Day 244 **A Tier 10-a-day: Model Solutions**

1 Ordering numbers

Write these numbers in order of size, starting with the smallest.

0.14 8% 0.41 $\frac{8}{10}$

Change each to a decimal: 0.14 = 0.14, 8% = 0.08, 0.41 = 0.41, $\frac{8}{10}$ = 0.8

Order the decimals: 0.08 < 0.14 < 0.41 < 0.8

Answer: 8%, 0.14, 0.41, $\frac{8}{10}$

2 Median from a frequency table

The frequency table shows data for 25 children.

(a) Find the median.

(b) Work out the range.

(a) The median is the 13th value (25 + 1) ÷ 2 = 13

Cumulative frequencies: 7, 12, 15, 21, 25

The 13th value is 2

(b) Range = 4 − 0 = 4

Answer: (a) 2 (b) 4

3 Loci and constructions

PQ is a straight line of length 4 cm.

A point S moves so that it is always less than 7 cm from the point P.

Describe the region where S can be.

Less than 7 cm from P means inside the circle

Centre P, radius 7 cm

Answer: Inside a circle with centre P and radius 7 cm

4 Compound interest

Hugo invests £2000 in a savings account. (Calculator)

The account pays 4% compound interest per year.

Work out the amount in the account after 2 years.

Multiplier = 100% + 4% = 1.04

£2000 × 1.04^2 = £2163.200

= £2163.20 to the nearest penny

Answer: £2163.20

5 Double inequalities

(a) Solve $-22 \leq 4x - 6 < -2$

(b) Write down all the integer values of x that satisfy this inequality.

(a) Add 6 to every part: $-16 \leq 4x < 4$

Divide every part by 4: $-4 \leq x < 1$

(b) The integers are −4, −3, −2, −1, 0

Answer: (a) $-4 \leq x < 1$ (b) −4, −3, −2, −1, 0

6 Perimeter and area with algebra

An isosceles triangle has two equal sides of length (5x + 3) cm and (x + 23) cm.

The third side is 12 cm.

Work out the perimeter of the triangle.

The two equal sides give an equation

5x + 3 = x + 23

4x = 20

x = 5

Equal sides = 5 × 5 + 3 = 28 cm

Perimeter = 28 + 28 + 12 = 68

Answer: 68 cm

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7 Composite functions

f(x) = 2x − 1
g(x) = x^2 − 4
Solve fg(x) = −1

fg(x) = 2(x^2 − 4) − 1 = 2x^2 − 9
2x^2 − 9 = −1, so 2x^2 = 8
x^2 = 4, so x = ±2
Answer: x = 2 or x = −2

8 Trigonometry: finding a side

Work out the value of x. (Calculator)
Give your answer to 3 significant figures.
The diagram is not drawn accurately.

x is the adjacent and 9 cm is the opposite, so use tan
tan 34° = $\frac{9}{x}$
x = 9 ÷ tan 34°
x = 13.3
Answer: x = 13.3 cm

9 Finding a rate of compound change

Leah invests £1,000 in a savings account. (Calculator)
Compound interest is paid at a fixed rate each year.
After 2 years the investment is worth £1,060.90.
Work out the annual rate of interest.

Overall multiplier = £1,060.90 ÷ £1,000 = 1.0609
Take the square root: $\sqrt{1.0609}$ = 1.03
Rate = (1.03 − 1) × 100 = 3%
Answer: 3%

10 Rearranging formulae (subject twice)

Make x the subject of y = $\frac{2x + 1}{2x + 3}$

Multiply both sides by (2x + 3): y(2x + 3) = 2x + 1
Expand the bracket: 2xy + 3y = 2x + 1
Collect the x terms on one side: 2xy − 2x = −3y + 1
Factorise: x(2y − 2) = −3y + 1
Divide by (2y − 2): x = $\frac{-3y + 1}{2y - 2}$
Answer: x = $\frac{-3y + 1}{2y - 2}$