Day 275 **B Tier 10-a-day: Model Solutions**

1 Function notation

f(x) = 6x + 9
(a) Work out f(6)
(b) Solve f(x) = −15

(a) f(6) = 6 × 6 + 9 = 45
(b) 6x + 9 = −15
Subtract 9 from both sides: 6x = −24
Divide both sides by 6
Answer: (a) 45 (b) x = −4

2 Negative and zero indices

Work out
(a) 5^{-3}
(b) $5^0 + \sqrt{49}$

(a) A negative power means the reciprocal: $5^{-3} = \frac{1}{5^3} = \frac{1}{125}$

(b) Anything to the power 0 is 1, so $5^0 = 1$
$\sqrt{49} = 7$, so 1 + 7 = 8
Answer: (a) $\frac{1}{125}$ (b) 8

3 Integer inequalities

n is an integer.
Write down all the values of n for which
$-1 < n \leq 3$

List the whole numbers between −1 and 3
Include −1 only if the sign is ≤, and 3 only if the sign is ≤
Answer: 0, 1, 2, 3

4 Relative frequency

Sam tests a drawing pin landing point up.
In 250 trials it happens 100 times.
Estimate how many times it will happen in 1000 trials.

Relative frequency = 100 ÷ 250 = 0.4
0.4 × 1000 = 400
Answer: 400

5 Significant figures

Work out the value of this expression. (Calculator)
$\sqrt{6^2 + 6^2}$
Give your answer correct to 3 significant figures.

Use a calculator: the full display is 8.485281...
Round to 3 significant figures: 8.49
Answer: 8.49

6 Direct proportion

P is directly proportional to n.
When n = 2, P = 12.
Find the value of P when n = 20.

P = kn
12 = k × 2, so k = 12 ÷ 2 = 6
P = 6 × 20 = 120
Answer: P = 120

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7 Trigonometry: finding an angle

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

We know the opposite (6 cm) and the adjacent (11 cm), so use tan

$\tan x = \frac{6}{11}$

$x = \tan^{-1}(\frac{6}{11}) = 28.610...$

x = 28.6° (1 d.p.)

Answer: x = 28.6°

8 Algebraic fractions

Simplify fully $\frac{x^2 - 4x}{x}$

Factorise the top: $x(x - 4)$
Cancel the x on the top and bottom
Answer: x − 4

9 Volume of cuboids

A paddling pool is a cuboid 10 cm long, 20 cm wide and 40 cm deep.
(a) Work out the volume of the paddling pool.
(b) How many litres of water does it hold when full?
1 litre = 1000 cm^3

(a) Volume = length × width × depth

$10 \times 20 \times 40 = 8000\ cm^3$

(b) 8000 ÷ 1000 = 8 litres

Answer: (a) 8000 cm^3 (b) 8 litres

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 50%. (Calculator)
Two weeks later it is reduced by a further 50% of the new price.
The final price is £62.50.
Work out the original price of the sofa.

Multipliers: 0.5 and 0.5
Overall multiplier = 0.5 × 0.5 = 0.25
Original price = £62.50 ÷ 0.25 = £250
Answer: £250