Day 341 **A Tier 10-a-day: Model Solutions**

1 Volume of a cylinder

A cylinder has radius 10 cm and volume 1100π cm^3.
Work out the height of the cylinder.

$\pi r^2 h = 1100\pi$
$100\pi \times h = 1100\pi$
$h = 1100 \div 100 = 11$
Answer: 11 cm

2 Rearranging formulae

Make a the subject of $b = \frac{a - 1}{5}$

Multiply both sides by 5: $5b = a - 1$
Add 1 to both sides
$a = 5b + 1$
Answer: a = 5b + 1

3 Median and interquartile range

Here are the ages, in years, of 7 people.
77 18 27 29 11 53 36
(a) Work out the median.
(b) Work out the interquartile range.

Put in order: 11, 18, 27, 29, 36, 53, 77
(a) The middle value is number 4, so the median is 29
(b) Lower half: 11, 18, 27, so LQ = 18
Upper half: 36, 53, 77, so UQ = 53
IQR = 53 − 18 = 35
Answer: (a) 29 (b) 35

4 HCF and LCM in index form

$A = 2^2 \times 5^4 \times 7^3$
$B = 2 \times 5^4 \times 7$
Find the highest common factor (HCF) and the lowest common multiple (LCM) of A and B.
Give your answers as products of prime factors.

HCF: for each prime take the lower power (a missing prime has power 0): $2 \times 5^4 \times 7$
LCM: for each prime take the higher power: $2^2 \times 5^4 \times 7^3$
Answer: HCF = $2 \times 5^4 \times 7$, LCM = $2^2 \times 5^4 \times 7^3$

5 Box plots

The box plot shows the masses, in kg, of the parcels in delivery A.
(a) Write down the median and the interquartile range.
For delivery B the median is 40 and the interquartile range is 10.
(b) Compare the distributions of the two deliveries.

(a) Median = 45
Interquartile range = 50 − 30 = 20
(b) The median for Delivery A is higher (45 compared with 40), so it has the higher values on average
The IQR for Delivery B is smaller (10 compared with 20), so its values are more consistent
Answer: (a) Median 45, IQR 20 (b) Delivery A has the higher median; Delivery B has the smaller IQR so is more consistent

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6 Volume of a pyramid

The diagram shows a pyramid with a square base of side 6 cm.
The perpendicular height of the pyramid is 3 cm.
Work out the volume of the pyramid.
The diagram is not drawn accurately.

Volume = $\frac{1}{3}$ × base area × height

= $\frac{1}{3}$ × 6 × 6 × 3

= 36

Answer: 36 cm^3

7 Recurring decimals, show that

(a) Show that $0.\dot{5}\dot{0} = \frac{50}{99}$

(b) Hence write $5.\dot{5}\dot{0}$ as a mixed number in its simplest form.

(a) Let x = 0.505050..., so 100x = 50.5050...

100x − x = 50, so 99x = 50 and x = $\frac{50}{99}$

(b) $5.\dot{5}\dot{0} = 5 + \frac{50}{99} = 5\frac{50}{99}$

Answer: (b) $5\frac{50}{99}$

8 Cumulative frequency graphs

The cumulative frequency graph shows the times taken by 80 people to finish a puzzle.
Use the graph to find an estimate for
(a) the median,
(b) the number of people with a time greater than 60 minutes.

(a) Median at cumulative frequency 80 ÷ 2 = 40
Read across from 40 to the graph, then down to the axis
Median = 30 minutes
(b) At 60 minutes the cumulative frequency is 46
80 − 46 = 34
Answer: (a) 30 minutes (b) 34

9 Rearranging formulae (subject twice)

Make x the subject of y = $\frac{3x + 3}{-x - 6}$

Multiply both sides by (−x − 6): y(−x − 6) = 3x + 3
Expand the bracket: −xy − 6y = 3x + 3
Collect the x terms on one side: −xy − 3x = 6y + 3
Factorise: x(−y − 3) = 6y + 3
Divide by (−y − 3): x = $\frac{6y + 3}{-y - 3}$
Multiply the top and bottom by −1: x = $\frac{-6y - 3}{y + 3}$

Answer: x = $\frac{-6y - 3}{y + 3}$

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10 Finding a rate of compound change

Oscar invests £17,500 in a savings account. (Calculator)
Compound interest is paid at a fixed rate each year.
After 3 years the investment is worth £30,240.
Work out the annual rate of interest.

Overall multiplier = £30,240 ÷ £17,500 = 1.728

Take the cube root: $\sqrt[3]{1.728} = 1.2$

Rate = (1.2 − 1) × 100 = 20%

Answer: 20%