Day 295 **B Tier 10-a-day: Model Solutions**

1 Angles on a line and round a point

The diagram shows 2 angles on a straight line.
Work out the value of n.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
110 + (n + 40) = 180
n + 150 = 180
n = 30
Answer: n = 30°

2 Ordering fractions

Write these in order of size.
Start with the smallest.

12%, $\frac{1}{4}$, 87.5%, 75%

Write each as a decimal:

12% = 0.12, $\frac{1}{4}$ = 0.25, 87.5% = 0.875, 75% = 0.75

Order: 12%, $\frac{1}{4}$, 75%, 87.5%

Answer: 12%, $\frac{1}{4}$, 75%, 87.5%

3 Congruent triangles

Triangle ABC has a right angle, a hypotenuse of 11 cm and another side of 5 cm.
Triangle XYZ has a right angle, a hypotenuse of 11 cm and another side of 5 cm.
Are the two triangles congruent?
Give a reason for your answer.

Both are right-angled with equal hypotenuses and one other equal side
So the triangles are congruent (RHS)
Answer: Yes, RHS (right angle, hypotenuse, side)

4 Comparing data sets

Here are Chloe's and Ravi's times to run a race.
Chloe: 48, 47, 41, 36, 50
Ravi: 38, 40, 41, 40, 38
Compare their results using the mean and the range.

Chloe: mean = 222 ÷ 5 = 44.4, range = 50 − 36 = 14
Ravi: mean = 197 ÷ 5 = 39.4, range = 41 − 38 = 3
Chloe has the higher mean
Ravi has the smaller range, so is more consistent
Answer: Chloe has the higher mean (44.4 v 39.4). Ravi is more consistent (range 3 v 14)

5 Expanding double brackets

Expand and simplify (x + 4)(x − 2)

Multiply every term in the first bracket by every term in the second:
$x^2 - 2x + 4x - 8$
Collect the x terms: $x^2 + 2x - 8$
Answer: $x^2 + 2x - 8$

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6 Bounds

The length of a rectangle is 20 cm and its width is 12 cm.
Both measurements are correct to the nearest cm.
Work out the upper bound for the perimeter of the rectangle.

Upper bound of each side = value + 0.5: 20.5 cm and 12.5 cm
Perimeter = 2 × (20.5 + 12.5) = 66 cm
Answer: 66 cm

7 Expected outcomes

The probability that a machine makes a faulty part is 0.9.
Work out how many times you would expect this to happen in 100 parts made.

Expected number = probability × number of trials
0.9 × 100 = 90
Answer: 90

8 Trigonometry in context

Sam stands 67 m from the base of a tree on level ground. (Calculator)
The angle of elevation of the top of the tree is 48°.
Work out the height of the tree.
Give your answer correct to 1 decimal place.

The distance is the adjacent side and the height is the opposite side

$\tan 48° = \frac{h}{67}$

h = 67 × tan 48° = 74.411...
h = 74.4 m (1 d.p.)
Answer: 74.4 m

9 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
3 pens and 2 pencils cost 165p.
4 pens and 2 pencils cost 210p.
Work out the cost of one pen and the cost of one pencil.

Let a = cost of one pen and b = cost of one pencil
3a + 2b = 165 and 4a + 2b = 210
Subtract: 1a = 210 − 165 = 45, so a = 45
Substitute: 3 × 45 + 2b = 165, so 2b = 30 and b = 15
Answer: One pen costs 45p and one pencil costs 15p

10 Adding fractions

Work out
(a) $\frac{1}{8} + \frac{2}{5}$
(b) $\frac{5}{8} - \frac{3}{10}$
Give each answer in its simplest form.

(a) Common denominator 40: $\frac{5}{40} + \frac{16}{40} = \frac{21}{40}$
(b) Common denominator 40: $\frac{25}{40} - \frac{12}{40} = \frac{13}{40}$
Answer: (a) $\frac{21}{40}$ (b) $\frac{13}{40}$