

6.4 Solving Two (Three?)-Step Equations: $a(x + b) = c$

Ex. Multiply

$$\begin{array}{lll} 5 \times 27 & 8 \times 34 & 3 \times 91 \\ = 5 \times (20 + 7) & = 8 \times (30 + 4) & = 3 \times (90 + 1) \\ = 5 \times 20 + 5 \times 7 & = 8 \times 30 + 8 \times 4 & = 3 \times 90 + 3 \times 1 \\ = 100 + 35 & = 240 + 32 & = 270 + 3 \\ = \boxed{135} & = \boxed{272} & = \boxed{273} \end{array}$$

Distribution:

$$\overbrace{\quad\quad\quad} \rightarrow a(b+c) = a \times b + a \times c$$

* also called the distributive property

Extend the idea to variable expression.

Ex. Multiply

$$\begin{array}{lll} 4(a-5) & -2(3x-1) & 6(4-g) \\ = 4 \cdot a - 4 \cdot 5 & = -2 \cdot 3x - 2 \cdot -1 & = 6 \cdot 4 - 6 \cdot g \\ = \boxed{4a - 20} & = \boxed{-6x + 2} & = \boxed{24 - 6g} \end{array}$$

Ex. Solve each equation in two different ways.

$2(g+4) = -8$

① Distribute or ② Divide first

$$\begin{array}{l} 2 \cdot g + 2 \cdot 4 \\ 2g + 8 = -8 \\ 2g - 8 = -8 \\ 2g = -16 \\ \frac{2g}{2} = \frac{-16}{2} \\ \boxed{g = -8} \end{array}$$

$$\begin{array}{l} 2(g+4) = -8 \\ \frac{2(g+4)}{2} = \frac{-8}{2} \\ g+4 = -4 \\ \frac{g+4}{-4} = \frac{-4}{-4} \\ \boxed{g = -8} \end{array}$$

$3(r-2) = 3$

$$\begin{array}{l} \frac{3(r-2)}{3} = \frac{3}{3} \\ r-2 = 1 \\ \frac{r-2}{+2} = \frac{1}{+2} \\ \boxed{r = 3} \end{array}$$

or $3(r-2) = 3$

$$\begin{array}{l} 3r - 6 = 3 \\ \frac{3r - 6}{+6} = \frac{3}{+6} \\ \frac{3r}{3} = \frac{9}{3} \\ \boxed{r = 3} \end{array}$$

$-2(x-3) = 12$

$$\begin{array}{l} -2x + 6 = 12 \\ \frac{-2x + 6}{-6} = \frac{12}{-6} \\ \frac{-2x}{-2} = \frac{-6}{-2} \end{array}$$

$$\begin{array}{l} \frac{-2x}{-2} = \frac{-6}{-2} \\ \boxed{x = -3} \end{array}$$

verify

$$\begin{array}{l} -2(-3-3) \stackrel{?}{=} 12 \\ -2(-6) \\ 12 = 12 \checkmark \end{array}$$

$-20 = -5(3+p)$

$$\begin{array}{l} \frac{-20}{-5} = \frac{-5(3+p)}{-5} \\ 4 = -3 + p \\ \boxed{1 = p} \end{array}$$

ch

$$\begin{array}{l} -20 \stackrel{?}{=} -5(3+1) \\ -20 \stackrel{?}{=} -5(4) \\ -20 = -20 \checkmark \end{array}$$

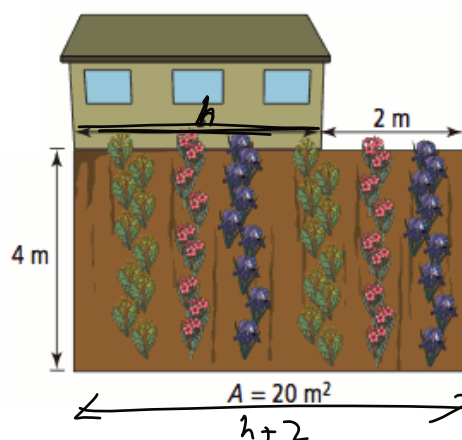
Ex. A flower garden is in the shape of a rectangle. The length of the garden is 2 m longer than the length of the shed beside it. The width of the garden is 4 m. If the area of the garden is 20 m^2 , what is the length of the shed?

Let $h = \text{shed length}$
~~width~~ $\times \text{length} = \text{area}$
 $4(h+2) = 20$

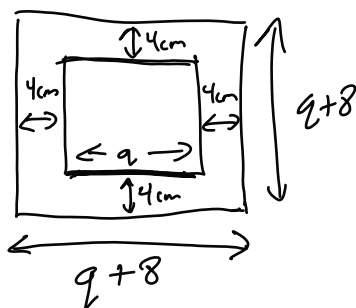
$$\begin{array}{r} h+2 \\ -2 \quad -2 \\ \hline \end{array}$$

$$h = 3$$

The shed is 3 m long



Ex. Kia plans to make a square Star Quilt for her grandmother. The quilt will have a 4-cm wide border around it. Kia wants the perimeter of the completed quilt to be 600 cm. How long should each side of the quilt be before she adds the border?



Let $q = \text{length of original side}$

$$4(q+8) = 600$$

$$\begin{array}{r} 4q + 32 \\ -32 \quad -32 \\ \hline \end{array}$$

$$\frac{4q}{4} = \frac{568}{4}$$

$$q = 142$$

The quilt, before border, should be 142 cm long.