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Worked Solutions

GCSE
MATHEMATICS

F

Foundation Tier　　Paper 3　Calculator
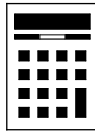
Wednesday 14 June 2023　　Morning　　Time allowed: 1 hour 30 minutes

Materials
For this paper you must have:
- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

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.

Advice
In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
TOTAL	

IB/M/Jun23/E7

8300/3F

Please note that these worked solutions have neither been provided nor approved by AQA 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** questions in the spaces provided.

1 (a) Solve $5x = 15$

[1 mark]

Dividing both sides by 5 eliminates the 5 on the left and gets x on its own. 15 ÷ 5 = 3

$x =$ _____3_____

1 (b) Solve $y + 7 = 50$

[1 mark]

Subtracting 7 from both sides eliminates the +7 on the left and gets y on its own. 50 - 7 = 43

$y =$ _____43_____

1 (c) Solve $\dfrac{c}{4} = 8$

[1 mark]

Multiplying both sides by 4 eliminates the 4 on the left and gets c on its own. 8 x 4 = 32

$c =$ _____32_____

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2 Here is a list of numbers.

10   8   2   11   12   15   4   4

2 (a) Write down the mode.

[1 mark]

Answer _____ 4 _____

4 appears twice. All of the other numbers only appear once. Therefore 4 is the mode as it appears more than any other number

2 (b) Work out the median.

[2 marks]

2, 4, 4, 8, 10, 11, 12, 15 ← *Putting the numbers in order then crossing off from both ends until there are two numbers left in the middle*

$$\frac{8+10}{2}$$

Answer _____ 9 _____

Doing the mean of the two numbers in the middle works out what is halfway between them. Mean = total ÷ number, where total is all of the numbers added together and number is how many numbers there are

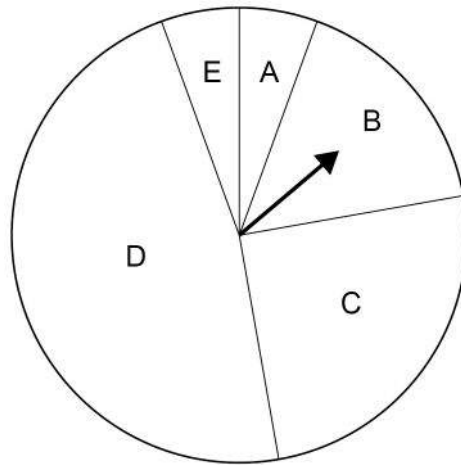**2 (c)** Work out the range.

[1 mark]

Range = largest - smallest. The largest is 15 and the smallest is 2. 15 - 2 = 13

Answer _____ 13 _____

Turn over for the next question

7

Turn over ▶

0 3

IB/M/Jun23/8300/3F

3 (a) A fair spinner with five sections is spun.

Complete these statements.

[2 marks]

The spinner is **most likely** to land on section _____D_____

The spinner is **equally likely** to land on sections _____A_____ and _____E_____

> D is most likely as the angle of the sector is greater than the others. A and E are equally likely as the angles of both of these sectors is the same

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3 (b) Two different spinners are spun.
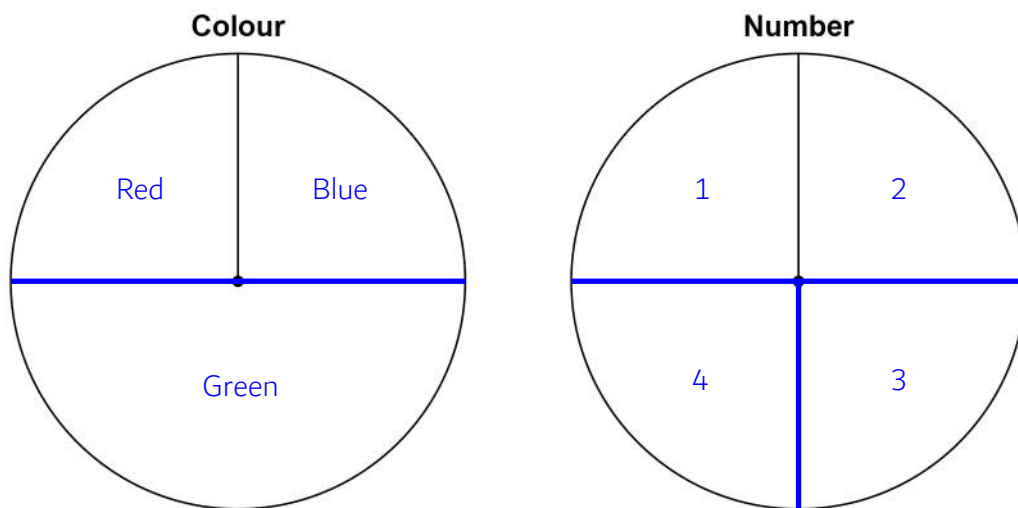
One spinner has sections labelled with colours.

The other spinner has sections labelled with numbers.

Here is a list of **all** the possible outcomes.

Red 1	Red 2	Red 3	Red 4
Blue 1	Blue 2	Blue 3	Blue 4
Green 1	Green 2	Green 3	Green 4

Show the possible sections on the two spinners.

[2 marks]

There are three possible colours: red, blue and green. There are four possible numbers: 1, 2, 3 and 4. The sections do not have to be equally sized

Turn over for the next question

Turn over ▶

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4

4 A reel holds 9.5 metres of ribbon.

2 pieces of ribbon are cut from the reel.

Each piece is 20 centimetres long.

What length of ribbon is left on the reel?

State the units of your answer.

[3 marks]

$20 \times 2 = 40$ ← Working out that the total length of the 2 pieces of 20 cm ribbon is 40 cm

9.5×100 ← There are 100 cm in 1 m so multiplying the 9.5 by 100 converts it into 950 cm

$950 - 40$ ← Subtracting the total length of the 2 pieces of 20 cm ribbon from the length of the ribbon on the reel in centimetres works out how much ribbon is left on the ribbon in centimetres

Answer _____ 910cm _____

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5 (a) The term-to-term rule for a sequence is

subtract 1 then multiply by 5

The 1st term is 4

Work out the 3rd term.

[2 marks]

4−1
3×5

Subtracting 1 from the 1st term then multiplying the result by 5 works out that the 2nd term is 15

15−1
14×5

Subtracting 1 from the 2nd term then multiplying the result by 5 works out that the 3rd term is 70

Answer _____ 70 _____

5 (b) The term-to-term rule for a different sequence is

add 20 then divide by 2
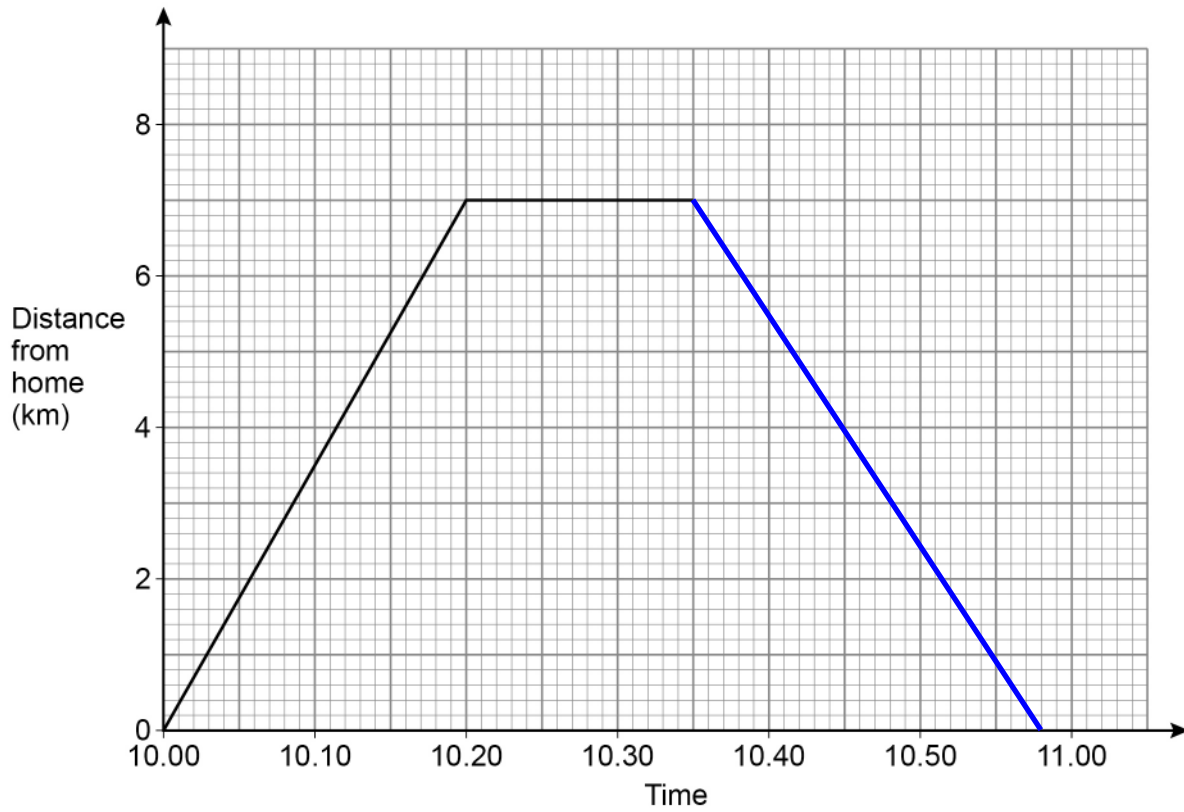
The 2nd term is 50

Work out the 1st term.

[2 marks]

50×2
100−20

Doing the opposite operations in the opposite order. Multiplying is the opposite of dividing and subtracting is the opposite of adding

Answer _____ 80 _____

7

Turn over ▶

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6 Scarlett leaves home at 10.00 to cycle to the supermarket.

Here is part of a distance-time graph of her trip to the supermarket.

6 (a) She arrives at the supermarket at 10.20

How far is the supermarket from her home?

[1 mark]

Answer _____ 7 _____ km

As her distance at 10.20 is 7 km and this is when she arrives at the supermarket

6 (b) She leaves the supermarket at 10.35

How long does she stay at the supermarket?

[1 mark]

Answer _____ 15 _____ minutes

10.20 and 10.35 are in the same hour so we can just do the difference of the minutes. 35 - 20 = 15

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6 (c) Scarlett cycles home at a constant speed using the same route.

It takes her 3 minutes longer than her journey to the supermarket.

Complete the distance-time graph.

[2 marks]

The horizontal scale goes up 10 minutes over 10 small boxes. Dividing the 10 minutes by the 10 small boxes works out that each small box is worth 1 minute. Her journey to the supermarket took 20 minutes so the journey home took 23 minutes, which is 23 boxes to the right of what is drawn so far. The distance from home goes back down to 0 and a straight line is drawn as it is constant speed

7 This week, Liam works

25 hours at £10.20 per hour

and

extra hours at the weekend at £11.80 per hour.

Here are the extra hours he works at the weekend.

Saturday	7 am to 10 am
Sunday	1 pm to 3 pm

In **total**, how much is he paid this week?

[4 marks]

$10-7=3$ ← The difference in time from 7 am to 10 am is 3 hours

$3-1=2$ ← The difference in time from 1 pm to 3 pm is 2 hours

$3+2$ ← Adding the 3 hours worked on Saturday and the 2 hours worked on Sunday works out that 5 hours were worked at the weekend

$5 \times 11.80 = 59$ ← Multiplying the 5 hours worked at the weekend by the £11.80 per hour works out that he was paid £59 for the weekend

25×10.20 ← Multiplying the 25 hours worked at £10.20 per hour works out that he was paid £255 for these hours

$255+59$

Answer £ _____ 314 _____

Adding the £59 paid for the weekend to the £255 paid for the 25 hours works out how much he was paid for the week in total

Turn over ▶

8

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8   Three oranges have masses of 60 g, 70 g and 85 g

Show that their **total** mass is between $\frac{1}{5}$ and $\frac{1}{4}$ of a kilogram.

[3 marks]

$\frac{1}{5} \times 1000 = 200$ ← There are 1000 g in 1 kg. Doing 1/5 of these 1000 g works out that 1/5 of a kilogram is 200 g

$\frac{1}{4} \times 1000 = 250$ ← There are 1000 g in 1 kg. Doing 1/5 of these 1000 g works out that 1/4 of a kilogram is 250 g

$60 + 70 + 85 = 215$ ← Adding the masses of the three oranges works out that their total mass is 215 g, which is between 200 g and 250 g

9   For each statement, tick the correct box.

[3 marks]

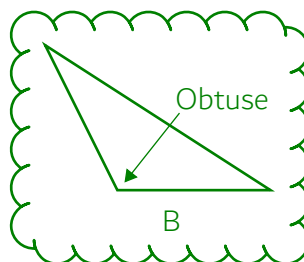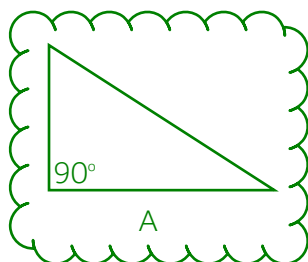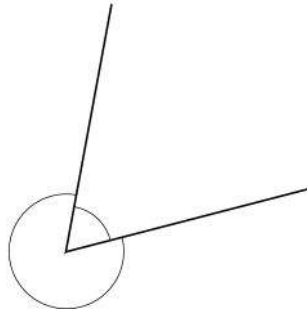|	Always true	Sometimes true	Never true
One of the three angles of a triangle is 90°		✓	
One of the three angles of a triangle is obtuse		✓	
One of the three angles of a triangle is reflex			✓

A triangle can have one 90° angle (see diagram A) but not every triangle has to have one.

A triangle can have one obtuse angle (see diagram B) but not every triangle has to have one as all three angles could be acute. Obtuse means an angle which is more than 90° but less than 180°. Acute means an angle which is less than 90°.

A triangle cannot have a reflex angle as this is more than 180° and triangles have 180° in total for all three of its angles

90°

A

Obtuse

B

10 (a) Simplify fully $p^2 \times p$

[1 mark]

p is basically p^1. a^x x a^y = a^{x+y}, so the indices should be added. 2 + 1 = 3

Answer _____ p^3

10 (b) Simplify fully $3a + 5c - a + 6c$

[2 marks]

Simplified by collecting like terms (which are in the same colours). 3a - a = 2a and 5c + 6c = 11c

Answer _____ $2a + 11c$

Turn over for the next question

9

Turn over ▶

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11 Two angles around a point are shown.

Not drawn accurately

The angles are in the ratio   2 : 7

Show that the larger angle is 280°

[2 marks]

$2+7$

$360 \div 9$

There are 9 parts in total in the ratio. There are 360° in total around a point. So dividing the 360° by the 9 parts works out that 1 part of the ratio is worth 40°

$40 \times 7 = 280$

Multiplying the value of 1 part of the ratio by the 7 parts which represent the larger angle shows that it is 280°

12 (a) $c > 4$ $d < 4$ $c - d = 6$

Work out a possible pair of values for c and d.

[2 marks]

c could be 7 as this is greater than 4 and is also greater than 6 (it does not have to be greater than 6 but this makes the subtraction easier as it avoids using negative numbers). d would be 1 as this is less than 4 and subtracting 1 from 7 gives 6

$c =$ _____7_____ $d =$ _____1_____

12 (b) w is greater than 1 **and** less than 2

x is greater than 0 **and** less than 1

$$w + x = 2.6$$

Work out a possible pair of values for w and x.

[2 marks]

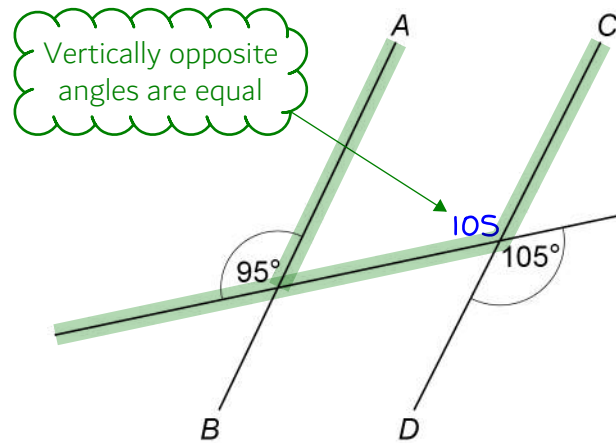*Subtracting possible values of w from 2.6 gives what x would be. 2.6 - 1.9 = 0.7 so w could be 1.9 and x would be 0.7*

$w =$ _____1.9_____ $x =$ _____0.7_____

6

Turn over ▶

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13 Here are three straight lines.

Vertically opposite angles are equal

A   C

Not drawn accurately

105

95°   105°

B   D

Are the lines *AB* and *CD* parallel?

Tick a box.

Yes ☐   No ✓

Show working to support your answer.

[2 marks]
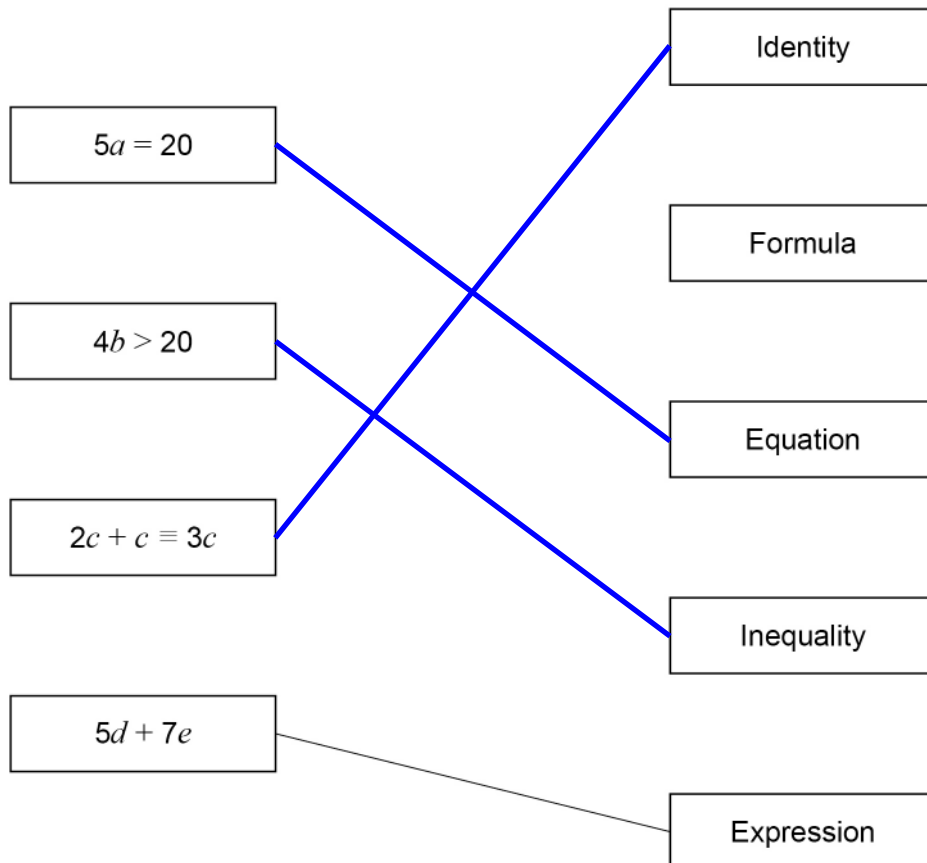
95 ≠ 105

The 95° does not equal to the 105° drawn on the diagram and they would be corresponding angles if lines AB and CD were parallel

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14 Match the algebra to the correct description.

One has been done for you.

[3 marks]

	Identity
$5a = 20$	Formula
$4b > 20$	Equation
$2c + c \equiv 3c$	Inequality
$5d + 7e$	Expression

5a = 20 is an equation as both halves are equal for a certain value of a.

4b > 20 is an inequality as both halves are not equal, the greater than symbol is used.

2c + c   3c is an identity as both halves are equivalent and is true for all values of c

Turn over for the next question

5

Turn over ▶

15 Popcorn is sold in bags.

8 small bags have a total mass of 496 g

5 small bags and 2 large bags have a total mass of 638 g

Work out the mass of a large bag.

[4 marks]

$496 \div 8$ ← Dividing the mass of 8 small bags by the 8 small bags works out that each small bag has a mass of 62 g

62×5 ← Multiplying the mass of each small bag by the 5 small bags works out that the mass of 5 small bags is 310 g

$638 - 310$ ← Subtracting the mass of the 5 small bags from the total mass of 5 small bags and 2 large bags works out that the mass of the 2 large bags is 328 g
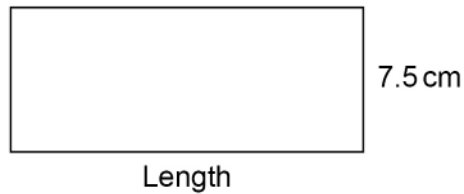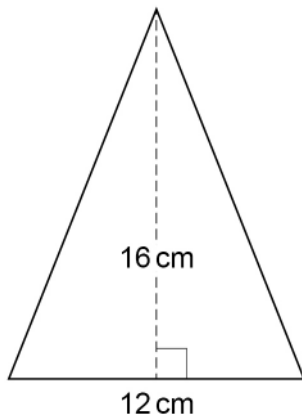
$328 \div 2$ ← Dividing the mass of the 2 large bags by the 2 large bags works out the mass of a large bag

Answer _____164_____ g

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16 The rectangle and the triangle have the same area.

Not drawn accurately

16 cm

12 cm

7.5 cm

Length

Work out the length of the rectangle.

[3 marks]

$\frac{1}{2} \times 12 \times 16$ ←

Area of triangle = 1/2 x base x height. 12 cm is the base and 16 cm is the height. So the area of the triangle is 96 cm²

$96 \div 7.5$ ←

The area of the rectangle is the same as the area of the triangle. Area of rectangle = length x width, so length = area of rectangle ÷ width. The area of rectangle is 96 cm² and the width is 7.5 cm

Answer _____12.8_____ cm

Turn over for the next question

7

Turn over ▶

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1 7

17 Match the name to the correct sequence.

One has been done for you.

[2 marks]

Name

Quadratic sequence

Linear sequence

Fibonacci-type sequence

Sequence

4, 5, 9, 14, 23...

−3, 1, 5, 9, 13...

−4, −1, 1, 5, 12...

8, 11, 16, 23, 32...

Linear sequences increase by the same amount between each term. The Fibonacci-type sequence is the one where adding the two previous terms gives the next term

18 The number of hedgehogs in England is expected to **reduce** by 4% each year.

Assume there are now 1 000 000 hedgehogs in England.

Work out the expected number of hedgehogs in England after **five** years.

You **must** show your working.

[3 marks]

$$1000000 \times \left(\frac{100-4}{100}\right)^5$$

Using the compound interest formula. 100% is the original amount. Subtracting 4% expresses the percentage it decreases to each year. Putting this over 100 converts the percentage to a fraction, which when multiplied by reduces by 4%. Raising the fraction to the power of 5 as it needs to be decreased by 4% 5 times
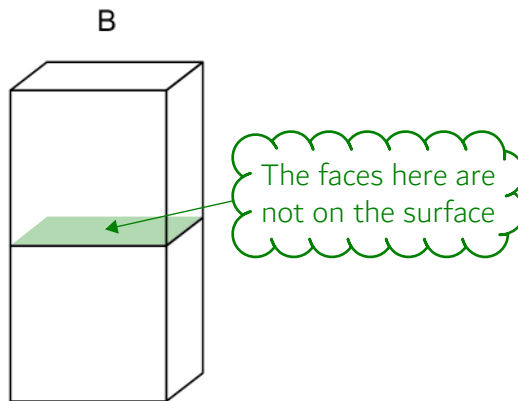
Answer   815373

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19 Here is cuboid A.

A
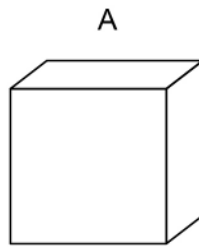
Cuboid B is made from **two** of cuboid A.

B

The faces here are not on the surface

volume of A : volume of B = 1 : 2

Matthew says,

"surface area of A : surface area of B must be 1 : 2 because B is made of 2 of A."

Is Matthew correct?

Tick **one** box.

☐ Yes   ✓ No   ☐ Cannot tell

Give a reason for your answer.

[2 marks]

Not all the faces of both cubes are on the surface in B so the surface area of B is not double the surface area of A

Turn over ▶

20

20 (a) Complete the table of values for $\quad y = x^2 + 2x$

x	−3	−2	−1	0	1
y	3	O	−1	0	3

Using table mode, enter f(x) = x² + 2x. Start: -3. End: 1. Step: 1

20 (b) Draw the graph of $\quad y = x^2 + 2x \quad$ for values of x from −3 to 1

[2 marks]
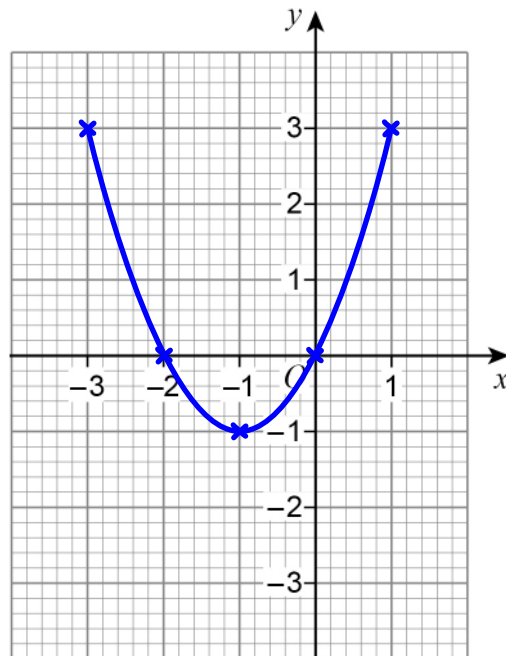
Plotting the points from the table of values then joining them up with a curve

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21 Jing has £2450

She saves some and gives the rest to her four brothers.

money saved : money given to brothers = 2 : 5

She gives each of her **four** brothers the **same** amount.

Does each brother receive more than £430 ?

You **must** show your working.

[4 marks]

2+5 ← We are given the total amount of money so it is helpful to work out that the total number of parts in the ratio is 7

2450÷7 ← The £2450 is represented by 7 parts in the ratio. Dividing the £2450 by the 7 parts works out that 1 part of the ratio is worth £350

350×5 ← Multiplying the value of 1 part of the ratio by the 5 parts which represent the money given to the brothers works out that £1750 was given to her brothers

1750÷4=437.50 ← Dividing the £1750 by the 4 brothers works out that each brother receives £437.50

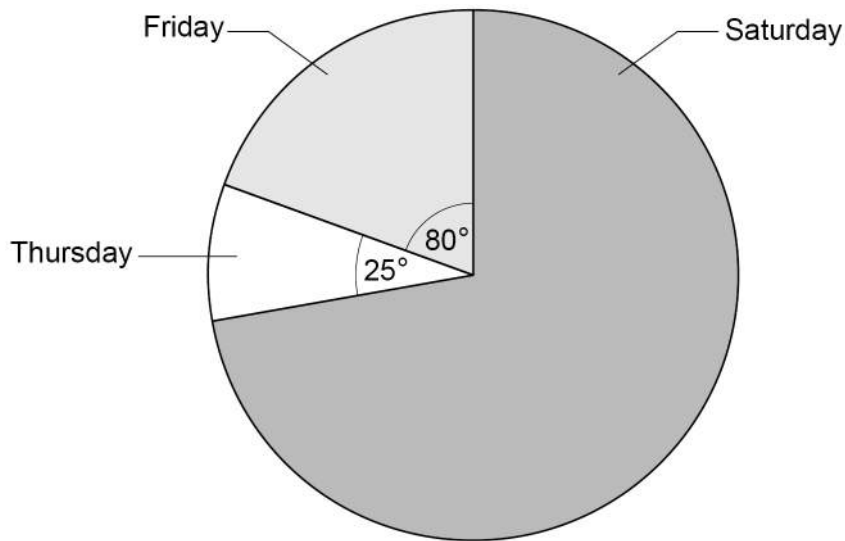Yes ← £437.50 is more than £430

Turn over for the next question

8

Turn over ▶

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22 The pie chart shows information about people at a fair during three days.

Not drawn accurately

There were 132 **more** people on Friday than on Thursday.

Work out the number of people on Saturday.

[3 marks]

80−25 ← This works out that there are 55° more for Friday than Thursday

132÷55=2.4 ← The 55° represents the 132 people. So dividing the 132 people by the 55° works out that 1° represents 2.4 people

360−25−80 ← Subtracting the number of degrees for Thursday and Friday from the total 360° in the pie chart works out that Saturday was 255°
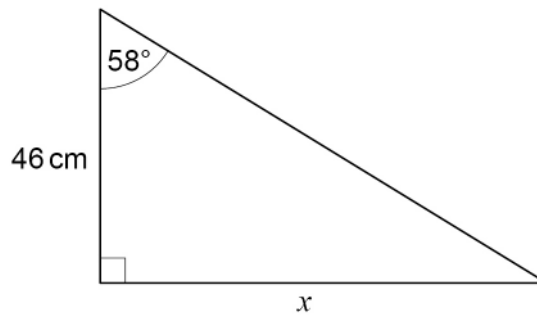
255×2.4 ← Multiplying the 255° for Saturday by the 2.4 people which each degree represents works out the number of people on Saturday

Answer _____ 612 _____

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23 Use trigonometry to work out the value of x.

Not drawn accurately

58°

46 cm

x

[3 marks]

$S\overset{O}{H}C\overset{A}{H}T\overset{O}{A}$

Right-angled trigonometry can be used so writing SOH CAH TOA as formula triangles. Ticking A as 46 cm is the adjacent and O as x is the opposite

$\tan 58 \times 46$

From the formula triangle, opposite = tan of the angle x adjacent

$x = \underline{\hspace{3cm} 73.6 \hspace{3cm}}$ cm

Turn over for the next question

6

Turn over ▶

24 Millie is estimating the value of

$$\dfrac{1}{\left(\sqrt[3]{8.34}\right)^2 \times 10.21}$$

She rounds each decimal number to 1 significant figure.

24 (a) Work out Millie's estimate.

You **must** show your working.

[2 marks]

$$\dfrac{1}{\left(\sqrt[3]{8}\right)^2 \times 10}$$

8.34 is 8 to 1 significant figure as the first significant figure is 8 and the 3 after it causes it to round down then everything after the 8 is set to 0 and the decimal places are ignored. 10.21 to 1 significant figure is 10 as the first significant figure is 1 and the 0 after it causes it to round down then everything after the 1 is set to 0 and the decimal places are ignored

Answer $\dfrac{1}{40}$

24 (b) Millie says,

"My estimate must be more than the exact value."

Without working out the exact value, give a reason how she can know this.

[1 mark]

8.34 and 10.21 were rounded down

Because they are the denominator of the fraction, this makes the estimate greater

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25 (a) Factorise $x^2 + 8x + 15$

[2 marks]

Two numbers which multiply to the 15 and add to the 8 are 3 and 5. Putting these in brackets with x

Answer $(x+3)(x+5)$

25 (b) Write down the **two** solutions of $(y + 2)(y - 4) = 0$

[1 mark]

Answer $y=-2, y=4$

There are two brackets multiplied to 0. Therefore one of the brackets must equal to 0. If y + 2 = 0, y = -2. If y - 4 = 0, y = 4

END OF QUESTIONS

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6