AQA

Please write clearly in block capitals.

Centre number ☐☐☐☐☐   Candidate number ☐☐☐☐

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
MATHEMATICS

F

Foundation Tier   Paper 3 Calculator
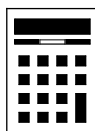
Tuesday 12 June 2018   Morning   Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a calculator
- mathematical instruments.

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.
- 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	
26–27	
TOTAL	

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 Circle the value of the digit 7 in 9.17

[1 mark]

$\dfrac{1}{70}$ $\dfrac{1}{7}$ $\dfrac{7}{10}$ $\left(\dfrac{7}{100}\right)$

The 9 is in the units column, the 1 is in the tenths column and the 7 is in the hundredths column so is worth 7 hundredths

2 Solve $3x = 2$

Circle your answer.

[1 mark]

$x = -1$ $\left(x = \dfrac{2}{3}\right)$ $x = \dfrac{3}{2}$ $x = 6$
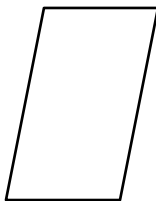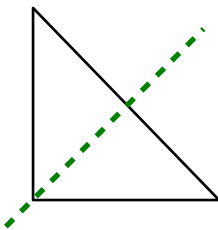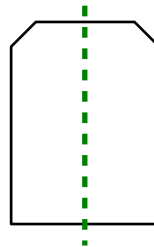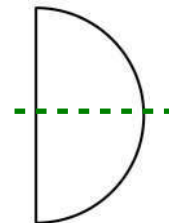
Dividing both sides by 3 solves for x

3 Which of these shapes has **no** lines of symmetry?

Circle the correct letter.

[1 mark]

(A)   B   C   D

The other shapes have lines of symmetry as shown

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4 Circle the shortest length.

[1 mark]

(1200 cm)   0.13 km   110 m   140 000 mm

1200/100 = 12   0.13 x 1000 = 130   140000/1000 = 140

Converting all of the lengths into metres. There are 100cm in a metre so 1200cm is 12m. There are 1000m in 1km so 0.13km is 130m. There are 1000mm in 1m so 140000mm is 140m

5 (a) Shade $\frac{2}{5}$ of this grid.

[1 mark]
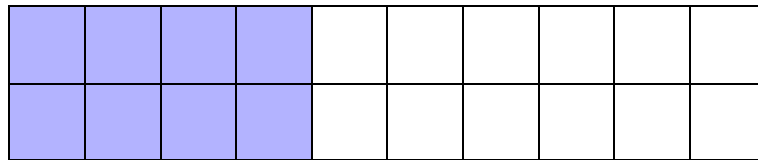
2/5 x 20 = 8   There are 20 squares and 2/5 of 20 is 8 so 8 squares need to be shaded

5 (b) Shade 10% of this grid.

[1 mark]
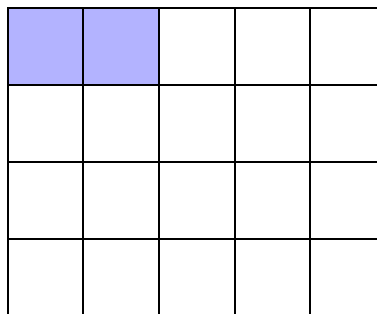
10% x 20 = 2   There are 20 squares and 10% of 20 is 2 so 2 squares need to be shaded

6

Turn over ▶

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6 Saj wants to go to all 19 home games at a football club.

For each game, a ticket costs £28

A season ticket

costs £379

and

gives entry to all 19 home games.

In total, how much does Saj save by buying a season ticket?

[3 marks]

$28 \times 19 - 379$

£28 multiplied by the 19 games works out how much it would cost to go to all 19 games without a season ticket. Subtracting the cost of the season ticket works out the difference and therefore how much was saved

Answer £ 153

7 Link the algebra to the correct description.

One has been done for you.

[3 marks]

$P = 3x + 4y$		Identity
$3x + 6 \equiv 3(x + 2)$		Equation
$3x + 2 = 14$		Formula
$3x + 2$		Inequality
$3x + 2 < 14$		Expression

Turn over for the next question

6
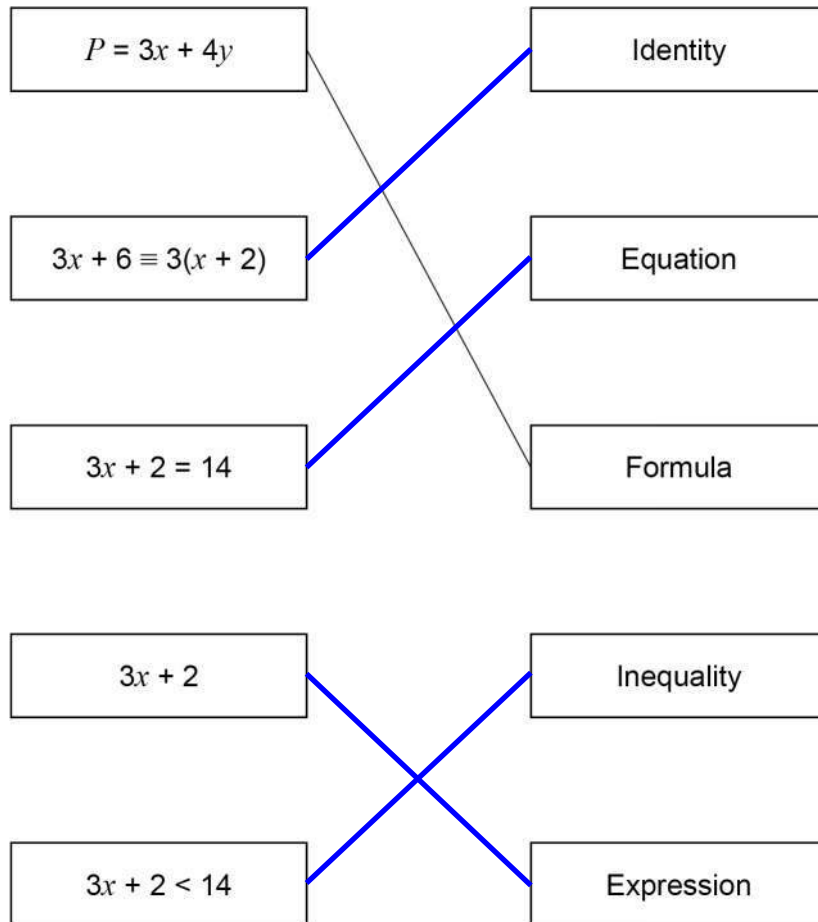
Turn over ▶

8 Jim has six banknotes.

The value of each note is £5 or £10 or £20

He **can** make £20 with three notes.

He **can** make £55 with four notes.

He **cannot** make £25 with three notes.

He **cannot** make £25 with four notes.

List the six notes.

[2 marks]

£ _____5_____   £ _____5_____   £ _____10_____

£ _____20_____   £ _____20_____   £ _____20_____

The only way of making £20 with three notes is using a £10 note and 2 £5 notes. The only way of making £55 with four notes is using 2 £20 notes, a £10 note and a £5 note. A £5 note and a £10 note were already listed using the first fact so the 2 £20 notes need to be added. For the last note, if there was another £5 note it would be possible to make £25 with four notes (a £10 note and 3 £5 notes) and if there was another £10 note it would be possible to make £25 with three notes (2 £10 notes and a £5 note). Therefore the last note must be a £20 note

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9 A music app has a shuffle play function.

This means that songs are played in a random order **without repeat**.

9 (a) Ruth puts 10 songs on shuffle play.

One of them is her favourite song.

Write down the probability that her favourite song plays first.

[1 mark]

Answer $\frac{1}{10}$

1 out of the 10 songs is her favourite

9 (b) Ted puts songs A, B and C on shuffle play.

List all the possible orders of songs A, B and C.

One has been done for you.

[2 marks]

A B C

A C B
B A C
B C A
C A B
C B A

The possible outcomes are systematically listed

Turn over for the next question

5

Turn over ▶

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IB/M/Jun18/8300/3F

10   Here is a scale drawing.

10.0 cm

130 m

2.0 cm

Ferris wheel
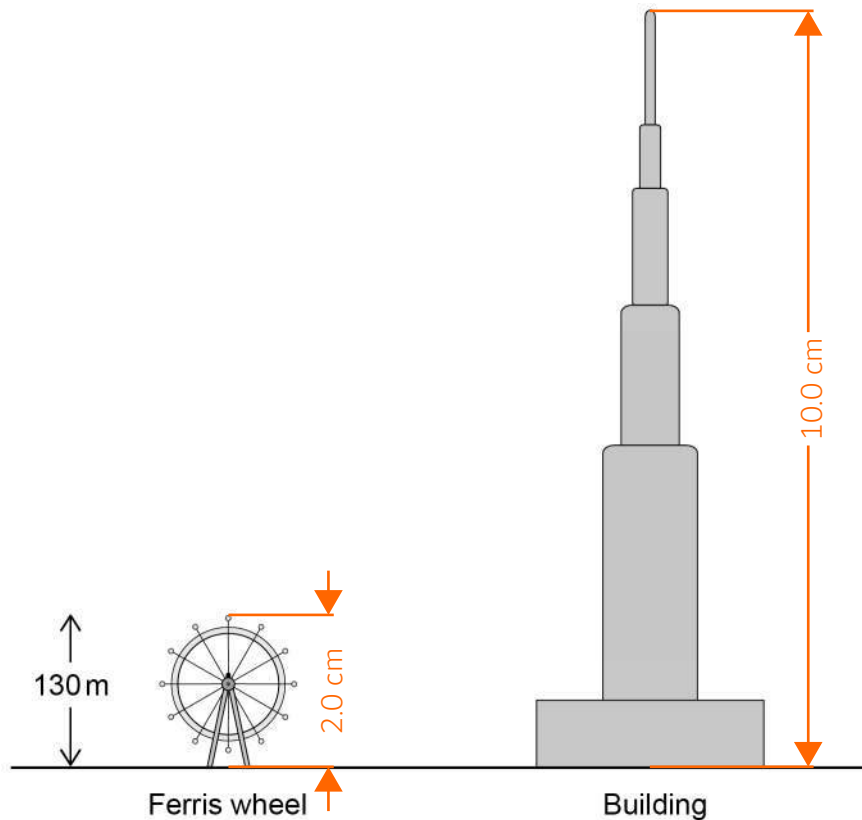
Building

The Ferris wheel has a height of 130 m
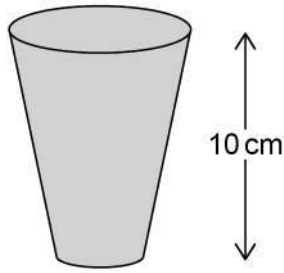
Work out the height of the building.

[3 marks]

$$130 \times \frac{10}{2}$$

Dividing the height of the building by the height of the Ferris wheel on the scale drawing works out how many times larger the building is. Multiplying this by the actual height of the Ferris wheel works out the actual height of the building

Answer   650   m

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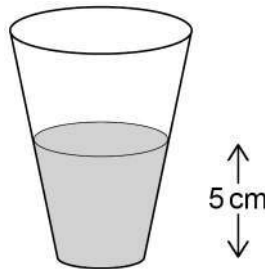**11**   Jo has a full cup of coffee.

She drinks some of it.

She says,

"Half of the coffee is still in the cup, because 5 cm is half of 10 cm"

Is she correct?

Tick a box.

☐ Yes   ✓ No

Give a reason for your answer.
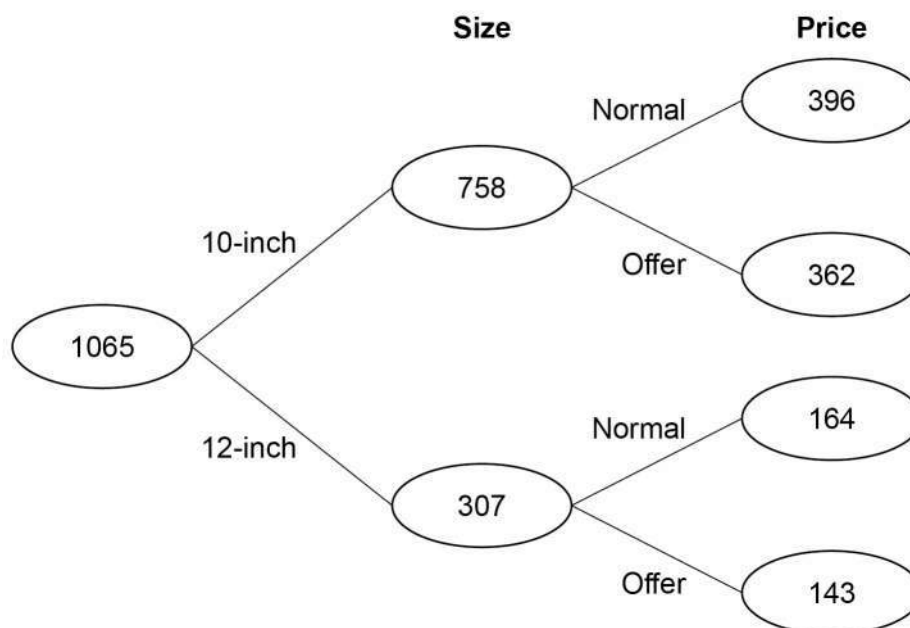
[1 mark]

It is wider at the top

4

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12 A takeaway sells 10-inch pizzas and 12-inch pizzas.

Here is some information about the numbers sold in two weeks.

Week 1

10-inch	512
12-inch	231
Total	743

Week 2

Size

Price

10-inch → 758 → Normal → 396
758 → Offer → 362
1065
12-inch → 307 → Normal → 164
307 → Offer → 143

12 (a) In each week a proportion of the pizzas sold were 10-inch.

In which week was this proportion greater?

Show working to support your answer.

[2 marks]

$$\frac{512}{743} - \frac{758}{1065} = -0.02$$

Expressing the fraction of the pizzas which were 10-inch for each week. Subtracting week 2 from week 1 gives a negative result so week 2 must be a higher proportion

Answer _____ Week 2 _____

12 (b) The table shows the profit or loss the takeaway makes on each pizza.

	Normal price	Offer price
10-inch	£3.74 profit	51p loss
12-inch	£5.29 profit	4p loss

In week 1 the total profit was £1895.55

At the end of week 1 the takeaway spent £175 on adverts.

Was the **increase** in profit in week 2 more than the cost of the adverts?

You **must** show your working.

[4 marks]

$3.74 \times 396 - 0.51 \times 362 + 5.29 \times 164 - 0.04 \times 143 - 1895.55$

There were 362 10-inch pizzas sold at a offer price. Multiplying the loss of each one by this works out the amount of loss for all of them

There were 143 12-inch pizzas sold at a offer price. Multiplying the loss of each one by this works out the amount of loss for all of them

There were 396 10-inch pizzas sold at a normal price. Multiplying the profit of each one by this works out the amount of profit for all of them

There were 164 12-inch pizzas sold at a normal price. Multiplying the profit of each one by this works out the amount of profit for all of them

Adding for profit and subtracting for loss works out the total profit in week 2. Subtracting the profit in week 1 works out the difference and therefore how much the profit increased

262.71

The increase in profit was £262.71 and this is more than the £175 spent on adverts

Answer _____ Yes _____

6

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1 1

13 A car travels 3.5 miles in 5 minutes.

Work out the average speed in miles per hour.

[3 marks]

$$\frac{3.5}{5 \div 60}$$

The unit of miles per hour means the number of miles divided by the number of hours. There are 60 minutes in an hour so dividing the 5 minutes by 60 converts it into hours

Answer _____42_____ mph

14 A triangle has base 9 cm and perpendicular height 5.6 cm

Not drawn accurately

5.6 cm

9 cm
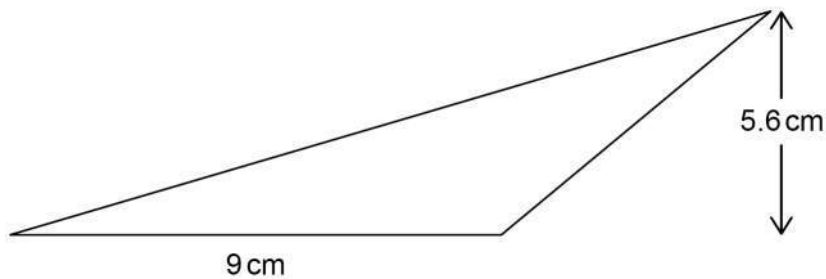
Work out the area of the triangle.

[2 marks]

$$\frac{1}{2} \times 9 \times 5.6$$

Area of triangle = 1/2 x base x height

Answer _____25.2_____ cm^2

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15 Four positive whole numbers add up to 36

One of the numbers is a multiple of 7

The other three numbers are equal.

Work out the result when the four numbers are multiplied.

[3 marks]

$$\frac{36-7}{3} = 9.\dot{6}$$

$$\frac{36-14}{3} = 7.\dot{3}$$

> Subtracting multiples of 7 from 36 to work out what the total of the other three numbers would be. Dividing this by 3 works out what each of the other three numbers would be

$$\frac{36-21}{3} = 5$$

$$21 \times 5 \times 5 \times 5$$

> The numbers must be 21, 5, 5 and 5

Answer _____ 2625 _____

Turn over ▶

16   A sketch of triangle *ABC* is shown.

Not drawn accurately

C

8 cm

37°

A

11 cm

B
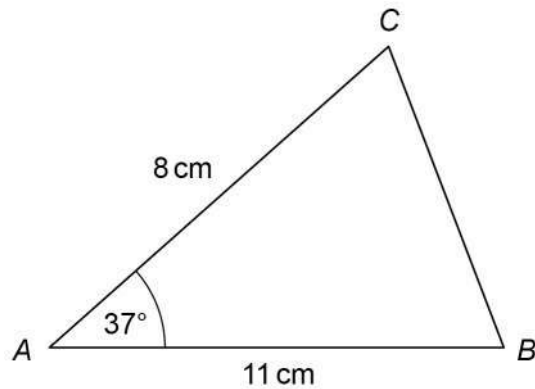
In the space below, complete an accurate drawing of triangle *ABC*.

[2 marks]

8.0 cm

37°

A

B
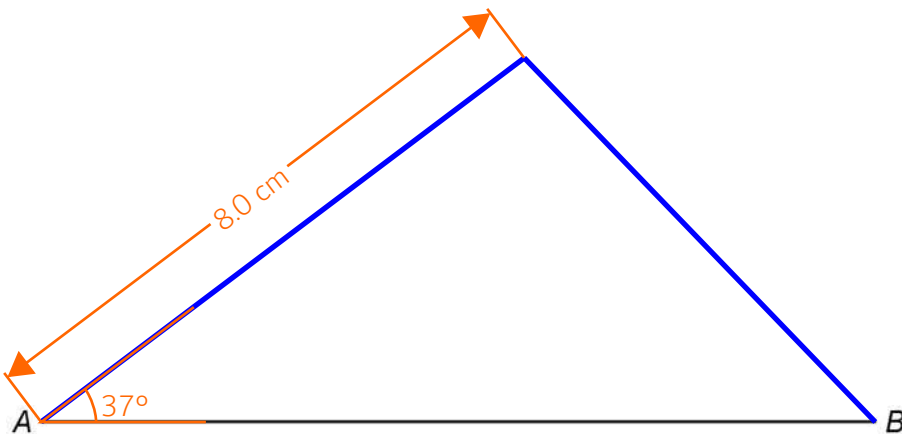
Using a protractor, measure a 37° angle at point A
and draw a line 8cm long at that angle from point A.
Then join up the end of the line and point B

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17 Simplify $7x - (3x - 2x)$

Circle your answer.

[1 mark]

$7x - 1$ $\qquad$ $2x$ $\qquad$ $6x$ $\qquad$ $8x$

Resolving the brackets first: 3x - 2x = x. Then 7x - x = 6x

18 A competition

took place in 1983

takes place every six years.

Circle the year in which it will also take place.

[1 mark]

2083 $\qquad$ 2036 $\qquad$ 2049 $\qquad$ 2023

Enter 1983 into the calculator and press =. Then press ANS + 6 and keep pressing equals until one of the years above appears

Turn over for the next question

4

Turn over ▶

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19   In an election there were four candidates, J, K, L and M.

Fran is drawing a pie chart to show the results.

The sectors for J and K have been drawn.

Votes
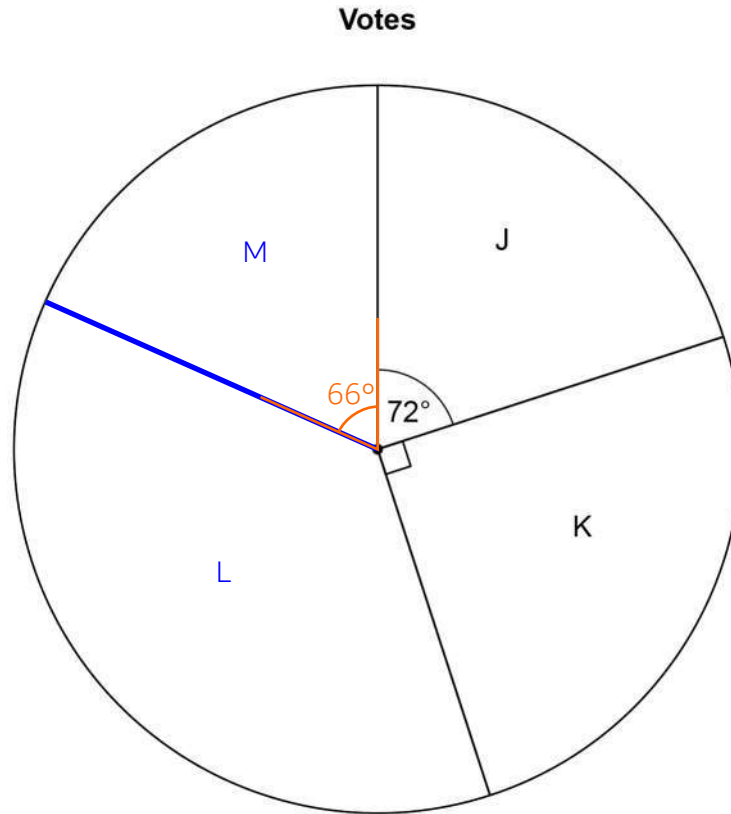
19 (a)   Twice as many people voted for L as voted for M.

Complete the pie chart.

[3 marks]

$$\frac{360-90-72}{3} = 66$$

Subtracting the angles for J and K from 360 works out the remaining degrees for L and M. The ratio of L to M is 2 : 1. There are 3 parts in total in this ratio so dividing by 3 works out what 1 part is worth, which represents the angle of M

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19 (b)   Altogether, 16 200 people voted.

How many voted for J?

[2 marks]

$$\frac{72}{360} \times 16200$$

72 out of the 360 degrees were for J. Working out this fraction of the total number of voters

Answer _____ 3240 _____

20   The probability that A is the outcome of an experiment is 0.2

Circle the probability that A is **not** the outcome.

[1 mark]

0   0.2   0.5   (0.8)

1 - 0.2 = 0.8

It is certain to either get A as the outcome or not A as the outcome. Therefore both probabilities must add to 1. Subtracting the 0.2 from 1 leaves the probability of not A

21   Rearrange $e = 2f$ to make f the subject.

Circle your answer.

[1 mark]

$f = 2e$ $f = \dfrac{2}{e}$ $f = e - 2$ $\left(f = \dfrac{e}{2}\right)$

Dividing both sides by 2 makes f the subject

Turn over for the next question

7

Turn over ▶

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22 Here is a rule for a sequence.

| After the first two terms, each term is half the sum of the previous two terms |

22 (a) Here is a sequence that follows this rule.

2   10   6   8̇......   7̇......   7̇.5......

Show that the 6th term is the first one that is **not** a whole number.

[3 marks]

$$\frac{10+6}{2} = 8$$

Working out the fourth term. The previous two terms were 10 and 6. Adding these together works out the sum then dividing by 2 works out half of the sum

$$\frac{6+8}{2} = 7$$

Working out the fifth term. The previous two terms were 6 and 8. Adding these together works out the sum then dividing by 2 works out half of the sum

$$\frac{8+7}{2} = 7.5$$

Working out the sixth term. The previous two terms were 8 and 7. Adding these together works out the sum then dividing by 2 works out half of the sum

22 (b) A different sequence follows the same rule.

The 1st term is 4

The 3rd term is 9.5

$$4 \quad \ldots\ldots \quad 9.5$$

Work out the 2nd term.

[3 marks]

$$\frac{4+x}{2} = 9.5$$

Let x be the second term. Adding 4 and x then dividing by 2 expresses half of the sum of the two previous terms to the third term. This must be equal to 9.5 as this is the third term

$$x = 9.5 \times 2 - 4$$

Multiplying both sides by 2 then subtracting 4 from both sides makes x, the second term, the subject

Answer   15

Turn over for the next question
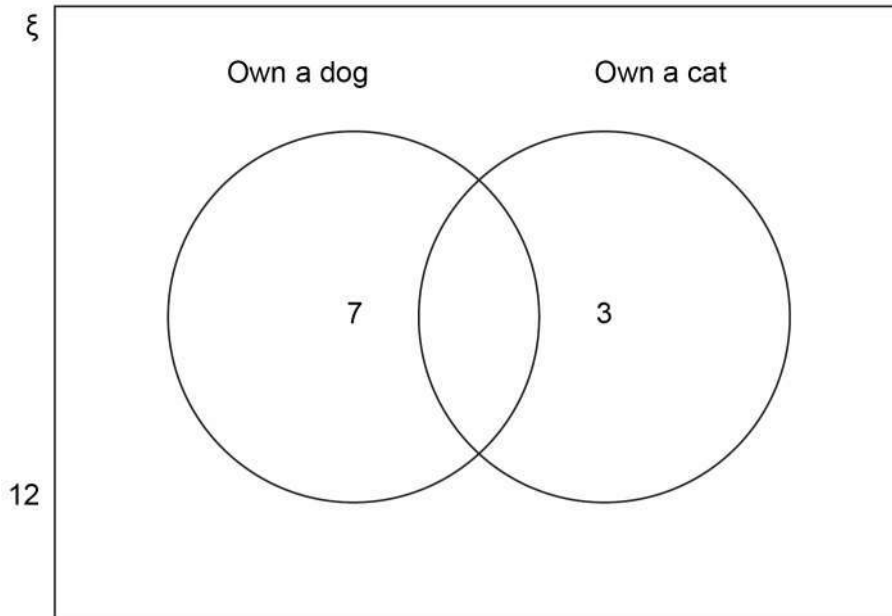
6

Turn over ▶

23 In a group of 20 people

7 own a dog

3 own a cat

12 do not own a dog or a cat.

Aidan shows this information on a Venn diagram.

Make **two** criticisms of his Venn diagram.

[2 marks]

Criticism 1   12 should be inside the rectangle

It belongs in the universal set

Criticism 2   Doesn't add up to 20

It currently adds up to 22 so there should be some in the intersection (the overlap of the two circles)

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24 a is a common factor of 72 and 120

b is a common multiple of 6 and 9

Work out the highest possible value of $\dfrac{a}{b}$

[4 marks]

$72 = 2^3 \times 3^2$

FACT B

$\boxed{\text{o, ,,}}$

Expressing both 72 and 120 as a product of prime factors by entering the number, pressing =, SHIFT then FACT (the button on the left)

$120 = 2^3 \times 3 \times 5$

$2^3 \times 3$

The highest common factor is the lowest power of each prime multiplied together

Answer $\dfrac{24}{18}$

Expressing the highest common factor of 72 and 120 over the lowest common multiple of 6 and 9. The LCM of 6 and 9 is found by counting up in 9s until a multiple of 6 is reached

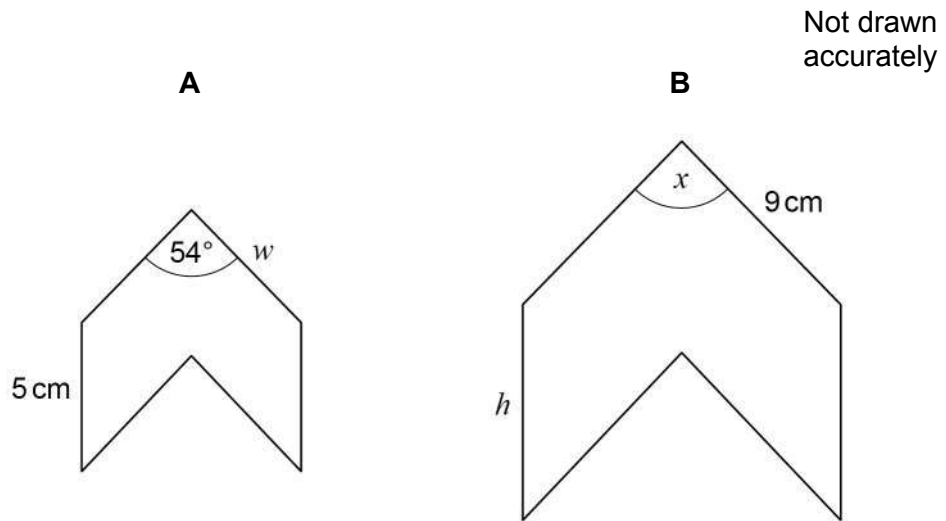**Turn over for the next question**

6

Turn over ▶

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25 A and B are similar shapes.

B is an enlargement of A with scale factor 1.5

Not drawn accurately

A

B

54° w

x 9 cm

5 cm

h

Work out the values of x, h and w.

[3 marks]

5×1.5 ← This works out h

$9 \div 1.5$ ← This works out w

x stays the same as it was in shape A as they are similar. The angles in similar shapes are the same

$x =$ _____54_____ degrees

$h =$ _____7.5_____ cm

$w =$ _____6_____ cm

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26   Investment A   Save £150 per month for 2 years.

                                2.5% interest is added to the total amount saved.

             Investment B   Invest £3500

                                  Compound interest is added at 3% per year.

After 2 years, how much **more** is investment B worth than investment A?

[4 marks]

$$3500 \times \left(\frac{100+3}{100}\right)^2 - 150 \times 12 \times 2 \times \frac{100+2.5}{100}$$

The worth of investment B. 100 + 3 works out the percentage it increases to each year. Dividing this by 100 converts it into a fraction multiplier. Raising this to the power of 2 as it needs to be multiplied by twice as it is after 2 years. Multiplying this by the £3500 increases it by 3% twice

The worth of investment A. There are 12 months in a year and there are 2 years so multiplying the £150 by 12 and 2 works out how much is saved before the interest. 100 + 2.5 works out the percentage it increases to. Dividing this by 100 converts it into a fraction multiplier. Multiplying by this by the amount saved before the interest increases it by 2.5%

Subtracting the worth of investment A from the worth of investment B works out the difference and therefore how much more investment B is worth than investment A

Answer   £ _____ 23.15 _____

Turn over for the next question

Turn over ▶

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27 (a) Show that the lines $y = 3x + 7$ and $2y - 6x = 8$ are parallel.

Do **not** use a graphical method.

[3 marks]

$$2y = 6x + 8$$
← Adding 6x to both sides of the second equation

$$y = 3x + 4$$
← Dividing both sides by 2

Both lines have gradient of 3 ← Both equations are now in the form y = mx +c, where m is the gradient. Parallel lines have the same gradient

27 (b) Is the point (–5, –6) above, below or on the line $y = 3x + 7$?

Tick **one** box.

[✓] Above   [ ] Below   [ ] On the line

You **must** show your working.

Do **not** use a graphical method.

[2 marks]

$$y = 3(-5) + 7 = -8$$
← Substituting the x coordinate of the point into the equation to find what y should be on the line. It should be -8 and -6 is above this

28 The cost of a ticket increases by 10% to £19.25

Work out the original cost.

[3 marks]

$\frac{19.25}{110} \times 100$ ← If it is increased by 10%, it is now at 110% of the original value. Dividing by 110 works out 1% of the original value. Multiplying by 100 works out 100%, the full amount, of the original value

Answer £ 17.50

Turn over for the next question

8

29 The nth term of a sequence is $12n - 5$

Work out the numbers in the sequence that

have two digits

and

are **not** prime.

[3 marks]

19, 31, 43, 55, 67, 79, 91

Using table mode by pressing MENU then 3. f(x) = 12x - 5. Ignore g(x). Start: 1. End: 30. Step: 1

This lists out the sequence up to the 30th term.
Writing down the ones which have two digits

FACT B

Enter each number, press = then SHIFT then FACT (the button on the left)

This expresses each number as a product of prime factors.
If it comes back as itself it must be prime. 55 = 5 x 11 and
91 = 7 x 13 so 55 and 91 are not prime

Answer   55, 91

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30 $\mathbf{a} = \begin{pmatrix} 6 \\ -10 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$

30 (a)   Work out $\mathbf{a} + \mathbf{b} + \mathbf{c}$

[2 marks]

$6 + -1 + -4$ ← *Adding together the x components and y components separately*

$-10 + 2 + 7$ ←

Answer $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$

30 (b)   Show that $\mathbf{a} + 2\mathbf{c} = k\mathbf{b}$, where k is an integer.

[2 marks]

$6 + 2(-4)$ ← *Working out the x components and y components separately*

$-10 + 2(7)$ ←

$\begin{pmatrix} -2 \\ 4 \end{pmatrix} = 2 \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ ← *Expressing the column vector as 2 lots of vector b*

END OF QUESTIONS

7

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