Day 17 **A Tier 10-a-day: Model Solutions**

1 Similar shapes: finding a length

The two triangles are similar.
Work out the value of x.
The diagrams are not drawn accurately.

Scale factor from the large triangle to the small triangle = $21 \div 28 = \frac{3}{4}$

$x = 32 \times \frac{3}{4} = 24$

Answer: x = 24 cm

2 Converting speeds

A sprinter travels at 12 m/s.
Work out this speed in kilometres per hour.

In 1 hour there are 3600 seconds, so 12 m/s = 12 × 3600 m/h
= 43200 m/h = 43200 ÷ 1000 km/h
= 43.2
Answer: 43.2 km/h

3 Mixed number addition and subtraction

Work out $4\frac{3}{7} + 3\frac{1}{3}$

Give your answer as a mixed number in its simplest form.

Write as improper fractions: $4\frac{3}{7} = \frac{31}{7}$ and $3\frac{1}{3} = \frac{10}{3}$

Common denominator 21: $\frac{93}{21} + \frac{70}{21}$

$= \frac{163}{21}$

$= 7\frac{16}{21}$

Answer: $7\frac{16}{21}$

4 Area of a sector

The diagram shows a sector of a circle of radius 12 cm.
Work out the area of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area = $\frac{40}{360} \times \pi \times 12^2$

$= \frac{1}{9} \times 144\ \pi$

$= 16\pi$

Answer: 16π cm^2

5 Error intervals

t = 1.24 has been truncated to 2 decimal places.
Write down the error interval for t.

Truncating means cutting off the digits after the second decimal place.
The original value is at least 1.24 and less than 1.24 + 0.01 = 1.25
Answer: $1.24 \leq t < 1.25$

6 Algebraic proof

Prove that the difference between the squares of two consecutive integers is always odd.

Let the integers be n and n + 1

$(n + 1)^2 - n^2 = n^2 + 2n + 1 - n^2 = 2n + 1$

2n is even, so 2n + 1 is odd

Answer: Proved

7 Arc length and perimeter of a sector

The diagram shows a sector of a circle of radius 12 cm.
Work out the perimeter of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Arc length = $\frac{40}{360} \times 2 \times \pi \times 12 = \frac{8}{3}\pi$

Perimeter = arc + two radii

$= \frac{8}{3}\pi + 24$

Answer: $\frac{8}{3}\pi + 24$ cm

8 Reverse percentages

In a sale, all prices are reduced by 6%. (Calculator)
A jacket costs £70.50 in the sale.
Work out the original price of the jacket.

The sale price is 94% of the original price.

94% = £70.50, so 1% = £70.50 ÷ 94 = £0.75

100% = £0.75 × 100 = £75

Answer: £75

9 Direct and inverse proportion

y is inversely proportional to the square of x.
When x = 1, y = 16.
(a) Find a formula for y in terms of x.
(b) Work out the value of y when x = 4.

(a) $y = \frac{k}{x^2}$. Substitute x = 1 and y = 16: $16 = \frac{k}{1}$, so $k = 16 \times 1 = 16$

$y = \frac{16}{x^2}$

(b) $y = \frac{16}{16} = 1$

Answer: (a) $y = \frac{16}{x^2}$ (b) 1

10 Pressure

A block rests on an area of 2.5 m^2 of the floor.
The pressure on the floor is 20 N/m^2.
Work out the force exerted by the block.

Force = pressure × area

$= 20 \times 2.5 = 50$

Answer: 50 N