# AQA *Model Solutions*

# GCSE
# MATHEMATICS

**F**

Foundation Tier          Paper 3  Calculator
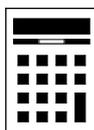
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Tuesday 11 June 2019          Morning          Time allowed: 1 hour 30 minutes

## 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 | |
| **TOTAL** | |

Answer **all** questions in the spaces provided

**1** Circle the value of the digit 2 in the answer to $5200 \div 10$

$5200 \div 10 = 520$

**[1 mark]**

2          20          200          2000

**2** Solve $x - 8 = 5$

Circle your answer.

$x - 8 = 5$
$x \underset{=}{+8} 13$

**[1 mark]**

$x = -13$          $x = -3$          $x = 3$          $x = 13$

**3** Circle the fraction that is equal to $2\frac{1}{4}$     $= \frac{9}{4}$

**[1 mark]**

$\frac{7}{4}$          $\frac{9}{4}$          $\frac{21}{4}$          $\frac{25}{4}$

**4**     Circle the expression which means    $x$ divided by $y$

**[1 mark]**

$$\frac{x}{y} \qquad\qquad \frac{y}{x} \qquad\qquad \frac{1}{xy} \qquad\qquad \frac{1}{x+y}$$

**5**     Put these numbers in order from smallest to largest.

$$\frac{31}{40} \qquad\qquad \frac{3}{4} \qquad\qquad \frac{7}{10} \qquad\qquad 0.725$$

↓       ↓       ↓       ↓    **[2 marks]**

0.775    0.75    0.7    0.725

④     ③     ①     ②

Smallest    $\frac{7}{10}$

0.725

$\frac{3}{4}$

Largest    $\frac{31}{40}$

**Turn over ▶**

**6** Josh downloads album A.

A has 11 tracks.

Each track on A costs the same.

The total cost of downloading A is £8.80

Josh also downloads album B.

B has 14 tracks.

**6 (a)** Work out the total cost of downloading B.

Assume each track costs the same as a track on A.

**[3 marks]**

Cost of downloading 1 track:

8.80 ÷ 11 = £0.80

Cost of downloading Album B (14 tracks)

14 × 0.8

= £11.20

Answer £ _____ 11.20 _____

**6 (b)** In fact, compared to the cost of each track on A

the cost of 6 tracks on B is **more** by 5p each

the cost of 8 tracks on B is **less** by 5p each.

What does this tell you about your answer to part (a)?

Tick **one** box.

[✓] The total cost is **less** than my answer to part (a)

[ ] The total cost is **more** than my answer to part (a)

[ ] The total cost is **the same** as my answer to part (a)

Give a reason for your decision.

**[2 marks]**

Examples : 6 × 0.85 = 5.1

8 × 0.75 = 6

6 + 5.1 = 11.1

**Turn over for the next question**

5

**Turn over ▶**

**7**  The pictogram shows information about the houses in a street.

Each house has 3, 4 or 5 bedrooms.

**Key:** ⌂ represents 2 houses

| 3-bedroom houses | ⌂ ⌂ ⌂ ⌂ ◿ |
| 4-bedroom houses | ⌂ ⌂ ⌂ ⌂ ⌂ |
| 5-bedroom houses | ⌂ ◿ |

In total, how many bedrooms do these houses have?

**[3 marks]**

3 :   2 + 2 + 2 + 2 + 1 = 9
4 :   2 + 2 + 2 + 2 + 2 = 10
5 :   2 + 1           = 3

9 houses have 3 bedrooms     = 27 bedroom
        10 × 4            = 40
        3 × 5            = 1,5
                         —————
                          8 2

Answer _____ 8 2 _____

**8**      Four positive whole numbers add up to 84

One of the numbers is a multiple of 17

The other three numbers are equal.

What are the four numbers?

**[3 marks]**

Multiple of 17: 17, 34, 51, 68, 85

When we subtract the multiple of 17 from 84, it must be divisible by 3 as the 3 numbers are equal and whole numbers

$84 - 51 = 33$ ← divisible by 3
$33 \div 3 = 11$

Answer    11    11    11    51

**Turn over for the next question**

6

**Turn over ▶**

**9** Jim wants to buy 10 rolls of wallpaper.

He sees these prices.

| Wallpaper | |
|---|---|
| Single roll | £12.50 |
| Pack of 3 rolls | £34.50 |
| Pack of 5 rolls | £58.75 |

What is the cheapest price for 10 rolls?

**[4 marks]**

2 packs of 5: 58.75 × 2 = £117.50

3 packs of 3 + 1 roll: 3 × 34.50 + 12.50
= £116

1 pack of 5, 3 and 2 rolls
: 58.75 + 34.50 + 25
= £118.25

Answer £ 116

**10** In rectangle *ABCD*

triangle *ABE* is equilateral

triangle *CDE* is isosceles, with *CE = DE*

A ........ B    Not drawn accurately

∠DEA = ∠CEB

60

$x$  E  $x$

65°  25  130  25

D ........ C
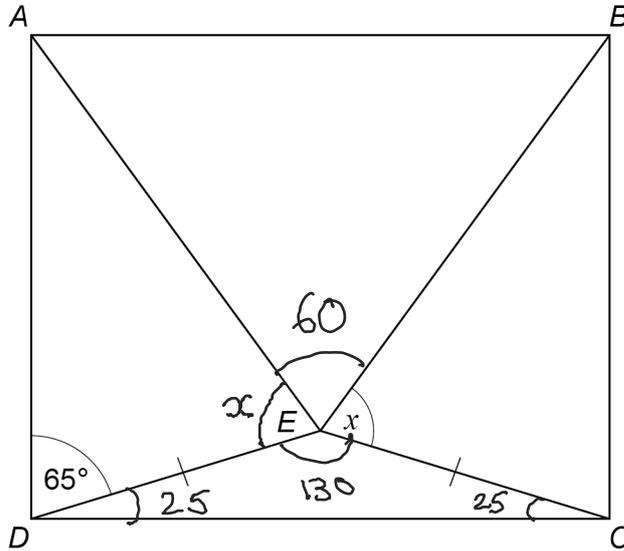
Work out the size of angle $x$.

**[4 marks]**

$\angle AEB = 180 \div 3 = 60°$  equilatralel triangle

$\angle EDC$ and $\angle ECD = 90 - 65 = 25°$  rightangle

$\angle DEC = 180 - 25 - 25 = 130$  Angles in triangle

$x + x + 130 + 60 = 360$  around a point

$2x = $  170

$x = \div 2$

Answer _____ 85 _____ degrees

**Turn over ▶**

**11 (a)** Complete the number machine.

Input $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ Output

$$\boxed{a} \rightarrow \boxed{+2} \rightarrow \boxed{\times 5} \rightarrow \boxed{5a + 10}$$
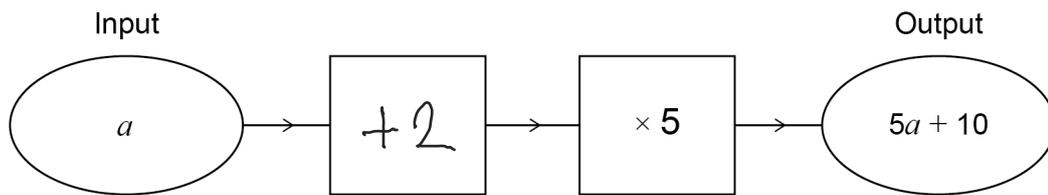
$$\frac{5a+10}{5} = a + 2$$ **[1 mark]**

**11 (b)** Write down the output $y$ in terms of $x$.

Input $\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad$ Output

$$\boxed{x} \rightarrow \boxed{\div 2} \rightarrow \boxed{+4} \rightarrow \boxed{y}$$
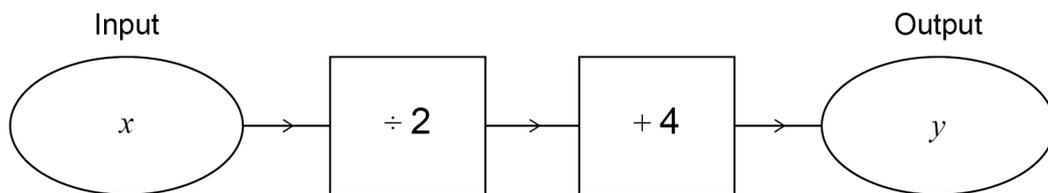
**[1 mark]**

Answer $\quad y = \dfrac{x}{2} + 4$

**12**     The first four triangular numbers are     1, 3, 6, 10   +5

+4

Circle the next triangular number.

**[1 mark]**

14          (15)          16          19

**13**     Write down **all** the prime numbers between 40 and 50

'only divisible by 1 and itself

**[2 marks]**

41, 43, 4̶5̶, 47, 4̶9̶  7×7

9×5

Answer     41, 43, 47

**Turn over for the next question**

5

**Turn over ▶**

**14** In this question use

1 cubic foot = 6.23 gallons

1 cubic foot = 0.028 cubic metres

Convert 3115 gallons into cubic metres.

**[3 marks]**

$\times 500 \left( \begin{array}{l} 1 \text{ cubic ft} = 6.23 \text{gall} \\ 500 \text{ft}^3 = 3115 \text{gall} \end{array} \right) \times 500$

$\times 500 \left( \begin{array}{l} 1 \text{ ft}^3 = 0.028 \text{ m}^3 \\ 500 \text{ft}^3 = 14 \end{array} \right) \times 500$

Answer _____ 14 _____ m³

**15** Circle the correct statement.

**[1 mark]**

$\frac{1}{3} \leqslant 30\%$ $\qquad$ $\frac{1}{3} = 30\%$ $\qquad$ $\frac{1}{3} < 30\%$ $\qquad$ $\boxed{\frac{1}{3} \neq 30\%}$

33%

**16** Which shape **must** have rotational symmetry?

Circle your answer.

**[1 mark]**

isosceles triangle $\qquad$ trapezium $\qquad$ kite $\qquad$ parallelogram

**Turn over for the next question**

5

**Turn over ▶**

**17** A shop sells ice creams.

Each ice cream has two scoops.

The possible flavours are vanilla (V), strawberry (S), chocolate (C) and mint (M).

The two scoops can be the same flavour or different flavours.

**17 (a)** List **all** the possible options for the two scoops.

**[2 marks]**

VV , VS, VC, VM
SS , SC, SM
CC , CM
MM

**17 (b)** In one hour the shop sells 180 scoops of ice cream.
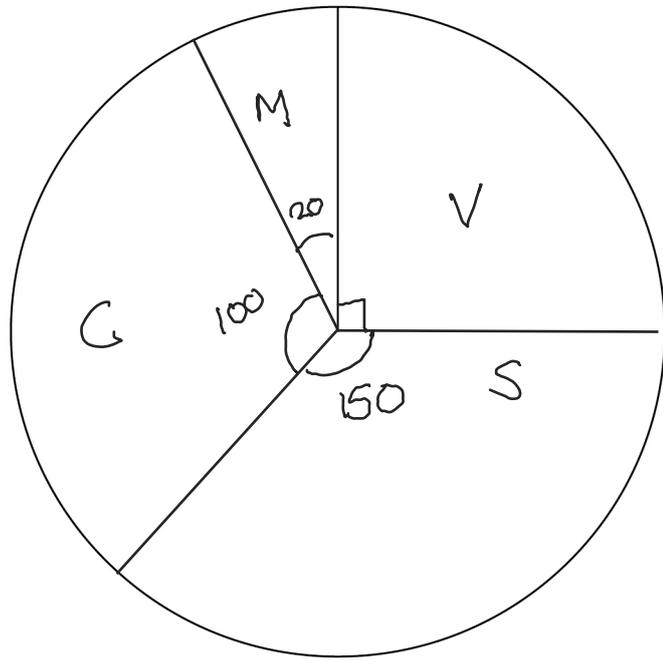
The number of scoops of each flavour is shown in the table.

$\frac{360}{180} = 2$

| Flavour | Vanilla | Strawberry | Chocolate | Mint |
|---|---|---|---|---|
| **Number of scoops** | 45 ×2 | 75 ×2 | 50 ×2 | 10 ×2 |
| Degree | 90 | 150 | 100 | 20 |

Complete the pie chart to represent the data.

**[4 marks]**



M

20

V

C 100

150 S

Not to Scale

use protracter to measure angle

_____

_____

_____

_____

_____

_____

_____

_____

6

**Turn over ▶**

**18** On the grid, draw an enlargement of the triangle with scale factor $\frac{1}{2}$ $\div 2$

**[2 marks]**

6 $6 \div 2 = 3$

4

$4 \div 2 = 2$
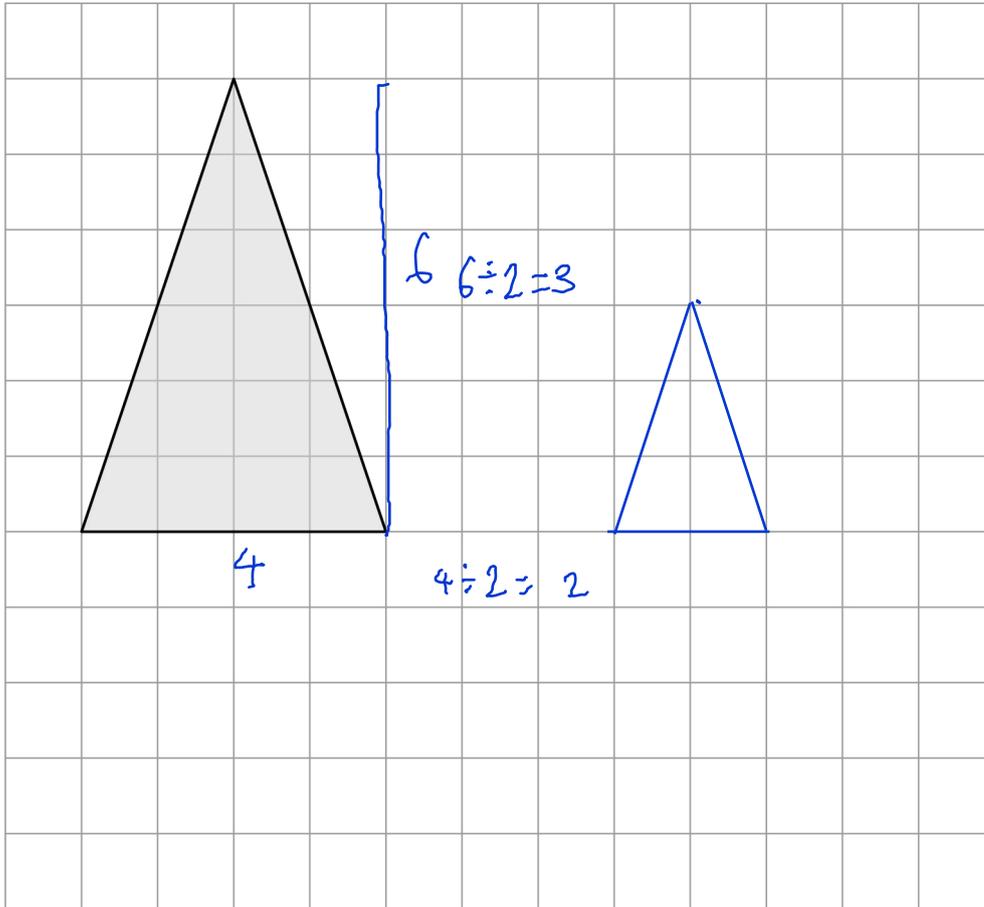
**19 (a)** Simplify fully $3a^2 + 7a + 3 - a^2 + 8a - 4$

**[3 marks]**

$3 - 1 = 2$

$7 + 8 = 15$

$3 - 4 = -1$

Answer $\quad 2a^2 + 15a - 1$

**19 (b)** Factorise fully $24y^2 - 20y$ $\quad \sim 4y$ is the HCF

**[2 marks]**

$\dfrac{24y^2}{4y}$

$4y \left( 6y - 5 \right)$ $\quad \dfrac{20y}{4y}$

Answer $\quad 4y(6y - 5)$

**20** Solve $x^2 = 196$

**[2 marks]**

$x = \pm \sqrt{196}$

$= 14 \text{ or } -14$

Answer $\quad 14 \text{ or } -14$

9

**Turn over ▶**

**21** To the nearest pound, Jon has £9

To the nearest 50p, Ellie has £6.50

Work out the <u>maximum possible total</u> amount of money.

**[3 marks]**

Joe: $8.50 \leq £ < 9.50$

Ellie: $6.25 \leq £ < 6.75$

doesn't include 9.50 or 6.75

UB + UB (max) $\qquad$ $9.49 + 6.74$

$= 16.23$

Answer £ 16.23

**22** Here is a formula.

$$T = n^2 - \frac{12}{n}$$

**22 (a)** Work out $T$ when $n = 5$

**[1 mark]**

$n = 5$

$T = 5^2 - \dfrac{12}{5} = 25 - 2.4$

Answer _____22.6_____

**22 (b)** Why is $T$ **always** positive when $n$ is negative?

**[2 marks]**

Because $n^2$ will always be positive and $-(neg) = +$ the number.
Therefore it will always be positive

**6**

**Turn over ▶**

**23** In one hour a machine can make

600 nuts

or

720 bolts.

At 3 pm the machine starts working.

It makes 900 nuts and then changes to making bolts.

How many **bolts** will the machine make by 8 pm?

**[4 marks]**

900 nuts take $\frac{900}{600}$ h = 1.5 hours

It starts making bolts at 3pm + 1h 30
= 4:30 pm

4:30 to 8 = 3h 30min

Makes bolts for 3.5 hours

720 × 3.5

=

Answer _____ 2 520 _____

**24** Two solids, J and K, have the same density.

Complete the table.

Include units in your answers.

**[3 marks]**

|  | J | K |
|---|---|---|
| **Mass** | 48 g | 78 g |
| **Volume** | 8 cm³ | 13 cm³ |
| **Density** | 6 g/cm³ | 6 g/cm³ |

same

$$\text{Density} = \frac{mass}{vol}$$

$$D = \frac{48}{8} = 6$$

$$Vol = \frac{78}{6} = 13$$

**Turn over for the next question**

7

**Turn over ▶**

IB/M/Jun19/8300/3F

**25**   Towns *P*, *Q* and *R* are connected by roads *PQ*, *PR* and *QR*.

PR is 10 km longer than PQ.

QR is twice as long as PR.

The total length of the three roads is 170 km

R

Not drawn accurately

$x + 10$

P

$x$

$2(x+10)$

Q
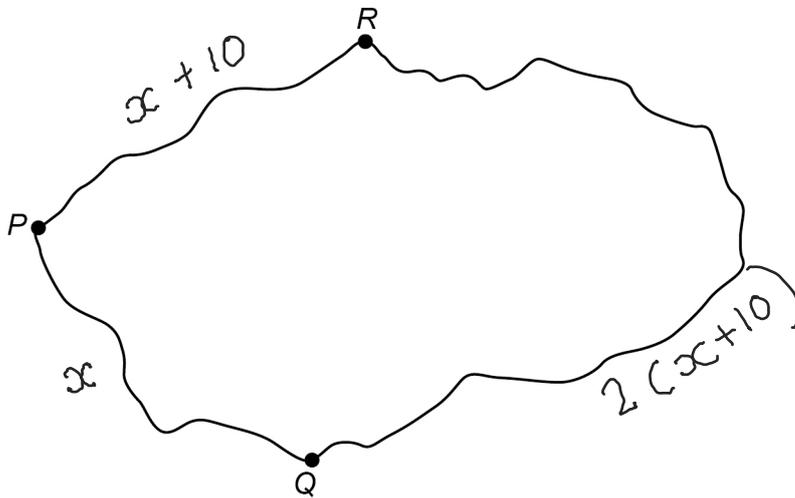
Work out the length of *PQ*.

**[4 marks]**

$$170 = x + x + 10 + 2(x+10)$$
$$170 = x + x + 10 + 2x + 20$$
$$= 4x + 30$$

$$4x + 30 = 170$$
$$4x = \overset{-30}{140}$$
$$x = \overset{\div 4}{35} = PQ$$

Answer _____ 35 _____ km

**26** Mia wants to borrow £6000 and repay it, with interest, after two years.

She sees two offers for loans.

① ②

| Offer 1 |
| Compound interest |
| 3% per year |

$= \times 1.01$
$= \times 1.05$

| Offer 2 |
| Compound interest |
| First year 1% |
| Second year 5% |

$100\% + 3\% = 103\%$
$= \times 1.03$

Mia says,

"I will pay back the <u>same amount</u> because the average of 1% and 5% is 3%"

Is she correct?

You **must** show your working.

**[3 marks]**

2 years

① $6000 \times 1.03^2 = £6365.40$

Year 1   Year 2

② $6000 \times 1.01 \times 1.05 = £6363$

The amounts are different
therefore she is not correct

**Turn over for the next question**

7

**Turn over ▶**

**27**   Here are two sets of numbers, A and B.

|  | **Set A** |  |  | **Set B** |  |
| --- | --- | --- | --- | --- | --- |

**Set A**

| 200 | 160 |
| --- | --- |
| 104 | 100 |

**Set B**

| 270 | 400 | 483 |
| --- | --- | --- |
|  | 300 | $x$ |

mean of Set A : mean of Set B = 3 : 8

Work out the value of $x$.

[4 marks]

$A: \quad \dfrac{200 + 100 + 160 + 104}{4} = \dfrac{564}{4} = 141$

Ratio : $\quad \overset{\times 47}{\underset{\times 47}{\huge(}} \begin{array}{c} 3 : 8 \\ 141 : 376 \end{array} \overset{\times 47}{\huge)}$

Mean for B = 376

$376 = \dfrac{270 + 400 + 483 + 300 + x}{5}$   (×5)

Answer   $427$

$1880 = x + 1453$

$427 \overset{-1453}{=} x$

**28** A straight line

has gradient 4

and

passes through the point (5, 23)

Work out the equation of the line.

Give your answer in the form $y = mx + c$

**[3 marks]**

$m = 4$

$y = 4x + c$

$23 = 4(5) + c$

$23 - 20 = c = 3$

$\overset{\sim 20}{}$

$y = 4x + 3$

Answer $\underline{\quad y = 4x + 3 \quad}$

**Turn over for the next question**

7

**Turn over ▶**

**29** Two sides of a triangle have lengths 13 cm and 27 cm
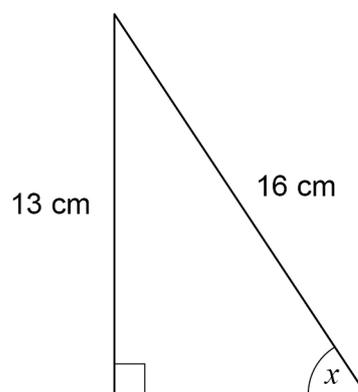
Which of these is a **possible** length of the other side?
Circle your answer.

**[1 mark]**

13 cm          14 cm          (27 cm)          40 cm

**30** Here is a right-angled triangle.

Not drawn accurately

13 cm          16 cm

$x$

Use trigonometry to work out the size of angle $x$.

**[2 marks]**

$\sin x = \dfrac{opp}{hyp}$

$\sin x = \dfrac{13}{16}$

$x = \sin^{-1}\left(\dfrac{13}{16}\right) = 54.34\ldots$

Answer _____54.3_____ degrees

**END OF QUESTIONS**

3

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