Day 257 **B Tier 10-a-day: Model Solutions**

1 Angles on a line and round a point

The diagram shows 4 angles round a point.
Work out the value of c.
The diagram is not drawn accurately.

Angles round a point add up to 360°
(3c + 20) + 115 + (2c + 35) + (2c + 29) = 360
7c + 199 = 360
7c = 161
c = 161 ÷ 7 = 23
Answer: c = 23°

2 Sharing in a ratio

Aisha, Sam and Femi share 169 stamps in the ratio 4 : 3 : 6.
Work out how many Femi gets.

4 + 3 + 6 = 13 parts
1 part = 169 ÷ 13 = 13
Femi gets 6 × 13 = 78
Answer: 78

3 Order of operations

Work out
(a) 41 − 40 ÷ 5 + 6 × 3
(b) 5^2 − (10 − 8) × 3

(a) Divide and multiply first: 40 ÷ 5 = 8 and 6 × 3 = 18
Then from left to right: 41 − 8 + 18 = 51
(b) Brackets: 10 − 8 = 2
Powers: 5^2 = 25
Multiply: 2 × 3 = 6
Subtract: 25 − 6 = 19
Answer: (a) 51 (b) 19

4 Distance, speed and time

A boat travels at a constant speed of 18 km/h for 30 minutes.
How far does it travel?

30 minutes = $\frac{1}{2}$ hour

Distance = speed × time = 18 × $\frac{1}{2}$ = 9

Answer: 9 km

5 Perimeter and area of compound shapes

The diagram shows the shape of a garden.
All the corners are right angles. All lengths are in m.
(a) Find the perimeter.
(b) Find the area.

(a) Missing lengths: 11 − 4 = 7 and 12 − 8 = 4
Perimeter = 11 + 8 + 7 + 4 + 4 + 12 = 46
(b) Split into two rectangles: 11 × 8 = 88 and 4 × 4 = 16
88 + 16 = 104
Answer: (a) 46 m (b) 104 m^2

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6 Adding fractions

Work out

(a) $\frac{2}{5} + \frac{1}{6}$

(b) $\frac{1}{8} - \frac{1}{12}$

Give each answer in its simplest form.

(a) Common denominator 30: $\frac{12}{30} + \frac{5}{30} = \frac{17}{30}$

(b) Common denominator 24: $\frac{3}{24} - \frac{2}{24} = \frac{1}{24}$

Answer: (a) $\frac{17}{30}$ (b) $\frac{1}{24}$

7 Compound areas

A rectangular poster measures 15 cm by 16 cm.
A rectangle measuring 7 cm by 4 cm is cut out.
Work out the area that is left.

Whole area = 15 × 16 = 240
Area cut out = 7 × 4 = 28
240 − 28 = 212

Answer: 212 cm^2

8 Venn diagram problems

36 adults were asked.
19 of them like tea and 17 of them like coffee.
7 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they like tea but do not like coffee.

(a) Union = 19 + 17 − 7 = 29
Neither = 36 − 29 = 7
(b) Only like tea = 19 − 7 = 12
P = 12 out of 36

Answer: (a) 7 (b) $\frac{1}{3}$

9 Trial and improvement

The equation $x^3 + x = 13$ has a solution between 2 and 3. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 2.5: $2.5^3 + 2.5 = 18.125$ (too big)
x = 2.2: $2.2^3 + 2.2 = 12.848$ (too small)
x = 2.3: $2.3^3 + 2.3 = 14.467$ (too big)
x = 2.25: value = 13.641 (too big), so the solution is below 2.25
So x = 2.2 to 1 decimal place

Answer: x = 2.2

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10 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
1 pen and 2 pencils cost 160p.
3 pens and 2 pencils cost 300p.
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
1a + 2b = 160 and 3a + 2b = 300
Subtract: 2a = 300 − 160 = 140, so a = 70
Substitute: 1 × 70 + 2b = 160, so 2b = 90 and b = 45
Answer: One pen costs 70p and one pencil costs 45p