



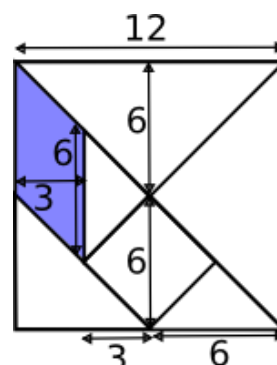
Stage 3 ★★

Mixed Selection 1 – Solution

1. Tangram Area

The parallelogram has base 6cm and height 3cm, so the area is

$$6\text{cm} \times 3\text{cm} = 18\text{cm}$$



2. Triangles' triangle

The perimeter of the large triangle is 24cm, so it has side of length 8cm, so each small triangle has side of length 1cm. So each small triangle has perimeter 3cm.

$$\begin{aligned} \text{Total length of black lines} &= \text{Total perimeter of shaded triangles} \\ &= \text{Number of shaded triangles} \times 3\text{ cm} \\ &= 27 \times 3\text{cm} \\ &= 81 \end{aligned}$$

3. L-emental

The perimeter of the shape is $4 \times \text{length}$, so the original rectangles are 10 cm long.

There is insufficient information to be able to say anything about the width - except that it is less than 10 cm.

4. Guillotine

Let AB and AD be of length b and h respectively. Then the area of $ABCD = bh$ and the area of $ABQP = \frac{1}{2}b \left(\frac{h}{2} + \frac{h}{3} \right) = \frac{5bh}{12}$.

Thus the required ratio is $\frac{5}{12}$.

5. Margins

The area of the page inside the margins is $26\text{cm} \times 36\text{cm} = 936\text{cm}^2$.

So the percentage of the page occupied by the margins is

$$\frac{264}{1200} \times 100\% = 22\%.$$

These problems are adapted from UKMT Mathematical Challenge problems (ukmt.org.uk)