Day 1 **B Tier 10-a-day: Model Solutions**

1 Adding mixed numbers

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

Give your answer as a mixed number.

Whole numbers: 2 + 1 = 3

Fractions: $\frac{1}{3} + \frac{3}{4} = \frac{4}{12} + \frac{9}{12} = \frac{13}{12} = 1\frac{1}{12}$

$3 + 1\frac{1}{12} = 4\frac{1}{12}$

Answer: $4\frac{1}{12}$

2 Laws of indices

Simplify fully

(a) $4a^3b \times 3ab^2$

(b) $(2y^2)^3$

(a) Multiply the numbers: 4 × 3 = 12. Add the powers: $a^3 \times a = a^4$ and $b \times b^2 = b^3$

(b) Cube everything inside: $2^3 = 8$ and $(y^2)^3 = y^6$

Answer: (a) $12a^4b^3$ (b) $8y^6$

3 Proportion

12 biscuits need 180 g of butter.

(a) How much butter is needed for 20 biscuits?

(b) What is the greatest number of biscuits that can be made with 450 g of butter?

180 ÷ 12 = 15 g of butter for one biscuit

(a) 15 × 20 = 300 g

(b) 450 ÷ 15 = 30

Answer: (a) 300 g (b) 30

4 Angles in polygons

Each exterior angle of a regular polygon is 24°.

(a) How many sides does the polygon have?

(b) Work out the size of each interior angle.

(a) Exterior angles add up to 360°, so 360 ÷ 24 = 15

(b) Interior angle = 180 − 24 = 156°

Answer: (a) 15 (b) 156°

5 Independent events

The probability that it rains on Saturday is 0.3.

The probability that it rains on Sunday is 0.4.

The two events are independent.

(a) Work out the probability that it rains on both days.

(b) Work out the probability that it rains on at least one of the two days.

(a) 0.3 × 0.4 = 0.12

(b) P(no rain on either day) = 0.7 × 0.6 = 0.42

P(at least one day) = 1 − 0.42 = 0.58

Answer: (a) 0.12 (b) 0.58

6 Mean from a frequency table

The table shows the number of pets owned by each of 20 students.

Work out the mean number of pets.

Multiply each number of pets by its frequency: 0, 5, 14, 12, 8

Total number of pets = 39

Mean = 39 ÷ 20 = 1.95

Answer: 1.95

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7 Solving equations with brackets

Solve $3(2x - 1) = 4x + 9$

Expand: $6x - 3 = 4x + 9$
Subtract 4x: $2x - 3 = 9$
Add 3: $2x = 12$
Divide by 2: $x = 6$
Answer: x = 6

8 Standard form

(a) Write 0.00045 in standard form.
(b) Work out $(3 \times 10^5) \times (4 \times 10^3)$
Give your answer in standard form.

(a) Move the decimal point 4 places: $0.00045 = 4.5 \times 10^{-4}$
(b) $3 \times 4 = 12$ and $10^5 \times 10^3 = 10^8$, so 12×10^8
Written correctly in standard form, this is 1.2×10^9
Answer: (a) 4.5×10^{-4} (b) 1.2×10^9

9 Trigonometry in right-angled triangles

Work out the length x. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

We know the adjacent (8 cm) and want the opposite, so use tan.

$\tan 35° = \frac{x}{8}$

$x = 8 \times \tan 35° = 5.6017...$
$x = 5.6$ cm (1 d.p.)
Answer: x = 5.6 cm

10 Reverse percentages

In a sale, all prices are reduced by 15%.
A jacket costs £51 in the sale. (Calculator)
Work out the price of the jacket before the sale.

The sale price is $100\% - 15\% = 85\%$ of the original price.
$85\% = £51$, so $1\% = 51 \div 85 = £0.60$
$100\% = 0.6 \times 100 = £60$
Answer: £60