Day 165 **B Tier 10-a-day: Model Solutions**

1 Order of operations

Work out

(a) $8^2 - (22 - 7) \times 2$

(b) $2 \times (4 + 20) \div 6$

(a) Brackets: $22 - 7 = 15$

Powers: $8^2 = 64$

Multiply: $15 \times 2 = 30$

Subtract: $64 - 30 = 34$

(b) Brackets first: $4 + 20 = 24$

Multiply: $2 \times 24 = 48$

Divide: $48 \div 6 = 8$

Answer: (a) 34 (b) 8

2 Pythagoras in context

A hiker walks 12 km east and then 16 km south.

Work out the straight line distance from the start to the finish.

The two walks are at right angles, so use Pythagoras

$d^2 = 12^2 + 16^2 = 144 + 256 = 400$

$d = \sqrt{400} = 20$

Answer: 20 km

3 Relative frequency

Sam tests a drawing pin landing point up.

In 500 trials it happens 100 times.

Estimate how many times it will happen in 800 trials.

Relative frequency = $100 \div 500 = 0.2$

$0.2 \times 800 = 160$

Answer: 160

4 Angles in quadrilaterals

ABCD is a rhombus.

Angle DAB = 110°.

(a) Write down the size of angle BCD.

(b) Work out the size of angle ABC.

(a) Opposite angles are equal, so angle BCD = 110°

(b) Angles next to each other add up to 180°

$180 - 110 = 70$

Answer: (a) 110° (b) 70°

5 Inequalities on a number line

(a) Write down the inequality shown on the number line.

(b) Write down all the integers that satisfy the inequality.

(a) The circle at -3 is filled in and the circle at 0 is open

$-3 \leq x < 0$

(b) The whole numbers on the shaded part: -3, -2, -1

Answer: (a) $-3 \leq x < 0$ (b) $-3, -2, -1$

6 Capture-recapture

100 frogs in a lake are caught, tagged and returned to the lake.

Later, a sample of 30 frogs is caught and 6 of them are tagged.

Estimate the total number of frogs in the lake.

Proportion tagged in the sample = $6 \div 30$

This is the same proportion as 100 out of the whole population

Population $\approx 100 \times 30 \div 6 = 500$

Answer: 500

Day 165 **B Tier 10-a-day: Model Solutions**

7 Equation of a line

A straight line has gradient 2 and passes through the point (5, −5).
Find the equation of the line.

The equation is y = 2x + c
Substitute x = 5 and y = −5: −5 = 2 × 5 + c
−5 = 10 + c
c = −5 − 10 = −15
Answer: y = 2x − 15

8 Combined mean

In a test, the mean mark of 12 boys is 57.
The mean mark of 8 girls is 42.
Work out the mean mark of all 20 students.

Total for boys = 12 × 57 = 684
Total for girls = 8 × 42 = 336
Overall mean = (684 + 336) ÷ 20 = 1020 ÷ 20 = 51
Answer: 51

9 Estimation

Estimate the value of

$\frac{9.05}{5.19} + 9.05$

Show your rounding to 1 significant figure.

Round each number to 1 significant figure: 9.05 → 9, 9.05 → 9, 5.19 → 5
Estimate = 9 ÷ 5 + 9 = 10.8
Answer: 10.8

10 Area of a triangle using sine

In triangle PQR, PQ = 9 m, QR = 7 m and angle PQR = 75°. (Calculator)
Work out the area of the triangle.
Give your answer correct to 1 decimal place.

Area = ½ab sin C
Area = ½ × 9 × 7 × sin 75°
= 30.427...
= 30.4 m^2 (1 d.p.)
Answer: 30.4 m^2