Day 294 **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 p.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
65 + (2p + 57) = 180
2p + 122 = 180
2p = 58
p = 58 ÷ 2 = 29
Answer: p = 29°

2 Ratio with a difference

Sam and Leo share some money in the ratio 5 : 3.
Sam gets £30 more than Leo.
How much money does Leo get?

Difference in parts: 5 − 3 = 2
2 parts = £30, so 1 part = £15
Leo gets 3 × £15 = £45
Answer: £45

3 Prime factors

Write 162 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
162 ÷ 2 = 81, 81 ÷ 3 = 27, 27 ÷ 3 = 9, 9 ÷ 3 = 3, 3 is prime
162 = 2 × 3 × 3 × 3 × 3
In index form: $162 = 2 \times 3^4$
Answer: 2×3^4

4 Congruent triangles

Triangle ABC has a right angle, a hypotenuse of 12 mm and another side of 8 mm.
Triangle XYZ has a right angle, a hypotenuse of 12 mm and another side of 8 mm.
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)

5 Mixed numbers

Work out $3\frac{1}{2} - 1\frac{3}{4}$

Give your answer as a mixed number.

Write as improper fractions: $\frac{7}{2} - \frac{7}{4}$

Common denominator 4: $\frac{14}{4} - \frac{7}{4} = \frac{7}{4}$

As a mixed number: $1\frac{3}{4}$

Answer: $\mathbf{1\frac{3}{4}}$

Day 294 **B Tier 10-a-day: Model Solutions**

6 Sample space of two dice

Two fair spinners, numbered 1 to 4 and 1 to 4, are spun.
Work out the probability that the total score is less than 4.

There are 4 × 4 = 16 equally likely outcomes
Totals below 4: (1,1), (1,2), (2,1)
P = 3 out of 16

Answer: $\frac{3}{16}$

7 Trigonometry: finding an angle

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

We know the opposite (24 cm) and the hypotenuse (25 cm), so use sin

$\sin x = \frac{24}{25}$

$x = \sin^{-1}(\frac{24}{25}) = 73.740...$

x = 73.7° (1 d.p.)
Answer: x = 73.7°

8 Grouped frequency tables

The table shows the lengths of some leaves.
(a) Write down the modal class.
(b) Work out an estimate for the mean.

(a) The highest frequency is 5
(b) Use the midpoint of each class: 22.5, 27.5, 32.5, 37.5
Sum of midpoint × frequency = 22.5 × 4 + 27.5 × 5 + 32.5 × 2 + 37.5 × 4 = 442.5
Total frequency = 15
Estimate = 442.5 ÷ 15 = 29.5
Answer: (a) $25 < l \leq 30$ (b) 29.5

9 Difference of two squares

Factorise $n^2 - 9$

$9 = 3^2$, so this is a difference of two squares
$n^2 - 3^2 = (n - 3)(n + 3)$
Answer: $(n - 3)(n + 3)$

10 Quadratic equation problem

A rectangle has length (x + 5) cm and width (x − 2) cm.
The area of the rectangle is 18 cm^2.
(a) Show that $x^2 + 3x - 28 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: (x + 5)(x − 2) = 18
Expand: $x^2 + 3x - 10 = 18$
Subtract 18 from both sides: $x^2 + 3x - 28 = 0$
(b) Factorise: (x − 4)(x + 7) = 0, so x = 4 or x = −7
A length cannot be negative, so x = 4. Length = 4 + 5 = 9
Answer: (b) 9 cm