

40% of a group are girls

2 girls leave & 2 boys arrive

Then 30% of the group are girls

How many girls initially?

Initially: $B + G$ is size of group

$$\frac{40}{100} \times (B + G) = G$$

$$\Rightarrow G = \frac{2}{5} (B + G) = \frac{2}{5} B + \frac{2}{5} G$$

$$\Rightarrow \frac{3}{5} G = \frac{2}{5} B$$

$$\Rightarrow 3G = 2B \Rightarrow B = \frac{3G}{2}$$

Later: $(B + 2) + (G - 2)$ is total size

$$\frac{30}{100} \times (B + G) = G - 2$$

$\underbrace{\hspace{10em}}$
group size remains unchanged

$\underbrace{\hspace{10em}}$
new number of girls

$$\Rightarrow \frac{3}{10} B + \frac{3}{10} G = G - 2$$

$$\Rightarrow \frac{3}{10} \frac{3G}{2} = \frac{7}{10} G - 2$$

$$\Rightarrow \frac{9G}{20} = \frac{14G}{20} - 2$$

$$\Rightarrow 2 = \frac{5G}{20}$$

$$\Rightarrow 40 = 5G$$

$$\Rightarrow G = 8$$