Day 255 **B Tier 10-a-day: Model Solutions**

1 Algebraic fractions

Simplify fully $\frac{9x^2}{3x}$

$9 \div 3 = 3$ and $x^2 \div x = x$

Answer: 3x

2 Types of number

Here is a list of numbers.
92, 22, 97, 34, 36, 21, 10, 18
From the list, write down
(a) a factor of 60
(b) a prime number

(a) 10 ($60 \div 10 = 6$) divides exactly into 60
(b) 97 has exactly two factors, 1 and itself
Answer: (a) 10 (b) 97

3 Scale drawings and maps

A road is 2 km long.
It is drawn on a map with scale 1 : 25 000.
Work out the length of the road on the map, in cm.

2 km = 200 000 cm
$200\,000 \div 25\,000 = 8$ cm
Answer: 8 cm

4 Percentage as a fraction of

(a) Ivan scores 23 out of 25 in a quiz. Write this as a percentage.
(b) Write 50p as a percentage of £4.

(a) $\frac{23}{25} \times 100 = 92\%$

(b) Change both to pence: 50p and 400p

$\frac{50}{400} \times 100 = 12.5\%$

Answer: (a) 92% (b) 12.5%

5 Tables of values for quadratics

Complete the table of values for $y = x^2 - 2x + 4$

$x = -2$: $y = (-2)^2 + (-2) \times (-2) + 4 = 12$
$x = -1$: $y = (-1)^2 + (-2) \times (-1) + 4 = 7$
$x = 2$: $y = 2^2 + (-2) \times 2 + 4 = 4$
$x = 3$: $y = 3^2 + (-2) \times 3 + 4 = 7$
Answer: x = −2: 12, x = −1: 7, x = 2: 4, x = 3: 7

6 LCM problems

Two buses leave a bus station at 09:15.
One bus leaves every 20 minutes.
The other bus leaves every 6 minutes.
At what time do both buses next leave together?

Multiples of 20: 20, 40, 60
Multiples of 6: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60
The first common multiple is 60, so the LCM is 60 minutes
09:15 + 60 minutes = 10:15
Answer: 10:15

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7 Trigonometry: finding a side

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

Label the sides: x is the adjacent and 5 cm is the opposite
We use tan (opposite and adjacent)

$\tan 66° = \frac{5}{x}$

$x = \frac{5}{\tan 66°} = 2.226...$

x = 2.2 cm (1 d.p.)

Answer: x = 2.2 cm

8 Combined mean

In a test, the mean mark of 9 boys is 66.
The mean mark of 6 girls is 61.
Work out the mean mark of all 15 students.

Total for boys = 9 × 66 = 594
Total for girls = 6 × 61 = 366
Overall mean = (594 + 366) ÷ 15 = 960 ÷ 15 = 64

Answer: 64

9 Equation of a straight line graph

The diagram shows a straight line.
(a) Work out the gradient of the line.
(b) Find the equation of the line.

(a) The line crosses the y-axis at −3. Pick two points on the line and work out change in y divided by change in x
Gradient = 1
(b) The equation is y = mx + c with m = 1 and c = −3

Answer: (a) 1 (b) y = x − 3

10 Pay and overtime

Harry earns £15 per hour for the first 36 hours worked each week.
Any extra hours are paid at time and a half.
Last week Harry worked 41 hours.
Work out Harry's total pay for last week.

Normal pay: 36 × £15 = £540
Overtime rate: 1.5 × £15 = £22.50 per hour
Overtime pay: 5 × £22.50 = £112.50
Total = £540 + £112.50 = £652.50

Answer: £652.50