balls in total and 5 parts in total in the first ratio (as 3 + 2 = 5). Dividing the 35 balls by the 5 parts works out that each part of the ratio is worth 7 balls

7×3=21 ← There are 3 parts in the first ratio for red balls so multiplying the value of 1 part by 3 works out that there were originally 21 red balls

7×2=14 ← There are 2 parts in the first ratio for green balls so multiplying the value of 1 part by 2 works out that there were originally 14 green balls

21÷7
3×3=9 ← Checking to see if they are currently in the ratio of 7 : 3 by dividing the 21 red balls by the 7 parts which need to represent it to work out that 1 part of the ratio would be 3 balls. Then multiplying this by the 3 parts for green balls works out that there would need to be 9 green balls. This cannot work as this is less than the original 14 green balls and the question states that balls need to be added

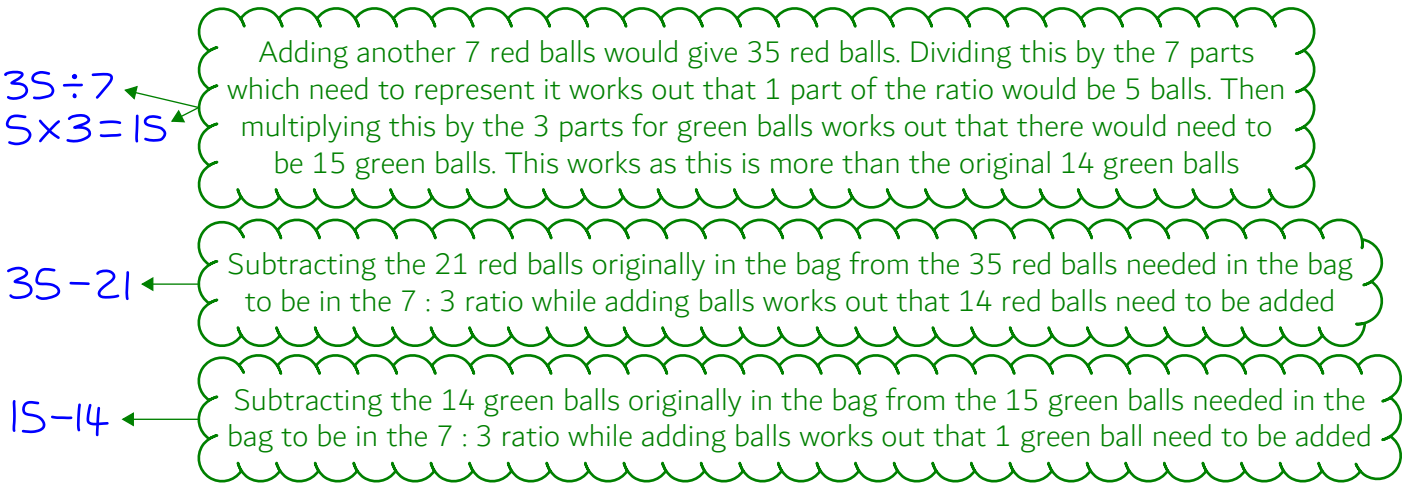
28÷7
4×3=12 ← The 7 : 3 ratio cannot be simplified so the number of red balls needs to be a multiple of 7. Adding another 7 red balls would give 28 red balls. Dividing this by the 7 parts which need to represent it works out that 1 part of the ratio would be 4 balls. Then multiplying this by the 3 parts for green balls works out that there would need to be 12 green balls. This cannot work as this is less than the original 14 green balls and the question states that balls need to be added

Number of red balls added to the bag = 14

Number of green balls added to the bag = 1 **[5]**

The method continues on the next page

END OF QUESTION PAPER


35÷7
5×3=15
Adding another 7 red balls would give 35 red balls. Dividing this by the 7 parts which need to represent it works out that 1 part of the ratio would be 5 balls. Then multiplying this by the 3 parts for green balls works out that there would need to be 15 green balls. This works as this is more than the original 14 green balls
35−21
Subtracting the 21 red balls originally in the bag from the 35 red balls needed in the bag to be in the 7 : 3 ratio while adding balls works out that 14 red balls need to be added
15−14
Subtracting the 14 green balls originally in the bag from the 15 green balls needed in the bag to be in the 7 : 3 ratio while adding balls works out that 1 green ball need to be added