**Day 286** **A Tier 10-a-day: Model Solutions**

## 1 Roots and powers

(a) Work out $\sqrt{3600}$

(b) Work out $\sqrt[3]{27000}$

(a) $\sqrt{3600} = \sqrt{36 \times 100} = 6 \times 10 = 60$

(b) $\sqrt[3]{27000} = 3 \times 10 = 30$

**Answer: (a) 60 (b) 30**

## 2 Isosceles triangles and exterior angles

PQR is an isosceles triangle with PQ = PR.
QRS is a straight line.
Angle PRS = 143°.
Work out the size of angle x.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
Angle PRQ = 180 − 143 = 37°
Base angles are equal, so angle PQR = 37°
x = 180 − 37 − 37 = 106

**Answer: x = 106°**

## 3 Calculator and significant figures

Work out $\frac{8.5 \times 4.9}{2.3}$ (Calculator)

Give your answer correct to 3 significant figures.

8.5 × 4.9 = 41.65
= 18.10870...
= 18.1 to 3 significant figures

**Answer: 18.1**

## 4 Simultaneous equations

Solve the simultaneous equations
3x − 4y = −11
−2x + 2y = 6

Multiply (2) by 2 to make the y coefficients match
3x − 4y = −11 (1)
−4x + 4y = 12 (2)
The y terms have opposite signs, so add the equations
−x = 1, so x = −1
Substitute x = −1 into equation (1) to find y = 2

**Answer: x = −1, y = 2**

## 5 Volume of a prism

The diagram shows a prism.
The cross-section of the prism is a right-angled triangle.
Work out the volume of the prism.
The diagram is not drawn accurately.

Area of cross-section = $\frac{1}{2} \times 10 \times 10 = 50$

Volume = area of cross-section × length
= 50 × 17
= 850

**Answer: 850 cm$^3$**

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## 6 Cumulative frequency graphs

The cumulative frequency graph shows information about the mass of 100 parcels.
Use the graph to find an estimate for
(a) the median,
(b) the number of parcels with a mass greater than 40 kg.

(a) Median at cumulative frequency 100 ÷ 2 = 50
Read across from 50 to the graph, then down to the axis
Median = 27.5 kg
(b) At 40 kg the cumulative frequency is 62
100 − 62 = 38
**Answer: (a) 27.5 kg (b) 38**

## 7 Midpoints and length of a line segment

A is the point (−2, 3) and B is the point (1, −3).
(a) Find the midpoint of AB.
(b) Work out the length of AB. Give your answer as a surd in its simplest form.

(a) Midpoint = $(\frac{-2+1}{2}, \frac{3+(-3)}{2}) = (-0.5, 0)$

(b) Length = $\sqrt{(3)^2 + (-6)^2}$
$= \sqrt{45} = 3\sqrt{5}$
**Answer: (a) (−0.5, 0) (b) $3\sqrt{5}$**

## 8 Recurring decimals to fractions

Write the recurring decimal $0.\dot{4}\dot{3}$ as a fraction in its simplest form.

Let x = 0.434343...
Multiply by 100: 100x = 43.4343...
Subtract: 99x = 43
$x = \frac{43}{99}$

**Answer: $\frac{43}{99}$**

## 9 Expanding double brackets

Expand and simplify
(2x + 4)(3x − 5)

Multiply every term in the first bracket by every term in the second
$= 6x^2 - 10x + 12x - 20$
$= 6x^2 + 2x - 20$
**Answer: $6x^2 + 2x - 20$**

## 10 Inverse proportion

12 machines take 5 hours to make a batch of bottles.
All the machines work at the same rate.
How long would it take 2 machines to make a batch of bottles?

Total work = 12 × 5 = 60 machine-hour
Time for 2 machines = 60 ÷ 2 = 30 hours
**Answer: 30 hours**