Day 299 **B Tier 10-a-day: Model Solutions**

1 Continuing sequences

Here are the first four terms of a sequence.
2, 20, 200, 2000
(a) Write down the next two terms.
(b) Describe the rule for continuing the sequence.

Each term is 10 times the term before: 20 ÷ 2 = 10
2000 × 10 = 20000 and 20000 × 10 = 200000
Answer: (a) 20000, 200000 (b) Multiply by 10 each time

2 Place value

Here are four digit cards.
2 1 3 9
Use all four cards to make the largest possible even number.

The last digit must be even. Put the biggest remaining digits first.
The largest even number is 9312
Answer: 9312

3 Angles in parallel lines

In the diagram, PQ is parallel to RS.
(a) Work out the size of angle b.
(b) Give a reason for your answer.
The diagram is not drawn accurately.

Angle b and the 105° angle are corresponding angles (F shape)
b = 105°
Corresponding angles are equal
Answer: (a) b = 105° (b) Corresponding angles are equal

4 Harder linear equations

Solve 8 − 3x = 4x − 20

Add 3x to both sides: 8 = 7x − 20
Add 20 to both sides: 28 = 7x
Divide both sides by 7
Answer: x = 4

5 Sample space of two dice

Two fair dice, numbered 1 to 6 and 1 to 8, are rolled.
Work out the probability that both dice show the same number.

There are 6 × 8 = 48 equally likely outcomes
Matching pairs: 1-1, 2-2, 3-3, 4-4, 5-5, 6-6
P = 6 out of 48
Answer: $\frac{1}{8}$

6 Fraction problems

A water tank is $\frac{3}{5}$ full.

12 litres of water are added.

The water tank is now $\frac{2}{3}$ full.

Work out the capacity of the water tank.

Fraction added = $\frac{2}{3} - \frac{3}{5} = \frac{1}{15}$

$\frac{1}{15}$ of the capacity = 12 litres
Whole capacity = 12 × 15 = 180 litres
Answer: 180 litres

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7 Combining ratios

In a bag of counters, the ratio of yellow to black is 4 : 5.
The ratio of black to red is 5 : 4.
Write down the ratio yellow : black : red.

Make the black part the same in both ratios: lowest common multiple of 5 and 5 is 5
yellow : black = 4 : 5
black : red = 5 : 4
yellow : black : red = 4 : 5 : 4
Answer: 4 : 5 : 4

8 Inequalities on a number line

(a) Write down the inequality shown on the number line.
(b) Write down all the integers that satisfy the inequality.

(a) The circle at −3 is open and the circle at 0 is open
$-3 < x < 0$
(b) The whole numbers on the shaded part: −2, −1
Answer: (a) $-3 < x < 0$ (b) −2, −1

9 Trigonometry in isosceles triangles

Triangle ABC is isosceles with AB = AC = 6 cm. (Calculator)
The base BC = 6 cm.
Work out the size of angle ABC.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 6 ÷ 2 = 3

$\cos B = \frac{3}{6}$

Angle ABC = $\cos^{-1}(\frac{3}{6})$ = 60.000...

= 60.0° (1 d.p.)
Answer: 60.0°

10 Direct proportion

P is directly proportional to n.
When n = 12, P = 18.
Find the value of n when P = 21.

P = kn
k = 18 ÷ 12 = 1.5
n = 21 ÷ 1.5 = 14
Answer: n = 14