Day 138 **A Tier 10-a-day: Model Solutions**

1 Factorising quadratics

Factorise $x^2 - 4x - 12$

Find two numbers that multiply to -12 and add to -4
The numbers are -6 and 2
$(x - 6)(x + 2)$
Answer: $(x - 6)(x + 2)$

2 Mean from a frequency table

Here is some information about 50 people.
(a) Work out the mean.
(b) Write down the mode.

(a) Total = $1 \times 13 + 2 \times 5 + 3 \times 8 + 4 \times 8 + 5 \times 16 = 159$
Mean = $159 \div 50 = 3.18$
(b) The highest frequency is 16, so the mode is 5
Answer: (a) 3.18 (b) 5

3 Straight line graphs

A straight line has equation $4x - 2y = -4$
(a) Find the gradient of the line.
(b) Find the coordinates of the point where the line crosses the x-axis.

(a) Rearrange into $y = mx + c$: $-2y = -4x - 4$
$y = 2x + 2$
The gradient is 2
(b) On the x-axis, $y = 0$: $4x = -4$, so $x = -1$
Answer: (a) 2 (b) $(-1, 0)$

4 Circle theorems: angles in the same segment

A, B, C and D are points on a circle. AC and BD meet at E.
Angle BAC = 40° and angle ACD = 60°.
Work out the size of angle x (angle AEB).
Give reasons for your working.

Angles in the same segment are equal, so angle ABD = angle ACD = 60°
In triangle ABE: angle BAE = 40° and angle ABE = 60°
$x = 180 - 40 - 60 = 80$
Answer: $x = 80°$

5 Wages and overtime

Ben is paid £11.20 per hour for a basic week of 36 hours. (Calculator)
Overtime is paid at time and a half.
Last week Ben worked 6 hours of overtime.
Work out Ben's total pay for the week.

Basic pay = $36 \times £11.20 = £403.20$
Overtime rate = $£11.20 \times 1.5 = £16.80$ per hour
Overtime pay = $6 \times £16.80 = £100.80$
Total = $£403.20 + £100.80 = £504.00$
Answer: £504.00

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6 Interior angles of polygons

The size of each angle of a pentagon is shown as an expression:
$(3x - 5)°$, $(2x + 45)°$, $(2x + 5)°$, $(2x + 50)°$, $(x + 55)°$
Work out the value of x.

Sum of angles = $(5 - 2) \times 180 = 540°$
$3x - 5 + 2x + 45 + 2x + 5 + 2x + 50 + x + 55 = 540$
$10x + 150 = 540$
$10x = 390$
$x = 39$
Answer: x = 39

7 Adding and subtracting in standard form

Work out $(3.75 \times 10^4) + (4.2 \times 10^3)$
Give your answer in standard form.

Write both numbers using 10^3: $3.75 \times 10^4 = 37.5 \times 10^3$
$(37.5 + 4.2) \times 10^3 = 41.7 \times 10^3$
In standard form: 4.17×10^4
Answer: 4.17×10^4

8 Transformations of graphs

The graph of y = f(x) has a minimum point at (2, 6).
Write down the coordinates of the turning point of the graph of
(a) y = 2f(x)
(b) y = f(−x)

(a) Multiplying f(x) by 2 stretches the graph vertically by a factor of 2, so the y-coordinate is multiplied by 2
The minimum point is (2, 12)
(b) The graph is reflected in the y-axis, so the x-coordinate changes sign
The minimum point is (−2, 6)
Answer: (a) (2, 12) (b) (−2, 6)

9 Frequency density

The table gives information about 118 measurements.
A histogram is drawn using this information.
(a) Work out the missing frequency.
(b) Work out the height of the bar for the class $55 < h \leq 70$.

(a) Missing frequency = $118 - (54 + 42 + 6) = 16$
(b) Class width = $70 - 55 = 15$
Frequency density = $6 \div 15 = 0.4$
Answer: (a) 16 (b) 0.4

10 Bounds of a speed or density

A metal block has mass 300 g and volume 89 cm^3. The mass is measured to the nearest 10 grams and the volume to the nearest cm^3. (Calculator)
Work out the lower bound for the density of the metal in g/cm^3.
Give your answer correct to 3 significant figures.

density = mass ÷ volume
For the lower bound of density use the lower bound of mass and the upper bound of volume.
$295 \div 89.5 = 3.29609$
$= 3.30$ g/cm^3 (3 s.f.)
Answer: 3.30 g/cm^3