Day 21 **B Tier 10-a-day: Model Solutions**

1 Integer inequalities

x is an integer.
Write down the greatest value of x for which $x < 1.7$

The integers below 1.7 are ... 0, 1
Answer: 1

2 Percentage as a fraction of

(a) Jasmine scores 320 out of 400 in a test. Write this as a percentage.
(b) Write £1.35 as a percentage of £5.

(a) $\frac{320}{400} \times 100 = 80\%$

(b) Change both to pence: 135p and 500p
$\frac{135}{500} \times 100 = 27\%$
Answer: (a) 80% (b) 27%

3 Forming equations

I think of a number.
I add 6 and then multiply the result by 4.
The answer is 84.
Work out my number.

Let the number be n: $4(n + 6) = 84$
Divide by 4: $n + 6 = 21$
Subtract 6
Answer: 15

4 Circumference and area of a circle

The diagram shows a circle with diameter 24 mm.
Work out the circumference of the circle.
Give your answer in terms of π.
The diagram is not drawn accurately.

Circumference = $\pi \times$ diameter
$\pi \times 24 = 24\pi$
Answer: 24π mm

5 Inverse proportion

2 pumps take 60 minutes to empty a pool.
All the pumps work at the same rate.
How long would it take 6 pumps?

The total work stays the same: $2 \times 60 = 120$ pumps-minutes
With 6 pumps: $120 \div 6 = 20$ minutes
Answer: 20 minutes

6 Wages and overtime

Mohammed is paid £8 per hour for a 35 hour week. (Calculator)
Overtime is paid at double time.
In one week he works 7 hours of overtime.
Work out his total pay for that week.

Normal pay: $35 \times £8 = £280$
Overtime rate: $£8 \times 2 = £16$ per hour
Overtime pay: $7 \times £16 = £112$
Total: $£280 + £112 = £392$
Answer: £392

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7 Rates

Nia types at 50 words per minute.
(a) How many words does Nia type in 12 minutes?
(b) How long does Nia take to type 1800 words?

(a) 50 × 12 = 600
(b) 1800 ÷ 50 = 36 minutes
Answer: (a) 600 words (b) 36 minutes

8 Simultaneous equations problem

A takeaway sells burgers and portions of chips.
2 burgers and 2 portions of chips cost £10.
4 burgers and 2 portions of chips cost £18.
Work out the cost of one burger and the cost of one portion of chips.

Let a = cost of one burger and b = cost of one portion of chips
2a + 2b = 10 and 4a + 2b = 18
Subtract: 2a = 18 − 10 = 8, so a = 4
Substitute: 2 × 4 + 2b = 10, so 2b = 2 and b = 1
Answer: One burger costs £4 and one portion of chips costs £1

9 Growth in standard form

There are 2.2×10^4 bacteria in a dish.
The number doubles every day.
How many are there after 5 days?
Give your answer in standard form.

Each day multiply by 2, so multiply by $2^5 = 32$
$2.2 \times 10^4 \times 32 = 70.4 \times 10^4$
In standard form: 7.04×10^5
Answer: 7.04×10^5

10 Isosceles triangles and Pythagoras

Triangle PQR is isosceles with PQ = PR = 10 m.
The base QR = 16 m.
(a) Work out the perpendicular height of the triangle.
(b) Work out the area of the triangle.

(a) The height splits the base in half: 16 ÷ 2 = 8
$h^2 = 10^2 - 8^2 = 100 - 64 = 36$, so h = 6
(b) Area = ½ × 16 × 6 = 48
Answer: (a) 6 m (b) 48 m^2