PRINCIPLES - LESSON 3B
SOLVING MULTI-STEP EQUATIONS

The first step to solving an equation is ALMOST ALWAYS to remove grouping symbols.

RECALL: FIVE GROUPING SYMBOLS

Parenthesis	Brackets	Braces	Absolute Value	Division Bar
( )	[ ]	{ }	| |	$\frac{1+2}{6-3}$

When several grouping symbols are used together, always work from the inside out.

REMEMBER:

- Remove all grouping symbols first.
- Work on the side of the equation that contains the variable.
- Undo each operation that has been done to the variable.
- Undo addition and subtraction before multiplication and division.
- Combine like terms whenever possible.

SOLVING EQUATIONS WITH GROUPING SYMBOLS

Solve.

ex1) $3(a+2)=21$

$3a+6=21$

$-6 \quad -6$

$\frac{3a}{3}=\frac{15}{3}$

$a=5$

ex2) $-4(-3y+2)=-20$

$12y-8=-20$

$+8 \quad +8$

$\frac{12y}{12}=\frac{-12}{12}$

$y=-1$

SOLVING EQUATIONS WITH GROUPING SYMBOLS

Solve.

ex3) $2x + 1(5x + 3) - 1(2x - 5) = 8$

$2x + 5x + 3 - 2x + 5 = 8$

$5x + 8 = 8$

$-8 \quad -8$

$\frac{5x}{5} = \frac{0}{5}$

$\boxed{x = 0}$

SOLVING EQUATIONS WITH GROUPING SYMBOLS

Solve.

ex4) $2(4r-4)+9(2r-7)=-149$

$8r-8+18r-63=-149$

$26r-71=-149$

$+71 \quad +71$

$\frac{26r}{26}=\frac{-78}{26}$

$r=-3$

SOLVING EQUATIONS WITH GROUPING SYMBOLS

Solve.

ex5) $4x - 3(2x - 1) + 7 = 15$

$4x - 6x + 3 + 7 = 15$

$-2x + 10 = 15$

$-10 \quad -10$

$\frac{-2x}{-2} = \frac{5}{-2}$

$$x = -\frac{5}{2}$$

There is no need to convert to a mixed number or to a decimal.

SOLVING EQUATIONS WITH GROUPING SYMBOLS

Solve.

ex6) $2[x+3(x-1)]=18$

Remove grouping from inside out.

$2[1x+3x-3]=18$

$2[4x-3]=18$

$8x-6=18$

$+6 \quad +6$

$\frac{8x}{8}=\frac{24}{8}$

$\boxed{x=3}$

WORD PROBLEMS INVOLVING GROUPING SYMBOLS

ex7) **Jane, Jasmine, and Jocelyn have many pairs of shoes. Jane has 3 times as many pairs as Jocelyn has. Jasmine has 2 more than twice the number Jocelyn has. Together the 3 girls have 56 pairs of shoes. How many pairs of shoes does each girl have?**

let n = number of pairs of Jocelyn's shoes

then $3n$ = number of pairs of Jane's shoes

and $2n+2$ = number of pairs of Jasmine's shoes

Jocelyn's shoes + Jane's shoes + Jasmine's shoes = 56

$$n + 3n + 2n + 2 = 56$$

$$6n + 2 = 56$$

$$-2 \quad -2$$

$$\frac{6n}{6} = \frac{54}{6}$$

$$n = 9$$

$n = 9$

$3n = 3(9) = 27$

$2n+2 = 2(9)+2 = 18+2 = 20$

Jocelyn has 9 pairs.
Jane has 27 pairs.
Jasmine has 20 pairs.