Day 215 **A Tier 10-a-day: Model Solutions**

1 Bearings

The bearing of Y from X is 135°.
Work out the bearing of X from Y.
The diagram is not drawn accurately.

The north lines at X and Y are parallel
Back bearing = 135° + 180° = 315°
Answer: 315°

2 Functions

f(x) = 3x + 6
g(x) = x^2 + 8
Find fg(2)

g(2) = 2^2 + 8 = 12
f(12) = 3 × 12 + 6 = 42
Answer: 42

3 Similar shapes: finding a length

The two triangles are similar.
Work out the value of x.
The diagrams are not drawn accurately.

Scale factor from the large triangle to the small triangle = 8 ÷ 32 = $\frac{1}{4}$

x = 28 × $\frac{1}{4}$ = 7

Answer: x = 7 m

4 Map scales

The scale of a map is 1 : 25000.
Two towns are 2 cm apart on the map.
Work out the real distance between the towns in kilometres.

Real distance = 2 × 25000 = 50000 cm
50000 cm = 500 m = 0.5 km
Answer: 0.5 km

5 Congruent triangles

Triangle XYZ: angle Y = 90°, XZ = 17 cm, XY = 15 cm.
Triangle STU: angle U = 90°, ST = 17 cm, SU = 15 cm.
Are the two triangles congruent?
Give a reason for your answer.

Both triangles have a right angle
XZ and ST are the hypotenuses: both 17 cm
XY = SU = 15 cm
Right angle, hypotenuse and one other side are equal, so the triangles are congruent (RHS)
Answer: Yes, congruent (RHS)

6 Growth and decay

A colony has 15,000 and grows by 6% per day. (Calculator)
Work out the number of bacteria after 3 days.
Give your answer to the nearest whole number.

Multiplier = 1.06
15,000 × 1.06^3 = 17,865.24
= 17,865 to the nearest whole number
Answer: 17,865

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7 Simple and compound interest

Cara and Nia each invest £5000 for 2 years. (Calculator)
Cara's account pays 2% simple interest per year.
Nia's account pays 2% compound interest per year.
Work out how much more interest Nia earns than Cara.

Simple interest = £5000 × 2% × 2 = £200

Compound: £5000 × 1.02^2 = £5202.00, so interest = £202.00

Difference = 202.00 − 200 = £2.00 (to the nearest penny)

Answer: £2.00

8 Quadratic inequalities

Solve $x^2 \leq 144$

$x^2 = 144$ at $x = \pm 12$

The curve $y = x^2$ is below 144 between the roots

$-12 \leq x \leq 12$

Answer: $-12 \leq x \leq 12$

9 Equation of a straight line

A straight line passes through the points (3, −3) and (4, −8).
Find the equation of the line.

Gradient = $\frac{-8-(-3)}{4-3} = \frac{-5}{1}$

Use $y = mx + c$ with $m = -5$ and the point (3, −3): $-3 = -5 \times 3 + c$

$c = 12$

$y = -5x + 12$

Answer: $y = -5x + 12$

10 Recurring decimals, show that

(a) Show that $0.\dot{1}\dot{6} = \frac{16}{99}$

(b) Hence write $2.\dot{1}\dot{6}$ as a mixed number in its simplest form.

(a) Let x = 0.161616..., so 100x = 16.1616...

$100x - x = 16$, so $99x = 16$ and $x = \frac{16}{99}$

(b) $2.\dot{1}\dot{6} = 2 + \frac{16}{99} = 2\frac{16}{99}$

Answer: (b) $2\frac{16}{99}$