Day 324 **B Tier 10-a-day: Model Solutions**

1 Angles in triangles

Triangle XYZ is isosceles with XY = XZ.
Angle XYZ = 40°.
Work out the size of angle YXZ.

Angle XZY is also 40° because the base angles are equal
40 + 40 = 80
180 − 80 = 100
Answer: 100°

2 Prime factors

Write 294 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
294 ÷ 2 = 147, 147 ÷ 3 = 49, 49 ÷ 7 = 7, 7 is prime
294 = 2 × 3 × 7 × 7
In index form: 294 = $2 \times 3 \times 7^2$
Answer: $2 \times 3 \times 7^2$

3 Continuing sequences

Here are the first four terms of a sequence.
2, 7, 17, 32
(a) Write down the next two terms.
(b) Describe the rule for continuing the sequence.

The differences are 5, 10, 15, going up by 5 each time
Next differences: 20 then 25
32 + 20 = 52 and 52 + 25 = 77
Answer: (a) 52, 77 (b) The differences go up by 5 each time

4 Median and range

Here are the number of customers at a shop each day.
10, 31, 29, 21, 13
(a) Find the median.
(b) Work out the range.

(a) Put in order: 10, 13, 21, 29, 31
The middle value is number 3: 21
(b) Range = largest − smallest = 31 − 10 = 21
Answer: (a) 21 (b) 21

5 Fractions and decimals

(a) Write $\frac{7}{16}$ as a decimal.

(b) Write $\frac{11}{15}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 7 ÷ 16 = 0.4375
(b) 11 ÷ 15: use short division, adding zeros
11 ÷ 15 = 0.73333333...
The digit 3 repeats
Answer: (a) 0.4375 (b) 0.73333333... (3 repeats)

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6 Direct proportion

P is directly proportional to n.
When n = 8, P = 32.
Find the value of P when n = 7.

P = kn
32 = k × 8, so k = 32 ÷ 8 = 4
P = 4 × 7 = 28
Answer: P = 28

7 Midpoint and length of a line

A is the point (−2, 4) and B is the point (−18, 16).
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB.

(a) Midpoint = (−20 ÷ 2, 20 ÷ 2) = (−10, 10)
(b) Horizontal distance = 16, vertical distance = 12
$AB^2 = 16^2 + 12^2 = 256 + 144 = 400$
$AB = \sqrt{400} = 20$
Answer: (a) (−10, 10) (b) 20

8 Fraction problems

A water tank is $\frac{2}{5}$ full.

143 litres of water are added.

The water tank is now $\frac{5}{6}$ full.

Work out the capacity of the water tank.

Fraction added = $\frac{5}{6} - \frac{2}{5} = \frac{13}{30}$

$\frac{13}{30}$ of the capacity = 143 litres

$\frac{1}{30}$ of the capacity = 143 ÷ 13 = 11 litres

Whole capacity = 11 × 30 = 330 litres
Answer: 330 litres

9 Combined mean

In a test, the mean mark of 20 boys is 54.
The mean mark of 5 girls is 69.
Work out the mean mark of all 25 students.

Total for boys = 20 × 54 = 1080
Total for girls = 5 × 69 = 345
Overall mean = (1080 + 345) ÷ 25 = 1425 ÷ 25 = 57
Answer: 57

10 Expanding and simplifying

Expand and simplify 5(x + 2) + 3(x + 1)

Expand each bracket: 5x + 10 + 3x + 3
Collect like terms: 8x + 13
Answer: 8x + 13