Day 221 **B Tier 10-a-day: Model Solutions**

1 Solving equations

Solve $n + 4 = 19$

Subtract 4 from both sides

Answer: n = 15

2 Map scales

The scale of a map is 1 : 10,000.
Two villages are 4 km apart.
How far apart are they on the map?
Give your answer in centimetres.

4 km = 400,000 cm
Divide by 10,000: 400,000 ÷ 10,000 = 40
Answer: 40 cm

3 Multiplying and dividing fractions

Work out

(a) $\frac{2}{5} \times \frac{5}{8}$

(b) $\frac{3}{4} \div \frac{1}{3}$

Give each answer in its simplest form.

(a) Multiply the tops and the bottoms: $\frac{10}{40} = \frac{1}{4}$

(b) Turn the second fraction upside down and multiply: $\frac{3}{4} \times 3 = \frac{9}{4} = 2\frac{1}{4}$

Answer: (a) $\frac{1}{4}$ (b) $2\frac{1}{4}$

4 Radius from area or circumference

The circumference of a circle is 22π cm.
Work out the radius of the circle.

Circumference = $2\pi r$, so $2r = 22$
$r = 22 \div 2 = 11$
Answer: 11 cm

5 Ratio and changes

In a room, the ratio of red counters to blue counters is 3 : 7.
There are 42 blue counters.
More red counters join so that there are equal numbers of red counters and blue counters.
How many red counters join?

7 parts = 42, so 1 part = 6
Originally there are 3 × 6 = 18 red counters
To equal 42, add 42 − 18 = 24
Answer: 24

6 Substitution into formulae

$v^2 = u^2 + 2as$
Work out the positive value of v when u = 4, a = 3 and s = 14

$v^2 = 4^2 + 2 \times 3 \times 14$
$v^2 = 16 + 84 = 100$
$v = \sqrt{100} = 10$
Answer: v = 10

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7 HCF and LCM from prime factors

$A = 2 \times 3^2 \times 7^2$

$B = 3 \times 5^3$

Write down, as a product of prime factors,

(a) the HCF of A and B

(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: 3

(b) LCM: take the larger power of every prime: $2 \times 3^2 \times 5^3 \times 7^2$

Answer: (a) 3 (b) $2 \times 3^2 \times 5^3 \times 7^2$

8 Arc length and sector area

The diagram shows a sector of a circle with radius 6 cm and angle 120°. (Calculator)

Work out the length of the arc of the sector.

Give your answer correct to 1 decimal place.

The diagram is not drawn accurately.

Arc length = $\frac{120}{360} \times 2 \times \pi \times 6$

= 12.566... = 12.6 cm (1 d.p.)

Answer: 12.6 cm

9 Fractions and decimals

(a) Write $\frac{6}{25}$ as a decimal.

(b) Write $\frac{2}{15}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 6 ÷ 25 = 0.24

(b) 2 ÷ 15: use short division, adding zeros

2 ÷ 15 = 0.13333333...

The digit 3 repeats

Answer: (a) 0.24 (b) 0.13333333... (3 repeats)

10 Chords and the centre of a circle

A circle has centre O and radius 11 m. (Calculator)

AB is a chord and M is the midpoint of AB. OM is perpendicular to AB.

Work out the value of x. Give your answer correct to 1 decimal place.

The diagram is not drawn accurately.

AM = 10 ÷ 2 = 5

Triangle OMA has a right angle at M, and OA is the hypotenuse

$x^2 = 11^2 - 5^2 = 121 - 25 = 96$

$x = \sqrt{96} = 9.798...$

x = 9.8 m (1 d.p.)

Answer: x = 9.8 m