Day 148 **A Tier 10-a-day: Model Solutions**

1 Equation of a straight line

A straight line passes through the points (−1, 6) and (3, −2).
Find the equation of the line.

Gradient = $\frac{-2-6}{3-(-1)} = \frac{-8}{4} = -2$

Use y = mx + c with m = −2 and the point (−1, 6): 6 = −2 × (−1) + c
c = 4
y = −2x + 4
Answer: y = −2x + 4

2 Decimal calculations

(a) Work out 0.5 × 0.09
(b) Work out 0.40 ÷ 0.05

(a) 5 × 9 = 45, and there are 3 decimal places in total, so 0.045
(b) Multiply both numbers by 100: 40 ÷ 5 = 8
Answer: (a) 0.045 (b) 8

3 Factorising quadratics

Factorise $x^2 - 3x - 10$

Find two numbers that multiply to −10 and add to −3
The numbers are −5 and 2
(x − 5)(x + 2)
Answer: (x − 5)(x + 2)

4 Trigonometry: finding an angle

Work out the size of angle x. (Calculator)
Give your answer to 1 decimal place.
The diagram is not drawn accurately.

The sides given are the opposite (12) and the adjacent (19), so use tan

$\tan x = \frac{12}{19}$

$x = \tan^{-1}(\frac{12}{19})$

x = 32.3°
Answer: x = 32.3°

5 Error intervals

m = 550 is rounded to the nearest 10.
Write down the error interval for m.

The rounding unit is 10, so the value could be up to half of this, 5, either side.
Lower bound = 550 − 5 = 545, upper bound = 550 + 5 = 555
Answer: 545 ≤ m < 555

6 Direct proportion formulae

y is directly proportional to the square root of x.
When x = 9, y = 15.
(a) Find a formula for y in terms of x.
(b) Work out the value of y when x = 36.

(a) $y = k\sqrt{x}$. Substitute: 15 = k × 3, so k = 5
$y = 5\sqrt{x}$
(b) y = 5 × 6 = 30
Answer: (a) $y = 5\sqrt{x}$ (b) 30

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7 Sectors: finding an angle or radius

A pizza slice is a sector of a circle has angle 200° at the centre and arc length 20π cm.
Work out the radius of the sector.

Arc length = $\frac{200}{360} \times 2 \times \pi \times r$

$20\pi = \frac{10}{9} \times r \times \pi$

$r = 20 \div \frac{10}{9}$

$r = 18$

Answer: 18 cm

8 Reverse percentages

In a sale, all prices are reduced by 30%.
A tent costs £28 in the sale.
Work out the original price of the tent.

70% represents £28
1% = £28 ÷ 70 = £0.4
100% = £0.4 × 100 = £40.00
Answer: £40.00

9 Inverse proportion formulae

y is inversely proportional to $\sqrt{x}$.
When x = 25, y = 9.
(a) Find a formula for y in terms of x.
(b) Work out the positive value of x when y = 5.625.

(a) $y = \frac{k}{\sqrt{x}}$. Substitute: $9 = \frac{k}{5}$, so $k = 9 \times 5 = 45$

$y = \frac{45}{\sqrt{x}}$

(b) $5.625 = \frac{45}{\sqrt{x}}$, so $\sqrt{x} = 45 \div 5.625 = 8$, so $x = 8^2 = 64$

Answer: (a) $\mathbf{y = \frac{45}{\sqrt{x}}}$ **(b) x = 64**

10 Angles in regular polygons around a point

An equilateral triangle and a regular dodecagon share the side PQ and are on opposite sides of it.
The two shapes meet at the point P.
Work out the size of the angle at P that is not inside either shape.

Interior angle of the equilateral triangle = 180 − 360 ÷ 3 = 60°
Interior angle of the regular dodecagon = 180 − 360 ÷ 12 = 150°
Angles round a point add up to 360°
360 − 60 − 150 = 150
Answer: 150°