Chapter 1

Equations and Inequalities

Section 1.1 Expression and Formulas

Variable: a letter in place of a number

Coefficient: a number multiplied to a variable

Constant: a number w/o a variable (x^0)

Algebraic Expression: a number sentence w/o an equal sign (can't be solved)

Order of Operations - PEMDAS

1. Grouping / fraction bar
2. Exponents
3. mult / divide
4. Add / Subtract.

Let's Practice...

Evaluate each expression if $a = -2$, $b = 3$, and $c = 4$.

1. $2a+(b+3)^2$

$2(-2)+(3+3)^2$

$-4+(6)^2$

$-4+36$

32

2. $a+3(b^2-(a+c))$

$(-2)+3(9-(-2+4))$

$-2+3(9-2)$

$-2+3(7)$

$-2+21$

19

3. $5c-2[(b-a)+c]$

$5(4)-2[(3+2)+4]$

$20-2(5+4)$

$20-2(9)$

$20-18$

2

Evaluate each expression if $a = -2$, $b = 3$, and $c = 4$.

4. $c(a^2 + b)$

$4(4+3)$

$4(7)$

28

5. $\dfrac{b^3 + ac}{ab + 2bc}$

$\dfrac{27 + (-2)(4)}{(-2)(3) + 2(3)(4)}$

$\dfrac{27 - 8}{-6 + 24}$

$\dfrac{19}{18}$

6. $\dfrac{9a - 2c}{4ab}$

$\dfrac{9(-2) - 2(4)}{4(-2)(3)}$

$\dfrac{-18 - 8}{-24}$

$\dfrac{-26}{-24} = \dfrac{13}{12}$

Let's practice...

A player's attack percentage ***a*** is calculated using the formula $a = \dfrac{k - e}{t}$, where ***k*** represents the number of kills, ***e*** represents the number of attack errors including blocks, and t represents the totals attacks attempted. Find the attack percentage given each set of values.

7. $k = 22$, $e = 11$, $t = 35$

$a = \dfrac{22 - 11}{35}$

$a = \dfrac{11}{35}$

$a \approx .31$

$a \approx 31\%$

8. $k = 33$, $e = 9$, $t = 50$

$a = \dfrac{33 - 9}{50}$

$a = \dfrac{24}{50}$

$a = .48$

$a = 48\%$

Section 1.2 Properties of Real Numbers

Set of Real Numbers (R)

Natural numbers (N) Countable Numbers (No 0)
$\{1, 2, 3, \ldots\}$

Whole numbers (W) includes 0 $\{0, 1, 2, 3, 4 \ldots\}$

Integers (Z) N, W, includes negative #'s $\{-2, -1, 0, 1, 2, \ldots\}$

Rational numbers (Q) N, W, Z can be written as a fraction,
$\{-2, 3/4, .\overline{3}, \sqrt{100}\}$

Irrational numbers (I) Cannot be written as a fraction,
$\{\pi, \sqrt{2}, e\}$

Property	Addition	Multiplication
Commutative	$a+b=b+a$	$ab=ba$
Associative	$(a+b)+c=a+(b+c)$	$(ab)c=a(bc)$
Identity	$a+0=a$	$a(1)=a$
Inverse	Additive Inverse $a+(-a)=0$	Multiplicative Inverse or Reciprocal $a \cdot \frac{1}{a}=1 \quad a \neq 0$
Closure	$a+b=\mathbb{R}$	$a(b)=\mathbb{R}$
Distributive	$a(b+c)=ab+ac$	

Let's practice ...

Name the sets of numbers to which each belong.

62 N, W, Z, Q, R	$\frac{5}{4}$ Q, R	$\sqrt{11}$ I	-12 Z, Q, R

Name the property illustrated by each equation.

$(6\cdot 8)\cdot 5 = 6(8\cdot 5)$	Assiative property of multiplication
$7(9-5) = 7\cdot 9 - 7\cdot 5$	Distributive
$84 + 16 = 16 + 84$	commutative property of +

The additive inverse of $\frac{4}{9}$ is $-\frac{4}{9}$, the multiplicative inverse or reciprocal is $\frac{9}{4}$.

Simplify.

$3(2x-4y)+7(8x-5)$ $6x - 12y + 56x - 5$ $61x - 17y$	$-5(8x-2y)-4(-6x-3y)$ $-40x + 10y + 24x + 12y$ $-16x + 22y$

Section 1.3 Solving Linear Equations

Equation: # Sentence w/ = Sign (can be Solved)

Sum: +

Difference: −

Product: (x) mult.

Quotient: ÷

Property	Examples
Reflexive	$a+b=a+b$
Symmetric	$a=b \quad b=a$
Transitive	if $a=b$ & $b=c$ then $a=c$
Substitution	a may be replaced $a=b$ & $b=c$ then $a=c$ by replacement.

Let's Practice...

Write an algebraic expression to represent each verbal expression.

1. the product of 12 and the sum of a number and negative 3

   $12(n+(-3))$ or $12(n-3)$

2. The difference between the product of 4 and a number and the square of the number.

   $4n-n^2$

Write a verbal sentence to represent the following: $\frac{x}{4}+8=-16$

the Sum of 8 & the Quotient of a number and four is -16.

Solve the equations.

1. $\left(\frac{2}{9}x+8=16\right)9$

$2x+72=144$

$2x=72$

$\boxed{x=36}$

2. $12x-3=4x+21$

$8x-3=21$

$8x=24$

$x=3$

3. $5(x-2)=6-(2x-1)$

$5x-10=6-2x+1$

$7x-10=7$

$7x=17$

$x=\frac{17}{7}$

4. $12\left(\frac{2}{3}x+\frac{1}{4}=x-\frac{1}{6}\right)$

$8x+3=12x-2$

$3=4x-2$

$5=4x$

$x=\frac{5}{4}$

5. Solve for q in the following equation: $\left(\frac{8r-5q}{2}=3\right)2$

$8r-5q=6$

$-5q=6-8r$

-5

$q=\frac{8r-6}{5}$

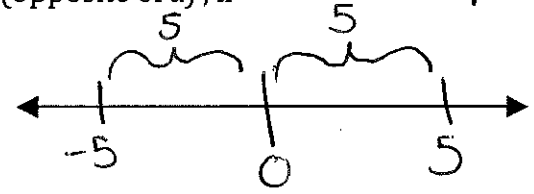
Section 1.4 Solving Absolute Value Equations

The absolute value | | of a number is the distance from 0 on a # line.

$|a| = a$, if $a \geq 0$ $\quad |3| = 3$

$|a| = -a$ (opposite of a), if $a < 0$ $\quad |-3| = 3$

$|x| = 5$



Let's Practice... **Evaluate when x = -4 and y = -9.**

a. $|4x + 3| - 7$

$|4(-4)+3|-7$

$|-16+3|-7$

$|-13|-7$

$13-7$

6

b. $-3|xy|$

$-3|-4(-9)|$

$-3|36|$

$-3 \cdot 36$

-108

c. $-2|3x+8|-4$

$-2|3(-4)+8|-4$

$-2|-12+8|-4$

$-2|-4|-4$

$-2(4)-4$

$-8-4$

-12

Solve: $|6x - 3| = 15$

$6x-3=-15$ $\quad 6x-3=15$

$6x=-12$ $\quad 6x=18$

$x=-2$ $\quad x=3$

$x = \{-2, 3\}$

Solve: $2|4x + 3| - 5 = 15$

$2|4x+3| = 20$

$|4x-3| = 10$

$4x-3=-10$ $\quad 4x-3=10$

$4x=-7$ $\quad 4x=13$

$x=\frac{-7}{4}$ $\quad x=\frac{13}{4}$

$x = \{-\frac{7}{4}, \frac{13}{4}\}$

Section 1.5 Solving Linear Inequalities

Important

Multiplying **or** dividing each side of an inequality by a **negative** number requires you to **reverse** the inequality symbol.

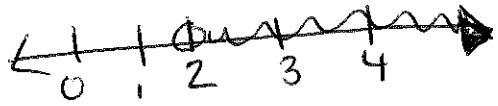
Let's practice...

Solve each inequality and graph the solution set on a number line.

a. $11y - 9 > 13$

$11y > 22$

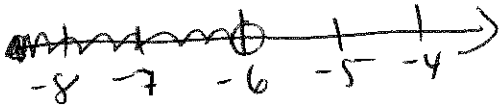
$y > 2$



b. $-4w - 13 > -21$

$-4w > 24$

$w < -6$



c. $7x + 9 \geq 10x - 12$

$9 \geq 3x - 12$

$3x - 12 \leq 9$

$3x \leq 21$

$x \leq 7$

d. $\frac{2x-9}{4} \leq x + 2$

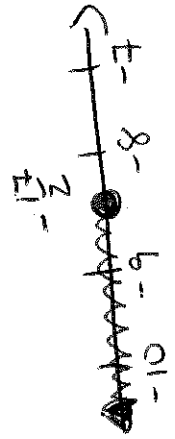
$2x - 9 \leq 4x + 8$

$-9 \leq 2x + 8$

$2x + 8 \leq -9$

$2x \leq -17$

$x \leq -\frac{17}{2}$ or -8.5



e. Tara is delivering bags of mulch. Each bag weighs 48 pounds and the push cart weighs 65 pounds. If her truck is capable of hauling 1 ton, how many bags of mulch can she safely take on each trip?

1 ton = 2000 lbs

$48m + 65 \leq 2000$

$48m \leq 1935$

$\frac{48m}{48} \leq \frac{1935}{48}$

$m \leq 40.3125$

$m \leq 40$ bags

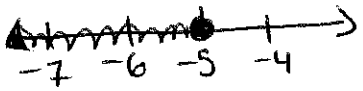
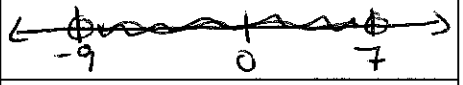
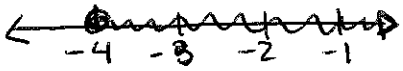
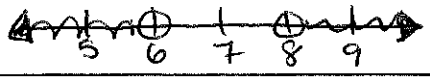
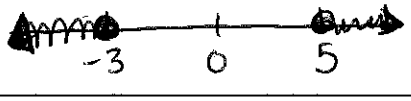
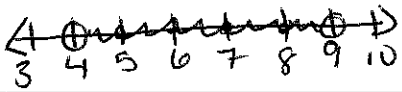
Section 1.6 Algebra Lab

Set Builder Notation vs. Interval Notation

Open circle → ( )

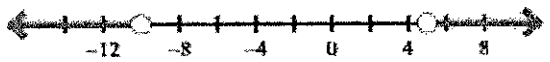
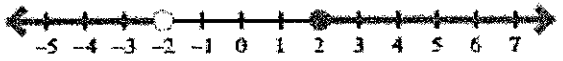
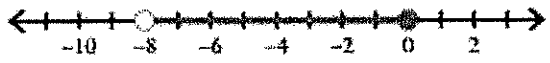
Closed circle → [ ]

If **or** is used, the union ∪ symbol is used in place of **or**.

	Set Builder Notation	Interval Notation	Graph
1.	$\{x \le -5\}$	$(-\infty, -5]$	
2.	$\{-9 < x < 7\}$	$(-9, 7)$	
3.	$\{x \ge -4\}$	$[-4, \infty)$	
4.	$\{x < 6 \text{ or } x > 8\}$	$(-\infty, 6) \cup (8, \infty)$	
5.	$\{x \le -3 \text{ or } x \ge 5\}$	$(-\infty, -3] \cup [5, \infty)$	
6.	$\{4 < x < 9\}$	$(4, 9)$	

Algebra 2
1.6 Notation Practice

Name _____

Graph	Set Notation	Interval Notation
1. 	$\{x \mid x<-10 \text{ or } x>5\}$	$(-\infty,-10) \cup (5,\infty)$
2. 	$\{x \mid 6<x<8\}$	$(6,8)$
3. 	$\{x \mid x<-2 \text{ or } x\geq 2\}$	$(-\infty,2) \cup [2,\infty)$
4. 	$\{x \mid -8<x\leq 0\}$	$(-8,0]$

Section 1.6 Solving Linear Inequalities

Important

Multiplying **or** dividing each side of an inequality by a **negative** number requires you to **reverse** the inequality symbol.

Part One: Compound Inequalities

A compound inequality consists of two inequalities w/ the same variable separated by "and" or "or".

Let's practice...

Solve each inequality and graph the solution set on a number line.

a. $-8 < 3t + 4 \leq 10$

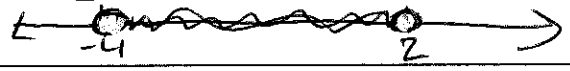
and

$-8 < 3t+4$ | $3t+4 \leq 10$

$-12 < 3t$ | $3t \leq 6$

$-4 < t$ | $t \leq 2$

$\{-4 < x \leq 2\}$



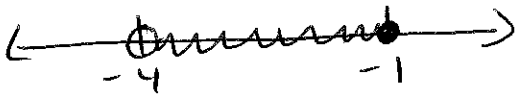
b. $-5 \geq 3x - 2 > -14$

$-3 \geq 3x > -12$

or

$-1 \geq x > -4$

$\{-4 < x \leq -1\}$

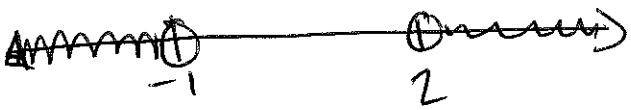


c. $-2x + 7 < 3$ or $3x + 5 < 2$

$-2x < -4$ | $3x < -3$

$x > 2$ | $x < -1$

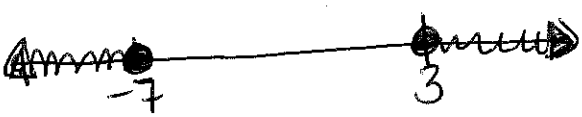
$\{x < -1$ or $x > 2\}$



d. $5x \geq 15$ *or* $-3x \geq 21$

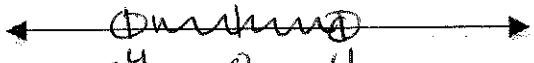
$x \geq 3$ or $x \leq -7$

$\{x \leq -7$ or $x \geq 3\}$



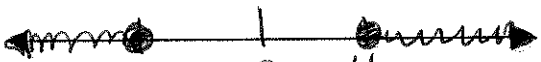
Part Two: Absolute Value Inequalities

$|x| < 4$



less than "and"

$|x| \geq 4$



great "or"

Let's practice...

Solve each absolute value inequality.

a. $|4x-7|-2>17$ "OR"

$|4x-7|>19$

$4x-7>19$ or $4x-7<-19$

$4x>26$ $\quad 4x<-12$

$x>\frac{26}{4}$ $\quad x<-3$

$\{x \mid x>\frac{13}{2}$ OR $x<-3\}$

b. $|5x-2|+3<17$ "or"

$|5x-2|<14$

$5x-2>-14$ or $5x-2<14$

$5x>-12$ $\quad 5x<16$

$x>-\frac{12}{5}$ $\quad x<\frac{16}{5}$

$\{x \mid x>-\frac{12}{5}$ OR $x<\frac{16}{5}\}$

c. $|-6b| \leq 60$ "and"

$-60 \leq -6b \leq 60$

$10 \geq b \geq -10$

$\{-10 \leq b \leq 10\}$

d. $2|4x+3|-5>15$ "and"

$2|4x+3|>20$

$|4x+3|>10$

$-10<4x+3<10$

$-13<4x<7$

$\{-\frac{13}{4}<x<\frac{7}{4}\}$