$\boxed{\text{KEY}}$

Solving Equation Review Notes

To solve equations, we must do the opposite math operation to both sides of the equation. If it takes several steps to isolate the variable, start with addition/subtraction and then multiply/divide.

A. Solving Simple Equations and Equations with Brackets

Example 1: *Solve for x.*

$3x + 7 = 16$

$3x + \cancel{7} = 16$
$\quad\ \ \cancel{-7} \quad -7$
$\frac{\cancel{3}x}{\cancel{3}} = \frac{9}{3}$

$\boxed{x = 3}$

Practice. *Solve for the variable.*

a) $-2x + \cancel{5} = 15$
$\cancel{-5} \quad -5$ • REMOVE CONSTANT
$\frac{-\cancel{2}x}{\cancel{-2}} = \frac{10}{-2}$ • REMOVE COEFFICIENT
$\boxed{x = -5}$

b) $5z - \cancel{4} = 6$
$\cancel{+4} \quad +4$
$\frac{5z}{5} = \frac{10}{5}$
$\boxed{z = 2}$

Example 2: *Solve for x.*

$7x - 3 = 4\cancel{x} + 3$
$-4x \quad \cancel{-4x}$ • ELIMINATE X'S ON ONE SIDE
$3x - \cancel{3} = 3$
$\cancel{+3} \quad +3$ • REMOVE CONSTANT
$\frac{\cancel{3}x}{\cancel{3}} = \frac{6}{3}$ • REMOVE COEFFICIENT
$\boxed{x = 2}$

Practice. *Solve for the variable.*

a) $\cancel{y} + 7 = 3y - 9$
$\cancel{-y} \quad -y$
$7 = 2y - \cancel{9}$
$+9 \quad \cancel{+9}$
$\frac{16}{2} = \frac{\cancel{2}y}{\cancel{2}} \rightarrow \boxed{8 = y}$

b) $3r - 2 = -5\cancel{r} + 14$
$+5r \quad \cancel{+5r}$
$8r - \cancel{2} = 14$
$\cancel{+2} \quad +2$
$\frac{\cancel{8}r}{\cancel{8}} = \frac{16}{8} \rightarrow \boxed{r = 2}$

To solve equations that include brackets, eliminate the brackets (distribute) and solve as usual.

Example 3: *Solve for x.*

$-4t - (3t + 5) = 9 \rightarrow -4 + -1(3t + 5) = 9$

$-4t - 3t - 5 = 9$
$-7t - \cancel{5} = 9$
$\cancel{+5} \quad +5$
$\frac{-7t}{-7} = \frac{14}{-7}$

Practice. *Solve for the variable.*

a) $8 - 2(-3 + 2y) = -2$

$8 + 6 - 4y = -2$

$14 - 4y = -2$

$-14 \qquad -14$

$-4y = -16$

$\frac{-4y}{-4} = \frac{-16}{-4}$

$\boxed{y = 4}$

b) $6 - (x + 2) = 5$

$6 - x - 2 = 5$

$-x + 4 = 5$

$-4 \qquad -4$

$-x = 1$

$-1x = 1$

$\frac{-1x}{-1} = \frac{1}{-1}$

$\boxed{x = -1}$

B. Solving Equations with Fractions

Deal with the ***denominator*** before dealing with the numerator. Since a denominator means the same as divide, we multiply all of the terms by the lowest common multiple (LCM) of the denominators = to eliminate the denominator.

Example 7: *Solve for x.*

$12 \cdot \left(\frac{x}{4} = \frac{x}{12} + \frac{2}{3}\right) \Rightarrow \overset{3}{\cancel{12}}\left(\frac{x}{\cancel{4}}\right) = \cancel{12}\left(\frac{x}{\cancel{12}}\right) + \overset{4}{\cancel{12}}\left(\frac{2}{\cancel{3}}\right)$

$3x = x + 8$

$-x \qquad -x$

$2x = 8$

$\frac{2x}{2} = \frac{8}{2}$

$\boxed{x = 4}$

Example 8: *Solve for x.*

$\left(\frac{4x - 6}{5} = \frac{2 + 2x}{3}\right) \cdot 15$

$\Rightarrow \overset{3}{\cancel{15}}\left(\frac{4x-6}{\cancel{5}}\right) = \overset{5}{\cancel{15}}\left(\frac{2+2x}{\cancel{3}}\right)$

$3(4x - 6) = 5(2 + 2x)$

$12x - 18 = 10 + 10x$

$-10x \qquad -10x$

$2x - 18 = 10$

$+18 \qquad +18$

$\frac{2x}{2} = \frac{28}{2} \Rightarrow \boxed{x = 14}$

Practice. *Solve for the variable.*

a) $\left(\frac{x}{2} - \frac{5x}{6} = \frac{1}{9}\right) \cdot 18$

$\overset{9}{\cancel{18}}\left(\frac{x}{\cancel{2}}\right) - \overset{3}{\cancel{18}}\left(\frac{5x}{\cancel{6}}\right) = \overset{2}{\cancel{18}}\left(\frac{1}{\cancel{9}}\right)$

$9x - 15x = 2$

$\frac{-6x}{-6} = \frac{2}{-6}$

$\boxed{x = -\frac{1}{3}}$

*REDUCE FRACTIONS!

b) $15 \cdot \left(\frac{x}{3} - \frac{2x}{5} = \frac{-7}{15}\right)$

$\overset{5}{\cancel{15}}\left(\frac{x}{\cancel{3}}\right) - \overset{3}{\cancel{15}}\left(\frac{2x}{\cancel{5}}\right) = \cancel{15}\left(\frac{-7}{\cancel{15}}\right)$

$5x - 6x = -7$

$-1x = -7$

$\frac{-1x}{-1} = \frac{-7}{-1}$

$\boxed{x = +7}$

C. Rearranging Formulas

The ability to rearrange formulas or rewrite them in different ways is an important skill in both mathematics and science.

Follow the same process we have been practising the past few classes. To rearrange a formula:

1) add or subtract both sides by the same number and/or variable.
2) multiply or divide both sides by the same quantity.

Examples: Solve for the indicated variable.

a) $2 \cdot A = \frac{1}{\cancel{2}}bh \cdot \cancel{2}$ for *h*

$$\frac{2A}{b} = \frac{\cancel{b}h}{\cancel{b}} \rightarrow \boxed{\frac{2A}{b} = h}$$

b) $W = \cancel{R} + Ht$ for *H*

$$-R \quad \cancel{-R}$$

$$\frac{W-R}{t} = \frac{H\cancel{t}}{\cancel{t}} \rightarrow \boxed{\frac{W-R}{t} = H}$$

c) $SA = \cancel{\pi r^2} + \pi rs$ for *s*

$$-\pi r^2 \quad \cancel{-\pi r^2}$$

$$\frac{SA - \pi r^2}{\pi r} = \frac{\cancel{\pi r}s}{\cancel{\pi r}} \rightarrow \boxed{\frac{SA-\pi r^2}{\pi r} = s}$$

d) $C = \frac{5}{9}(F - 32)$ for *F*

$$C = \frac{5}{9}F - \cancel{\frac{160}{9}}$$

$$+\frac{160}{9} \qquad \cancel{+\frac{160}{9}}$$

$$\frac{9}{5} \cdot \left(C + \frac{160}{9}\right) = \frac{\cancel{5}}{\cancel{9}}F \cdot \frac{\cancel{9}}{\cancel{5}} \rightarrow \frac{9}{5}\left(C + \frac{160}{9}\right) = F$$

or

$$\frac{9}{5} \cdot C = \frac{\cancel{9}}{\cancel{5}} \cdot \frac{\cancel{5}}{\cancel{9}}(F - 32)$$

$$\frac{9}{5}C = F - \cancel{32}$$

$$+32 \qquad \cancel{+32}$$

$$\rightarrow \boxed{\frac{9}{5}C + 32 = F}$$

Worksheet