Name: NOTES KEY

Date: ____________

CHAPTER 6 NOTES – Equation Solving

Calendar of Chapter: See the 'Homework' link on the webpage

What You'll Learn:

6.V – using correct vocabulary to describe aspects of equations
6.L – strategies to add and subtract like terms
6.1 – strategies to solve simpler algebraic equations & how to do an algebraic 'check'
6.2 - how to correctly apply the distributive property & solving more complex equations
End of Notes – What is algebra used for in 'real life'?

What is the opposite of each operation?

Operation	Opposite Operation
+	
-	
x	
÷	
Squaring^2	

Why are variables (letters) used in math?

What is the difference between an expression and an equation?

6.V – Evaluating Expressions

Focus: Learn all relevant vocabulary for expressions and equations.

Warmup:

Can you match the vocabulary with the parts of the expression?

3x – 5

Variable
Constant
Coefficient
Expression

What is a **variable**?

a letter or symbol used to represent an unknown or changing value

What is a **coefficient**?

A number multiplied to a variable

Ex1
What is the coefficient for:
a) -3x
b) w
c) -y

a) $-3x$ (b) $w = 1w$ (c) $-y = -1y$

-3 1 -1

What is a **constant**?

A 'stand alone' number (with no variable multiplied to it)

How many **terms** does the 'Warmup' expression have?

2 ; $3x$ and -5

How are terms separated?
How do you use the addition & subtraction signs when separating terms?

using addition & subtraction

One of the most important ideas of the chapter:
The sign in front of a term is part of that term! ex $3x - 5$; second term is -5

Ex2

a) How many terms:
b) Put trays under each term.
c) Write each term separately
d) List all variables, coefficients, constant

3x – 6y + z - 8

(a) 4 terms

(b) $\underbrace{3x}\underbrace{-6y}\underbrace{+z}\underbrace{-8}$

(c) $3x, -6y, z, -8$

(d) vars: x, y, z
Coeff: $3, -6, 1$
Const: -8

Ex3

For each expression: Identify any
a) variable(s)
b) coefficient(s)
c) constant(s)
d) Put trays under each term
i) $2 - 7p$
ii) $3x^2 - y - 5$
iii) $x - 6b + 1$

	1) $2 - 7p$	2) $3x^2 - y - 5$	3) $x - 6b + 1$
Vars:	p	x, y	x, b
Coeff:	-7	3, -1	1, -6
Const:	2	-5	1

Find somebody across the classroom to compare answers with. Discuss any discrepancies.

NOTE:

When there is no coefficient written in front of a variable, the coefficient is 1 (or -1 if negative in front).

What is **substitution**?

Once you know the value for a variable, replace the variable with the value, using brackets.

Ex4
Evaluate for **x = -2** and **y = 3**
a) xy + 2x
b) $3x^2 - 2y - 4$

a) $xy + 2x$

$(-2)(3) + 2(-2)$
$-6 + -4$
-10

b) $3x^2 - 2y - 4$

$3(-2)^2 - 2(3) - 4$
$3(4) - 2(3) - 4$
$12 - 6 - 4$
$6 - 4 = 2$

Ex5
Here is an example of how **algebraic expressions** can be used:

Let's say you are planning an outdoor birthday party. At the grocery store, hamburgers are \$1.50 each, buns are \$0.50 each, juice is \$1.00 each, water is \$0.75 each, and the big cake you get is \$30.
Create an expression for this scenario:

$1.50x + 0.50y + 1.00z + 0.75w + 30$

Would it cost under \$100 (which is all you have to spend) if you bought 20 hamburgers, 20 buns, 15 juices, and 10 waters? Use your expression and substitute:

$1.50(20) + 0.50(20) + 1.00(15) + 0.75(10) + 30$
$30 + 10 + 15 + 7.50 + 30$
$= \$92.50$ Yes, it would cost under \$100

Ex6
Make up you own scenario and create an expression for it:

answers will vary

6.L – Like Terms

Focus: To be able to identify, count, and combine like terms.

Review:
How many terms in each expression, and what are they?
a) $2x - 3y + 7$
b) $x^2 - 6x + 4y - 1$

ACTIVITY:
Sit with a partner, get some white strips, some white squares, some coloured strips, and some coloured squares

a) $2x - 3y + 7$

3

$2x, -3y, 7$

b) $x^2 - 6x + 4y - 1$

4

$x^2, -6x, 4y, -1$

a) Make the following groups on your desk from left to right:
3 coloured strips, 4 white strips, 1 coloured strip, 2 white strips
b) Mathematicians love to abbreviate. So instead of writing **'3 coloured strips'**, how could this be abbreviated?

3c

c) Rewrite the expression from part (a) using abbreviations:

$3c + 4w + 1c + 2w$

d) Now, simplify the expression by grouping identical objects:

$4c + 6w$

You have just **combined LIKE TERMS!**
e) Why was your answer not 10? After all, 3 + 4 + 1 + 2 does equal 10.

white strips are different from coloured strips

f) Now, use the white strips and coloured strips and set up your own question similar to part (a). Then, have your partner write the question, and then write the answer using abbreviations. Then switch roles.

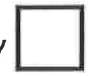
=

g) With your partner, set out 6 coloured and 5 white strips. Then take away 1 coloured and 3 white strips. Write and solve an equation for this using abbreviations.

$6c + 5w - 1c - 3w = 5c + 2w$

h) Find another partnership, and share your equations from part (g). Discuss any inconsistencies.

i) Put a white strip and a white square in front of you. We call a white strip *w* because it has area = (*w*)(1) = *w*. What is the area of a white square (what do we call a white square)?

w  w

A = W × W = W²

So, a white strip is ***w***, a white square is ***w²***, a coloured strip is ***c***, so a coloured square is C^2.

j) From left to right, set out groupings of: 3 white squares, 4 white strips, 1 white square, and 2 white strips.
k) Write the question on the left using abbreviations, and the answer on the right:

$$3w^2 + 4w + 1w^2 + 2w \quad = \quad 4w^2 + 6w$$

L) With a partner, use all four types of objects and set up a question on your desk. Then switch with another set of partners, write their question, then figure out the answer:

=

Discuss with those around you the process of identifying & combining like terms:

Identifying: like terms have the same variable(s) raised to the same exponent(s)

Combining: Add or subtract the coefficients and leave the variable(s) the same.

Ex1
Simplify
a) $3x - 4y - 2x + 2y$
b) $-9a + 2a^2 - 7a - a^2$
c) $8x - 1 + x - 7$
d) $2m + n - 6 + n - 3m$
e) $3x^2 - 4 + 2x - 3x^2 + x$
f) $xy + 2xy^2 - 4xy - x^2y$

Example 1 - Simplify

a) $3x - 4y - 2x + 2y$.
$= 1x - 2y$
$= x - 2y$

-Which terms are like terms?
-Put a 'tray' under each term, including the sign in front of the term. Use a different style tray for each different set of like terms.
-Combine like terms by adding/subtracting the coefficient but leaving the variable the same.

b) $-9a + 2a^2 - 7a - a^2$
$= -16a + 1a^2$
$= -16a + a^2$

(c) $8x - 1 + 1x - 7$
$9x - 8$

(d) $2m + 1n - 6 + 1n - 3m$
$-1m + 2n - 6$
$-m + 2n - 6$

e) $3x^2 - 4 + 2x - 3x^2 + 1x$
$3x - 4$

(f) $1xy + 2xy^2 - 4xy - x^2y$
$-3xy + 2xy^2 - x^2y$

Ex2
Write the answer from Ex1 part (d) in three different ways by rearranging the order of the terms

Ex 2
(d) $-m + 2n - 6$ | $-m - 6 + 2n$
$2n - m - 6$ | $-6 - m + 2n$
$2n - 6 - m$ | $-6 + 2n - m$

6.1A – Using Addition and Subtraction to Solve Equations
Using Division and Multiplication to Solve Equations

Focus: Solving one-step equations concretely and algebraically

Warmup:
Solve by inspection
(just by looking)

1) $x + 7 = 12$ 2) $n - 4 = 2$

$x = 5$ $n = 6$

ACTIVITY #1:

a) Let's revisit the equation we modeled the other day. Below, on the left, draw one jar and three chips. On the right, draw eight chips:

b) Using your picture, figure out how many chips are in the jar: 5

c) How could we explain this to a younger student using our picture?
remove a chip from each side (so both sides still equal) until only the jar remains on one side

d) Write an equation that represents the picture:

$x + 3 = 8$

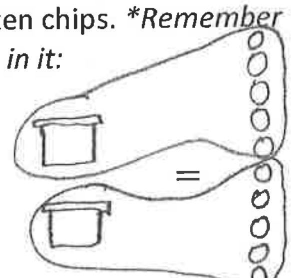
e) Now, we will solve the equation algebraically (showing all work clearly) in a manner that mimics our actions with the jar and chips:

$$x + \cancel{3} = 8$$
$$\cancel{-3} \quad -3$$
$$x = 5$$

← took 3 chips off of each side

ACTIVITY #2

a) Let's model another equation. Below, on the left, draw two jars. On the right, draw ten chips. **Remember that each jar will have the same amount of chips in it:*



b) Using your picture, figure out how many chips are in each jar: 5

c) How could we explain this to a younger student using our picture?
2 jars, so split chips into 2 groups

d) Write an equation that represents the picture: $2x = 10$

e) Now, we will solve the equation algebraically (showing all work clearly) in a manner that mimics our actions with the jar and chips:

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{10}{2}$$
$$x = 5$$

← split chips into two groups (because two jars)

Ex1

Solve the following algebraically:

a) n + 5 = 11

b) 4 + m = 6

c) 6x = 18

d) 12 = 3x

a) $n + \cancel{5} = 11$

$\cancel{-5} \quad | \quad -5$

$n = 6$

b) $+4 + m = -7$

$m + \cancel{4} = -7$

$\cancel{-4} \quad | \quad -4$

$m = -11$

c) $\frac{\cancel{6}x}{\cancel{6}} = \frac{18}{6}$

$x = 3$

d) $\frac{12}{3} = \frac{\cancel{3}x}{\cancel{3}}$

$4 = x$

What is a good way to frame equation solving in your mind?

Ask yourself these questions:

1) What is currently happening to the variable?

2) What is the opposite of that?

-- *Do the opposite to both sides!*

Ex2 – Solve each equation algebraically. Use the questions posed above for assistance.

a) m – 5 = 9

b) 10 = -3 + x

c) y – 7 = -4

d) -4n = 8

e) -18 = -p

f) $\frac{x}{2} = 4$

g) $\frac{m}{5} = -6$

h) $-4 = \frac{x}{-3}$

a) $m - \cancel{5} = 9$

$\cancel{+5} \quad | \quad +5$

$m = 14$

(b) $10 = +3 - x$

$10 = -x + \cancel{3}$

$-3 \quad | \quad \cancel{-3}$

$7 = \cancel{-1}x$

$\frac{}{-1} \quad | \quad \frac{}{\cancel{-1}}$

$-7 = x$

(c) $y - \cancel{7} = -4$

$\cancel{+7} \quad | \quad +7$

$y = 3$

(d) $\frac{\cancel{-4}n}{\cancel{-4}} = \frac{8}{-4}$

$n = -2$

(e) $\frac{-18}{-1} = \frac{\cancel{-1}p}{\cancel{-1}}$

$18 = p$

(f) $\frac{\cancel{2}x}{\cancel{2}} = 4(2)$

$x = 8$

(g) $\frac{\cancel{5}m}{\cancel{5}} = -6(5)$

$m = -30$

(h) $-4^{(-3)} = \frac{x(\cancel{-3})}{\cancel{-3}}$

$12 = x$

6.1B – Solving Equations Using More Than One Step

Focus: Applying opposite operation strategies to solve multiple-step equations.

Warmup:
Solve algebraically with work shown: $3 - w = -5$

$+3 - w = -5$

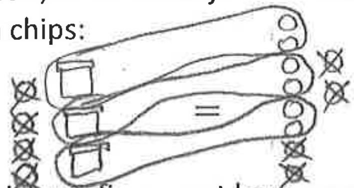
$-w + \cancel{3} = -5$
$\quad\; -3 \quad -3$

$\dfrac{-1w}{-1} = \dfrac{-8}{-1}$

$W = 8$

ACTIVITY:

a) Let's revisit the equation we modeled the other day. Below, on the left, draw three jars and four chips. On the right, draw ten chips:



b) Using your picture, figure out how many chips are in the jar: 2

c) How could we explain this to a younger student using our picture? first, cancel out all chips beside the jars. Then group the chips on the right with a jar on the left

d) Write an equation that represents the picture: $3x+4=10$

e) Now, we will solve the equation algebraically (showing all work clearly) in a manner that mimics our actions with the jar and chips:

$3x + \cancel{4} = 10$ ← take extra chips away from each side
$\quad -4 \quad -4$

$\dfrac{3x}{3} = \dfrac{6}{3}$ ← split remaining chips into 3 groups (because there are 3 jars)

$x = 2$

Why do we do the add/subtract step first?

easiest to get rid of any extra chips on the left before grouping step.

Ex1 – Solve algebraically
$5x + 7 = -18$

$5x + \cancel{7} = -18$
$\quad -7 \quad -7$

$\dfrac{\cancel{5}x}{\cancel{5}} = \dfrac{-25}{5}$

$x = -5$

What is a good way to frame two-step equation solving in your mind?

Ask yourself these questions:
1) First, are there any like terms to collect on the left side? Then on the right side? Use trays!
2) What two things are currently happening to the variable?
3) add/subtract first by doing the opposite to both sides.
4) multiply/divide step last (using opposites).

Ex2 – Solve
a) $-4x - 5 = 7$
b) $3x + 2 + 2x = 7$
c) $-24 - 1 = -2y - 7 + 4y$
d) $\frac{5x}{2} - 8 = -3$

a) $-4x - \cancel{5} = 7$
$\cancel{+5} \mid +5$
$\frac{-\cancel{4}x}{\cancel{-4}} = \frac{12}{-4}$
$x = -3$

(b) $\underbrace{3x} + \underbrace{2} + \underbrace{2x} = 7$
$5x + \cancel{2} = 7$
$\cancel{-2} \mid -2$
$\frac{\cancel{5}x}{\cancel{5}} = \frac{5}{5}$
$x = 1$

c) $\underbrace{-24 - 1} = \underbrace{-2y} - 7 + \underbrace{4y}$
$-25 = 2y - \cancel{7}$
$+7 \mid \cancel{+7}$
$\frac{-18}{2} = \frac{2y}{2}$
$-9 = y$

(d) $\frac{5x}{2} - \cancel{8} = -3$
$\cancel{+8} \mid +8$
$\frac{(\cancel{2})5x}{\cancel{2}} = 5(2)$
$\frac{\cancel{5}x}{\cancel{5}} = \frac{10}{5}$
$x = 2$

Ex3
Perform a written CHECK on Ex 2b to see if your answer is correct.

LS	RS
$3x + 2 + 2x$	7
$3(1) + 2 + 2(1)$	
$3 + 2 + 2$	
7	✓

So $x = 1$ is the answer to (b)

To check an answer to an equation, set up a 'T' table.
1) Write the original left side (LS) of the equation on the left, and the original right side (RS) of the equation on the right.
2) Substitute your answer into each variable. Use brackets.
3) Simplify the left side and simplify the right side.
4) If they are equal, your answer is correct!

6.1C – Solving Equations With Variables on Both Sides

Focus: Applying opposite operations to solve equations with variables on both sides.

Warmup:

Solve algebraically with work shown:

$3 - 4x = -25$

$+3 - 4x = -25$

$-4x + \cancel{3} = -25$

$\quad -\cancel{3} \quad -3$

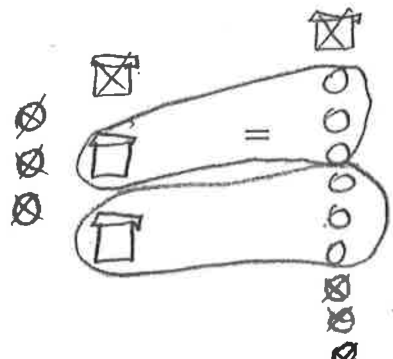
$\frac{-\cancel{4}x}{-\cancel{4}} = \frac{-28}{-4}$

$x = 7$

LS	RS
$3 - 4x$	-25
$3 - 4(7)$	
$3 - 28$	
-25 ✓	

ACTIVITY:

a) Let's revisit the equation we modeled the other day. Below, on the left, draw three jars and three chips. On the right, draw one jar and nine chips:



b) Using your picture, figure out how many chips are in the jar: 3

c) How could we explain this to a younger student using our picture? eliminate excess jars, eliminate excess chips, group remaining chips

d) Write an equation that represents the picture:

$$3x + 3 = x + 9$$

e) Now, we will solve the equation algebraically (showing all work clearly) in a manner that mimics our actions with the jar and chips:

$3x + 3 = 1\cancel{x} + 9$

$-1x \quad -\cancel{1x}$ ← cancel any jars on both sides

$2x + \cancel{3} = 9$

$\quad -\cancel{3} \quad -3$ ← cancel out excess chips

$\frac{\cancel{2}x}{\cancel{2}} = \frac{6}{2}$ ← group remaining chips into 2 groups (because 2 jars)

$x = 3$

What are the steps when the variable is on both sides?

1) First, are there any like terms to collect on the left side? Then on the right side? Use trays!
2) Get the variables to the same side. If the variable term you are moving is positive, subtract it on both sides, and visa versa
3) What two things are currently happening to the variable?
4) add/subtract first by doing the opposite to both sides.
5) multiply/divide step last (using opposites).

Ex1 – Solve

a) -8 – 2x = 3x + 5x + 2

b) 3x + 2 = -3x – 16

a) -8 – 2x = 3x + 5x + 2

$-8 - 2x = 8x + 2$

$-8x \quad -8x$

$-8 - 10x = 2$

$-10x - 8 = 2$

$+8 \quad +8$

$\frac{-10x}{-10} = \frac{10}{-10}$

$x = -1$

(b) 3x + 2 = -3x – 16

$+3x \quad +3x$

$6x + 2 = -16$

$-2 \quad -2$

$\frac{6x}{6} = \frac{-18}{6}$

$x = -3$

Ex2 – Solve

a) 4x – 7 + x = -20 – 5 - x

b) 3 + 2x = -x + 3 – 4x

Do a check for (b)

a) 4x – 7 + 1x = -20 – 5 – x

$5x - 7 = -25 - 1x$

$+1x \quad +1x$

$6x - 7 = -25$

$+7 \quad +7$

$\frac{6x}{6} = \frac{-18}{6}$

$x = -3$

(b) 3 + 2x = -1x + 3 – 4x

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

$+5x \quad +5x$

$7x + 3 = 3$

$-3 \quad -3$

$\frac{7x}{7} = \frac{0}{7}$

$x = 0$

LS	RS
$3 + 2x$	$-x + 3 - 4x$
$3 + 2(0)$	$-0 + 3 - 4(0)$
$3 + 0$	$0 + 3 - 0$
3	3

✓

6.2A – Solving Equations With Brackets using Distributive Property

Focus: Learning to solve equations that involve distributive property.

DISTRIBUTIVE PROPERTY INVESTIGATION #1:

On the right, set up 5 + 3 by drawing five open circles & three coloured circles

a) Now draw more circles in order to represent 2(5 + 3)

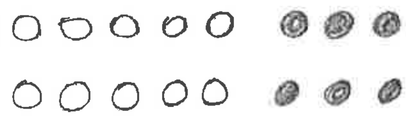
b) How many dots in total now?

c) Using BEDMAS, simplify 2(5 + 3). Does it equal your total for part (b)?

d) Now, count up the open dots, and count up the coloured dots. How many of each do you have?

e) How could we obtain the expression from part (d) using the original expression 2(5 + 3) ?

a)



b) 16

c) $2(5+3)$

$2(8)$

16

Yes

(d) 10 and 6

$= 16$

(e) $2(5+3)$

$= 2(5) + 2(3)$

$= 10 + 6$

$= 16$

f) Let's review by simplifying 2(5 + 3) by BEDMAS on the left, and simplifying 2(5 + 3) using distributive property on the right.

$2(5 + 3)$

$= 2(8)$

$= 16$

$2(5 + 3)$

$= 2(5) + 2(3)$

$= 10 + 6$

$= 16$

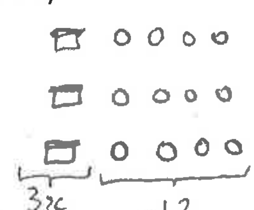
Distributive Property gives the same result as BEDMAS, as it's just another way to organize the numbers.

DISTRIBUTIVE PROPERTY INVESTIGATION #2:

If distributive property gives the same result as BEDMAS, why do we need it?

$3(x + 4)$

Simplify by BEDMAS	Simplify by distributive property
$3(x + 4)$ can't x and 4 are not like terms	$3(x + 4)$ $= 3x + 12$



Verify with pictures of chips & jars

When asked to 'Expand', it means to do distributive property.

Ex1 – Expand

a) 3(x + 2)

b) -2(x + 6)

c) – (y – 3)

a) $3(x+2)$ (b) $-2(x+6)$ (c) $-1(y-3)$

$3x+6$ $\quad$ $-2x-12$ $\quad$ $-1y+3$

$-y+3$

Ex2 – Expand & Simplify

a) 3(2x – 3) – 3(2x – 5)

b) $2(x^2 - 2x + 3) - 3(x + 4)$

a) $3(2x-3)-3(2x-5)$ (b) $2(x^2-2x+3)-3(x+4)$

$6x-9-6x+15$ $\quad$ $2x^2-4x+6-3x-12$

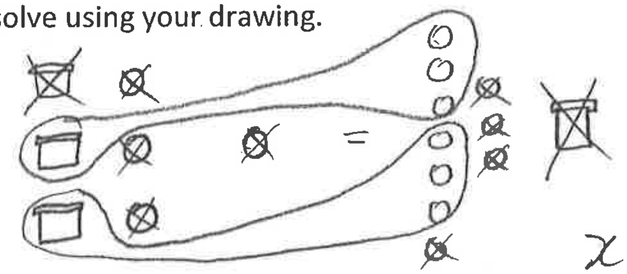
$= 6$ $\quad$ $= 2x^2-7x-6$

2.13 – Solving Equations with Brackets

Ex3 - Solve

3(x + 1) + 1 = 10 + x

Start by drawing a model of the question using jars & chips.
Then, solve using your drawing.



$x = 3$

Now, solve algebraically:

$$3(x+1)+1 = 10+x$$

$$3x+3+1 = 10+1x$$

$$3x+4 = 10+1x$$

$$-1x \qquad -1x$$

$$2x+4 = 10$$

$$-4 \qquad -4$$

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

$$\boxed{x=3}$$

What are the steps to solving equations that include brackets?

1) Expand any brackets in the equation (use distributive property).
2) Next, are there any like terms to collect on the left side? Then on the right side? Use trays!
3) Get the variables to the same side. If the variable term you are moving is positive, subtract it on both sides, and visa versa.
4) What two things are currently happening to the variable?
5) add/subtract first by doing the opposite to both sides.
6) multiply/divide step last (using opposites).

Ex4 - Solve

a) $2(x-3)-5=13-4x$

b) $4(n+7)=-44+2(n+6)$

a) $2(x-3)-5=13-4x$

$$2x-6-5=13-4x$$
$$2x-11=13-\cancel{4x}$$
$$+4x \qquad +\cancel{4x}$$
$$6x-\cancel{11}=13$$
$$+\cancel{11} \qquad +11$$
$$\frac{\cancel{6}x}{\cancel{6}}=\frac{24}{6}$$
$$x=4$$

(b) $4(n+7)=-44+2(n+6)$

$$4n+28=\underbrace{-44}+2n\underbrace{+12}$$
$$4n+28=\cancel{2n}-32$$
$$-2n \qquad -\cancel{2n}$$
$$2n+\cancel{28}=-32$$
$$-\cancel{28} \qquad -28$$
$$\frac{\cancel{2}n}{\cancel{2}}=\frac{-60}{2}$$
$$n=-30$$

Ex5 – Solve

$7(x-1)-2(x-6)=$
$2(x-5)+6$

$7(x-1)-2(x-6)=2(x-5)+6$

$$\underbrace{7x}\underbrace{-7}\underbrace{-2x}\underbrace{+12}=2x\underbrace{-10}\underbrace{+6}$$
$$5x+5=\cancel{2x}-4$$
$$-2x \qquad -\cancel{2x}$$
$$3x+\cancel{5}=-4$$
$$-\cancel{5} \qquad -5$$
$$\frac{\cancel{3}x}{\cancel{3}}=\frac{-9}{3}$$
$$x=-3$$

Do a check for Ex5

LS	RS
$7(x-1)-2(x-6)$	$2(x-5)+6$
$7(-3-1)-2(-3-6)$	$2(-3-5)+6$
$7(-4)-2(-9)$	$2(-8)+6$
$-28+18$	$-16+6$
-10	-10

✓

6.2B – Solving Equations With Fractions

Focus: Learning to solve equations that involve fractions.

Warmup:

Solve: $\frac{x}{4} = -5$

$\cancel{4}\frac{x}{\cancel{4}} = -5(4)$ $x = -20$

Ex1 – Solve

$\frac{y}{3} = \frac{2}{5}$

$\cancel{3}\frac{y}{\cancel{3}} = \frac{2}{5}(3)$ $y = \left(\frac{2}{5}\right)\left(\frac{3}{1}\right)$ $y = \frac{6}{5}$

Ex2 – Solve Ex1 using the **cross-multiply** method

$\frac{y}{3} \times \frac{2}{5}$

$5y = 3(2)$

$\frac{\cancel{5}y}{\cancel{5}} = \frac{6}{5}$

$y = \frac{6}{5}$

How does **cross-multiplying** work?

To **cross-multiply** in order to solve for a variable, there can only be one fraction on each side of the equation (and nothing else).
Step 1: Make a cross.
Step 2: Write each partners as a multiply, & set them equal to each other.
Step 3: Solve for the variable.

Ex3 – Solve

$\frac{t}{7} = -\frac{6}{21}$

put neg on top

$\frac{t}{7} \times \frac{-6}{21}$

$\frac{\cancel{21}t}{\cancel{21}} = \frac{-42}{21}$

$t = -2$

You could solve Ex3 by asking 'What is happening to *t*?', and then doing the opposite to both sides. But that is essentially what cross multiplying is, as you can see below:

$\cancel{7}\frac{t}{\cancel{7}} = \frac{-6}{21}(7) \Rightarrow t = \frac{-42}{21}$

$t = -2$

Ex4 – Solve

$\frac{3}{-4} = \frac{m}{8}$

$\frac{3}{-4} \times \frac{m}{8}$

$\frac{-\cancel{4}m}{\cancel{-4}} = \frac{24}{-4}$

$m = -6$

OR

$\frac{-3}{4} \times \frac{m}{8}$

$\frac{\cancel{4}m}{\cancel{4}} = \frac{-24}{4}$

$m = -6$

Ex5 – Solve

$$\frac{(w+2)}{5} = \frac{(w-4)}{3}$$

$$\frac{(w+2)}{5} \times \frac{(w-4)}{3}$$

$$3(w+2) = 5(w-4)$$

$$3w+6 = 5w-20$$

$$3w+6 = 5w-20$$
$$-5w \quad -5w$$
$$-2w + \cancel{6} = -20$$
$$\cancel{-6} \quad -6$$
$$\frac{-\cancel{2}w}{-\cancel{2}} = \frac{-26}{-2}$$
$$w = 13$$

When will **cross-multiply** not work?

If there is more than a single fraction on each side of the equation, you **cannot** use **cross-multiply** to get the answer.

Ex6 – Solve

$$\frac{x}{3} - \frac{3x}{2} = \frac{1}{6} - x$$

Step 1: Your goal is to **eliminate** the fractions, so that the equation is easier to solve. So, think about what **would** be the common denominator if you were to get one.
Step 2: Multiply every term by the number that **would** be the common denominator.
Step 3: This will **eliminate** all of the fractions. Now, **simplify** each term.
Step 4: Solve the resulting equation.

$$\frac{x}{3} - \frac{3x}{2} = \frac{1}{6} - x \Rightarrow$$ common denom for 2, 3, 6 would be 6

$$(6)\frac{x}{3} - (6)\frac{3x}{2} = (6)\frac{1}{6} - 1x(6)$$

$$2x - 9x = 1 - 6x$$

$$-7x = 1 - \cancel{6x}$$
$$+6x \quad +\cancel{6x}$$
$$\frac{-\cancel{1}x}{\cancel{-1}} = \frac{1}{-1}$$
$$x = -1$$

Ex7 – Solve

$$\frac{x+1}{3} - \frac{x+2}{7} = 1$$

$$\frac{(x+1)}{3} - \frac{(x+2)}{7} = 1$$ common denom would be 21

$$\frac{21(x+1)}{3} - \frac{21(x+2)}{7} = 1(21)$$

$$7(x+1) - 3(x+2) = 21$$
$$7x + 7 - 3x - 6 = 21$$
$$4x + \cancel{1} = 21$$
$$\cancel{-1} \quad -1$$

$$\frac{\cancel{4}x}{\cancel{4}} = \frac{20}{4}$$

$$x = 5$$

How is EQUATION SOLVING (ie Algebra) used in 'real life'?

A few, but not all, examples:

1) Finding out how many items or services you can purchase including or not including sales prices with the money you have.

2) Rates of change: vehicle (of all types) travel, gas consumption, time and distance, time and volume, chemical reaction rates, growth and decay, projectile motion, payment plans, interest in finances, population studies, medicine/treatment times & dosage & effects, conversions, percents

3) Scientific and Technological Formulas that help us to figure out many things – how long does it take for a satellite to orbit earth? For a text to be sent? How do we solve for Einstein's famous equation $E=mc^2$? For the force of gravity compared to the mass of the object? To program a video game? To map the folds in the brain?

And on, and on, and on....