Day 330 **A Tier 10-a-day: Model Solutions**

1 Transformations of graphs

The graph of y = f(x) has a minimum point at (−3, 2).
Write down the coordinates of the turning point of the graph of
(a) y = f(x) + 4
(b) y = −f(x)

(a) Adding 4 to f(x) moves the graph 4 units up
The minimum point is (−3, 6)
(b) The graph is reflected in the x-axis, so the y-coordinate changes sign
The minimum point becomes a maximum point at (−3, −2)
Answer: (a) (−3, 6) (b) (−3, −2)

2 Fraction calculations

Work out $(1\frac{1}{5} + 3\frac{3}{5}) \times 2\frac{1}{4}$

Give your answer as a mixed number in its simplest form.

Brackets first, as improper fractions: $\frac{6}{5} + \frac{18}{5} = \frac{24}{5}$

Then multiply: $\frac{24}{5} \times \frac{9}{4} = \frac{54}{5}$

$= 10\frac{4}{5}$

Answer: $10\frac{4}{5}$

3 Mean from a frequency table

The table shows information about 25 matches.
(a) Work out the mean.
(b) Write down the mode.

(a) Total = 0 × 11 + 1 × 5 + 2 × 5 + 3 × 3 + 4 × 1 = 28
Mean = 28 ÷ 25 = 1.12
(b) The highest frequency is 11, so the mode is 0
Answer: (a) 1.12 (b) 0

4 Exchange rates

The exchange rate is £1 = €1.18. (Calculator)
Aisha changes £850 into euros.
How much does Aisha get in euros?

£850 × 1.18 = €1,003
Answer: €1,003

5 Difference of two squares

(a) Factorise $25y^2 - 36z^2$
(b) Use the same idea to work out $67^2 - 33^2$ without a calculator.

(a) $25y^2 - 36z^2 = (5y)^2 - (6z)^2$
$(5y - 6z)(5y + 6z)$
(b) $a^2 - b^2 = (a + b)(a - b)$, so $67^2 - 33^2 = (67 + 33)(67 - 33)$
$= 100 \times 34 = 3400$
Answer: (a) (5y − 6z)(5y + 6z) (b) 3400

Day 330 **A Tier 10-a-day: Model Solutions**

6 Compound shapes with circles

The diagram shows a shape made from a rectangle and a semicircle.
Work out the perimeter of the shape.
Give your answer in terms of π.
The diagram is not drawn accurately.

Curved edge: $\frac{1}{2} \times \pi \times 18 = 9\pi$

Straight edges: 18 + 8 + 8 = 34

Total = $34 + 9\pi$

Answer: $34 + 9\pi$ cm

7 Negative and fractional indices

Work out the value of

(a) 10^{-2}

(b) $4^{\frac{-1}{2}}$

(a) $10^{-2} = \frac{1}{10^2} = \frac{1}{100}$

(b) $4^{\frac{-1}{2}} = \frac{1}{4^{\frac{1}{2}}} = \frac{1}{(\sqrt{4})} = \frac{1}{2}$

Answer: (a) $\frac{1}{100}$ (b) $\frac{1}{2}$

8 Volume of cones and spheres

A cone has base radius 6 cm and perpendicular height 17 cm.
Work out the volume of the cone. Give your answer in terms of π.

Volume = $\frac{1}{3} \times \pi \times r^2 \times h$

$= \frac{1}{3} \times \pi \times 6^2 \times 17$

$= 204\pi$

Answer: 204π cm^3

9 Equations with algebraic fractions

Solve $\frac{2}{(x-4)} + \frac{2}{(x-1)} = 1$

Multiply every term by $(x - 4)(x - 1)$

$2(x - 1) + 2(x - 4) = (x - 4)(x - 1)$

$4x - 10 = x^2 - 5x + 4$

$x^2 - 9x + 14 = 0$

$(x - 2)(x - 7) = 0$

$x = 2$ or $x = 7$

Answer: x = 2 or x = 7

10 Frequency density

The table gives information about 157 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 $80 < h \leq 85$.

(a) Missing frequency = $157 - (48 + 32 + 11) = 66$

(b) Class width = $85 - 80 = 5$

Frequency density = $11 \div 5 = 2.2$

Answer: (a) 66 (b) 2.2