**Day 11** **B Tier 10-a-day: Model Solutions**

## 1 Negative numbers

The temperature in a freezer is −9°C.
(a) The temperature rises by 3°C. Work out the new temperature.
(b) The highest temperature one day was 5°C and the lowest was −8°C. Work out the difference.

(a) −9 + 3 = −6
(b) Difference = 5 − (−8) = 5 + 8 = 13
**Answer: (a) −6°C (b) 13°C**

## 2 Rates

A tap fills a tank at a rate of 8 litres per minute.
The tank holds 40 litres.
How long does it take to fill the empty tank?

Time = 40 ÷ 8 = 5 minutes
**Answer: 5 minutes**

## 3 Compound areas

A rectangular lawn measures 23 m by 6 m.
A rectangle measuring 11 m by 3 m is cut out.
Work out the area that is left.

Whole area = 23 × 6 = 138
Area cut out = 11 × 3 = 33
138 − 33 = 105
**Answer: 105 $m^2$**

## 4 Where a line crosses the axes

A straight line has equation y = −3x + 6
(a) Write down the coordinates of the point where the line crosses the y-axis.
(b) Work out the coordinates of the point where the line crosses the x-axis.

(a) When x = 0, y = 6
(b) The line crosses the x-axis when y = 0: −3x + 6 = 0
−3x = −6
x = 2
**Answer: (a) (0, 6) (b) (2, 0)**

## 5 Sample space of two dice

Two fair dice, numbered 1 to 6 and 1 to 10, are rolled.
Work out the probability that the difference between the two scores is 1.

There are 6 × 10 = 60 equally likely outcomes
Pairs with difference 1: 11 outcomes
P = 11 out of 60
**Answer:** $\frac{11}{60}$

## 6 HCF and LCM from prime factors

A = $2^3 \times 5^2$
B = $2 \times 3 \times 5^2 \times 7$
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: $2 \times 5^2$
(b) LCM: take the larger power of every prime: $2^3 \times 3 \times 5^2 \times 7$
**Answer: (a) $2 \times 5^2$ (b) $2^3 \times 3 \times 5^2 \times 7$**

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## 7 Solving quadratic equations

Solve $x^2 - 64 = 0$

Factorise as a difference of two squares: $(x - 8)(x + 8) = 0$
Either $x - 8 = 0$ or $x + 8 = 0$
**Answer: $x = -8$ or $x = 8$**

## 8 Growth in standard form

There are $2.8 \times 10^3$ bacteria in a dish.
The number doubles every day.
How many are there after 6 days?
Give your answer in standard form.

Each day multiply by 2, so multiply by $2^6 = 64$
$2.8 \times 10^3 \times 64 = 179.2 \times 10^3$
In standard form: $1.792 \times 10^5$
**Answer: $1.792 \times 10^5$**

## 9 Area of a triangle using sine

In triangle XYZ, XY = 10 m, YZ = 7 m and angle XYZ = 40°. (Calculator)
Work out the area of the triangle.
Give your answer correct to 1 decimal place.

Area = ½ab sin C
Area = ½ × 10 × 7 × sin 40°
= 22.498...
= 22.5 $m^2$ (1 d.p.)
**Answer: 22.5 $m^2$**

## 10 Iteration

Here is an iteration formula.
$x_{n+1} = \sqrt{4x_n + 13}$
$x_0 = 3$
(a) Work out $x_1$
(b) Work out $x_2$. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = \sqrt{4 \times 3 + 13} = \sqrt{25} = 5$
(b) $x_2 = \sqrt{4 \times 5 + 13} = \sqrt{33} = 5.74456...$
= 5.745
**Answer: (a) 5 (b) 5.745**