



- 1 Here are the first four terms of a sequence.

3 6 12 24

- Write down the next term of the sequence.
- Write down the term-to-term rule of the sequence.

(2 marks)

Each term is double the term before

$$3 \times 2 = 6, 6 \times 2 = 12, 12 \times 2 = 24$$

The next term is $24 \times 2 = 48$

The term-to-term rule is multiply by 2

- 2 Aisha invests £2500 in a savings account.

The account pays 4% compound interest each year.

Work out the amount in the account after 2 years.

(2 marks)

4% increase: multiplier 1.04

$$= 2500 \times 1.04^2$$

$$= 2500 \times 1.0816$$

$$\boxed{£2704}$$

- 3 Solve $3x(x - 2) = 5$

Give your solutions correct to 3 significant figures.

(4 marks)

$$\begin{array}{rcl} 3x(x - 2) & = & 5 \\ 3x^2 - 6x & = & 5 \\ -5 & & -5 \\ 3x^2 - 6x - 5 & = & 0 \end{array}$$

$$a = 3, b = -6, c = -5$$

$$x = \frac{6 \pm \sqrt{(36 + 60)}}{6} = \frac{6 \pm \sqrt{96}}{6}$$

$$x = 2.63$$

$$x = -0.633$$

$$\boxed{x = 2.63 \text{ or } x = -0.633}$$

4

A box contains 5 green pegs and 3 white pegs.

Two pegs are taken from the box at random, without replacement.

Work out the probability that both pegs are green.

(3 marks)

$$P(\text{first peg green}) = \frac{5}{8}$$

After one green peg is removed, 4 green pegs remain out of 7

$$P(\text{both green}) = \frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$$

$$\boxed{\frac{5}{14}}$$

5

a. Factorise $m^2 - 64$

b. Factorise $k^2 - 100$

(2 marks)

$$a) 64 = 8^2$$

$$m^2 - 8^2 = (m - 8)(m + 8)$$

$$\boxed{(m - 8)(m + 8)}$$

$$b) 100 = 10^2$$

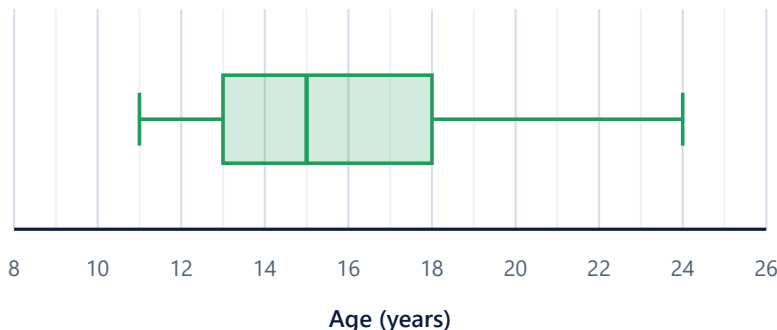
$$\boxed{(k - 10)(k + 10)}$$

6

The ages of the members of a youth orchestra are summarised below.

Youngest	Lower quartile	Median	Upper quartile	Oldest
11	13	15	18	24

- On the grid, draw a box plot for these ages.
- Work out the interquartile range.



(3 marks)

a)

Box from 13 to 18

Line inside the box at 15

Whiskers to 11 and 24

b)

$$IQR = 18 - 13$$

Box plot as drawn; $IQR = 5$ years

7

Triangle M has vertices at (2, 1), (3, 1) and (2, 3).

Triangle M is enlarged by scale factor -3 , centre (1, 0), to give triangle N.

Work out the coordinates of the vertices of triangle N.

(2 marks)

For each vertex, find the vector from the centre (1, 0) to the vertex, multiply it by -3 , then add it to the centre

(2, 1)

$$\text{vector } (1, 1) \quad (-3, -3), \text{ image } (1, 0) + (-3, -3) = (-2, -3)$$

$$(3, 1): \text{vector } (2, 1) \quad (-6, -3), \text{ image } (-5, -3)$$

$$(2, 3): \text{vector } (1, 3) \quad (-3, -9), \text{ image } (-2, -9)$$

$$(-2, -3), (-5, -3), (-2, -9)$$

8

A straight line passes through the points P (-3, 4) and Q (5, -8).

Work out the gradient of the line.

(2 marks)

$$\begin{aligned}\text{Gradient} &= \text{change in } y \text{ divided by change in } x \\ \text{Change in } y &= -8 - 4 = -12. \text{ Change in } x = 5 - (-3) = 8 \\ \text{Gradient} &= -12 \div 8 = -\frac{3}{2} = -1.5\end{aligned}$$

$$-\frac{3}{2}$$

9

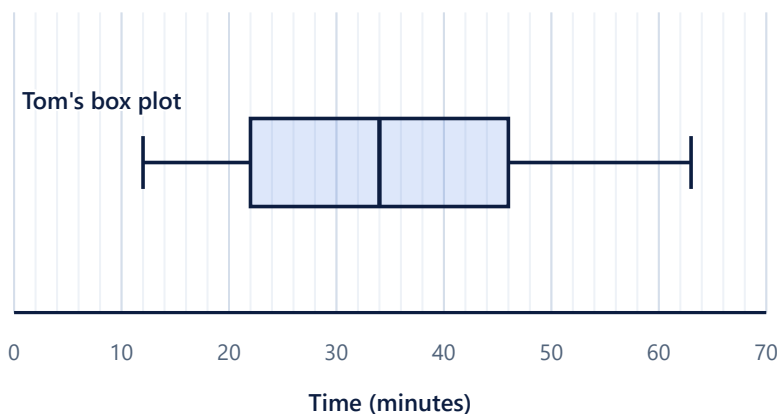
The table gives information about the times, in minutes, that 51 patients waited at a clinic.

Shortest time	15
Lower quartile	22
Median	38
Upper quartile	46
Longest time	63

Tom draws a box plot for this information. On his box plot:

- the left whisker ends at 12
- the line inside the box is drawn at 34

Write down two things that are wrong with Tom's box plot.



(2 marks)

The whisker must end at the shortest time, 15 minutes, but Tom drew it at 12

The line inside the box shows the median, 38 minutes, but Tom drew it at 34

- 10 The table shows the masses, m grams, of 40 tomatoes.

Mass (m grams)	Frequency
$50 < m \leq 60$	5
$60 < m \leq 70$	11
$70 < m \leq 80$	14
$80 < m \leq 90$	7
$90 < m \leq 100$	3

Complete the cumulative frequency table.

Mass (m grams)	Cumulative frequency
$50 < m \leq 60$	
$50 < m \leq 70$	
$50 < m \leq 80$	
$50 < m \leq 90$	
$50 < m \leq 100$	

(2 marks)

Add the frequencies as you go down the table

$$5, 5 + 11 = 16, 16 + 14 = 30, 30 + 7 = 37, 37 + 3 = 40$$

The final value 40 matches the total number of tomatoes

- 11 A straight line has equation $6x - 3y = 5$

Find the equation of the straight line that is parallel to this line and passes through the point (1, 4).

(3 marks)

$$\begin{array}{rcl} 6x - 3y & = & 5 \\ -6x & & \\ \hline -3y & = & -6x + 5 \\ \div(-3) & & \\ y & = & 2x - \frac{5}{3} \end{array}$$

$$\text{gradient} = 2$$

$$y = 2x + c$$

Substitute (1, 4)

$$4 = 2 \times 1 + c$$

$$c = 2$$

$$\boxed{y = 2x + 2}$$

12

$y = 7.8$ correct to 1 decimal place.

$z = 4.1$ correct to 1 decimal place.

a. Write down the upper bound of y .

b. Work out the upper bound of $y - z$.

(3 marks)

(a) y is 7.8 to 1 dp, so $7.75 \leq y < 7.85$. The upper bound of y is 7.85

(b) To make $y - z$ as large as possible, use the upper bound of y and the lower bound of z

The lower bound of z is 4.05

$7.85 - 4.05 = 3.8$, so the upper bound of $y - z$ is 3.8

13

A and B are points on a circle with centre O.

AB is not a diameter. M is the midpoint of the chord AB.

Prove that OM bisects angle AOB.

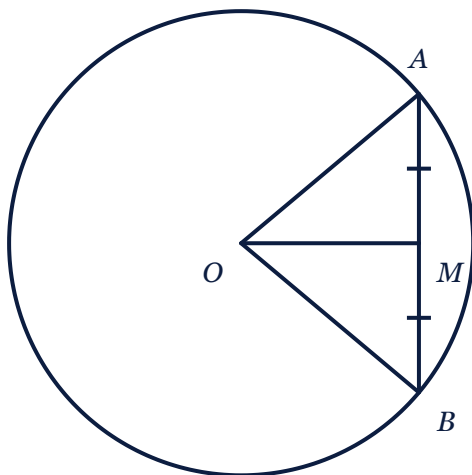


Diagram NOT accurately drawn

(3 marks)

$OA = OB$ because both are radii of the circle

$AM = BM$ because M is the midpoint of AB (given)

OM is common to both triangles, so $OM = OM$

So triangle OAM is congruent to triangle OBM (SSS)

Corresponding angles of congruent triangles are equal, so angle

$\angle AOM = \angle BOM$

Therefore OM bisects angle AOB

14

The distance d metres a dropped object falls is directly proportional to the square of the time t seconds.

When $t = 3$, $d = 45$.

Work out the value of d when $t = 6$.

(2 marks)

$$d = kt^2 \text{ with } 45 = k \times 9, \text{ so } k = 5$$

$$\text{When } t = 6, d = 5 \times 36 = 180$$

Check

$$\text{doubling } t \text{ multiplies } d \text{ by } 4, \text{ and } 45 \times 4 = 180$$

180

- 15 Triangle ABC is isosceles with $AB = AC = 5$ cm and $BC = 8$ cm.
Triangle PQR is similar to triangle ABC with $PQ = PR = 12$ cm.
Work out the length of QR.

(3 marks)

PQ corresponds to AB, QR corresponds to BC

$$\text{scale factor} = 12 \div 5 = 2.4$$

$$QR = 8 \times 2.4$$

$$19.2 \text{ cm}$$

- 16 A velocity-time graph shows a cyclist who accelerates uniformly from rest to 12 m/s in 8 seconds, then travels at a constant 12 m/s for 10 seconds.
- Work out the acceleration during the first 8 seconds.
 - Work out the total distance travelled in the 18 seconds.

(3 marks)

a) gradient

$$\frac{12}{8} = 1.5$$

$$1.5 \text{ m/s}^2$$

b) Area under the graph

$$\text{triangle} = \frac{1}{2} \times 8 \times 12 = 48$$

$$\text{rectangle} = 12 \times 10 = 120$$

$$48 + 120 = 168$$

$$168 \text{ m}$$

- 17 A conversion graph for gallons and litres is a straight line through the points (0, 0) and (10, 45). The horizontal axis shows gallons and the vertical axis shows litres.
- Work out the gradient of the line.
 - What does the gradient represent?

(3 marks)

a)

$$\text{gradient} = \frac{45 - 0}{10 - 0}$$

$$4.5$$

b) litres $\div$ gallons

$$4.5 \text{ litres in each gallon}$$

- 18 Shape S is rotated 90° clockwise about $(0, 0)$ and the image is then rotated 180° about $(0, 0)$.

Describe fully the single transformation that maps S onto its final image.

(2 marks)

Same centre, so add the turns

$$90^\circ + 180^\circ = 270^\circ$$

270° clockwise = 90° anticlockwise

Rotation 90° anticlockwise, centre $(0, 0)$

- 19 A sector of a circle has radius 6 cm and area $15\pi \text{ cm}^2$.

Work out the angle of the sector.

(2 marks)

$$\text{Area of a sector} = \left(\frac{\text{angle}}{360}\right) \times \pi r^2$$

$$\text{The full circle has area } \pi \times 36 = 36\pi \text{ cm}^2$$

$$\frac{\text{angle}}{360} = 15\pi \div 36\pi = \frac{5}{12}$$

$$\text{Angle} = \frac{5}{12} \times 360 = 150^\circ$$

$$150^\circ$$

- 20 Express 0.7 as a fraction.

(2 marks)

$$\text{Let } x = 0.777\ldots$$

$$\text{Then } 10x = 7.777\ldots$$

Multiplying by 10 shifts the decimal one place, so the repeating tails now match.

Subtracting removes that entire matching infinite tail, leaving a whole number

Subtracting

$$10x - x = 7.777\ldots - 0.777\ldots, \text{ so } 9x = 7$$

$$\text{Therefore } x = \frac{7}{9}$$

$$\frac{7}{9}$$