Day 340 **B Tier 10-a-day: Model Solutions**

1 Rates

Electricity costs 30p per unit.
There is also a standing charge of £8.
Work out the total bill for 200 units.

Cost of units: 200 × 30p = 6000p = £60
Add the standing charge: £60 + £8 = £68
Answer: £68

2 Midpoint and length of a line

A is the point (2, −3) and B is the point (14, −19).
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB.

(a) Midpoint = (16 ÷ 2, −22 ÷ 2) = (8, −11)
(b) Horizontal distance = 12, vertical distance = 16
$AB^2 = 12^2 + 16^2 = 144 + 256 = 400$
$AB = \sqrt{400} = 20$
Answer: (a) (8, −11) (b) 20

3 Metric units

A jug holds 2.75 litres of juice.
Each glass holds 250 ml.
How many glasses can be filled from the jug?

2.75 litres = 2.75 × 1000 = 2750 ml
2750 ÷ 250 = 11
Answer: 11 glasses

4 Trigonometry: finding a side

Find the length of p. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: p is the adjacent and 8 m is the hypotenuse
We use cos (adjacent and hypotenuse)

$\cos 65° = \frac{p}{8}$

p = 8 × cos 65° = 3.381...
p = 3.4 m (1 d.p.)
Answer: p = 3.4 m

5 Gradient and intercept

A straight line has equation y = −3x − 5
(a) Write down the gradient of the line.
(b) Write down the equation of a line that is parallel to this line and passes through the point (0, 1).

(a) The line is in the form y = mx + c, so the gradient m is the number in front of x
(b) Parallel lines have the same gradient, −3
It crosses the y-axis at 1, so c = 1
Answer: (a) −3 (b) y = −3x + 1

6 Percentage change

The number of members of a club goes from 300 to 330.
Work out the percentage increase.

Increase = 330 − 300 = 30

Percentage increase = $\frac{30}{300}$ × 100 = 10%

Answer: 10% increase

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7 Equation of a line

A straight line has gradient −2 and passes through the point (4, 8).
Find the equation of the line.

The equation is $y = -2x + c$
Substitute $x = 4$ and $y = 8$: $8 = -2 \times 4 + c$
$8 = -8 + c$
$c = 8 - (-8) = 16$
Answer: $y = -2x + 16$

8 Combined mean

In a test, the mean mark of 10 Class A is 69.
The mean mark of 5 Class B is 51.
Work out the mean mark of all 15 students.

Total for Class A = 10 × 69 = 690
Total for Class B = 5 × 51 = 255
Overall mean = (690 + 255) ÷ 15 = 945 ÷ 15 = 63
Answer: 63

9 Circle theorems

A, B and C are points on a circle, centre O.
Angle AOB = 110°.
Work out the size of angle ACB, marked a.
Give a reason for your answer.
The diagram is not drawn accurately.

The angle at the centre is twice the angle at the circumference
a = 110 ÷ 2 = 55°
Answer: a = 55°

10 Solving equations

Solve $a - 7 = 27$

Add 7 to both sides
Answer: a = 34