Day 293 **B Tier 10-a-day: Model Solutions**

1 Ratio, one part known

The ratio of red to blue among the counters in a bag is 5 : 4.
There are 8 blue.
How many red are there?

4 parts = 8 blue
1 part = 8 ÷ 4 = 2
red: 5 × 2 = 10
Answer: 10

2 Solving inequalities

Solve $3x + 6 \leq 24$

Subtract 6 from both sides: $3x \leq 18$
Divide both sides by 3 (a positive number, so the inequality sign stays the same)
Answer: $x \leq 6$

3 Volume of a prism

Here is a prism.
Its cross-section is an isosceles triangle.
Calculate the volume of the prism.
The diagram is not drawn accurately.

Area of cross-section = ½ × 14 × 7 = 49
Volume of prism = area of cross-section × length
49 × 6 = 294
Answer: 294 m^3

4 Probabilities adding to 1

The table shows the probabilities of a biased dice landing on each colour.
(a) Work out the value of x.
(b) The biased dice is used 200 times. How many times would you expect A?

(a) Probabilities add up to 1
0.15 + 0.25 + 0.1 + x = 1
x = 1 − 0.5 = 0.5
(b) 0.15 × 200 = 30
Answer: (a) 0.5 (b) 30

5 Compound percentages

A new van costs £15,500. (Calculator)
Its value falls by 4% each year.
Work out its value after 3 years.
Give your answer to the nearest pound.

Multiplier = 100% − 4% = 0.96
Value = 15500×0.96^3
= £13,713.41, which is £13,713 to the nearest pound
Answer: £13,713

6 Venn diagrams

The Venn diagram shows information about 21 workers in an office.
One of them is chosen at random.
Find the probability that the person chose both Bike and Bus.

Number in both circles = 4
Total = 10 + 4 + 3 + 4 = 21
P = 4 out of 21
Answer: $\frac{4}{21}$

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7 Surface area of a cylinder

A drum has radius 9 m and height 8 m. (Calculator)
It is closed.
Work out the total outside surface area.
Give your answer correct to 1 decimal place.

Two circles: $2 \times \pi \times 9^2 = 162\pi$
Curved surface: $2 \times \pi \times 9 \times 8 = 144\pi$
Total = $162\pi + 144\pi = 306\pi$
= 961.3 m^2 (1 d.p.)
Answer: 961.3 m^2

8 Simultaneous equations problem

A theme park sells adult tickets and child tickets.
2 adult tickets and 2 child tickets cost £30.
1 adult ticket and 2 child tickets cost £19.
Work out the cost of one adult ticket and the cost of one child ticket.

Let a = cost of one adult ticket and b = cost of one child ticket
2a + 2b = 30 and 1a + 2b = 19
Subtract: 1a = 30 − 19 = 11, so a = 11
Substitute: 2 × 11 + 2b = 30, so 2b = 8 and b = 4
Answer: One adult ticket costs £11 and one child ticket costs £4

9 Midpoint and length of a line

A is the point (−5, −5) and B is the point (−3, −2). (Calculator)
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB. Give your answer correct to 1 decimal place.

(a) Midpoint = (−8 ÷ 2, −7 ÷ 2) = (−4, −3.5)
(b) Horizontal distance = 2, vertical distance = 3
$AB^2 = 2^2 + 3^2 = 4 + 9 = 13$
$AB = \sqrt{13} = 3.606...$
Answer: (a) (−4, −3.5) (b) 3.6

10 Reverse percentages

In a sale, all prices are reduced by 35%. (Calculator)
A bike costs £78 in the sale.
Work out the original price of the bike.

The sale price is 100% − 35% = 65% of the original price.
65% = £78, so 1% = £78 ÷ 65 = £1.20
100% = £1.20 × 100 = £120
Answer: £120