Name: Key Per:___

Day	Date	Assignment (Due the next class meeting)
Monday Tuesday	8/12/19 (A) 8/13/19 (B)	1.2 Notes: Solving Linear Equations HW: 1.2 Worksheet ?, get syllabus signed, pay lab fee $3
Wednesday Thursday	8/14/19 (A) 8/15/19 (B)	1.3 Notes: Solving Equations with Variables on Both Sides
Friday Monday	8/16/19 (A) 8/19/19 (B)	1.4 Notes: Solving Literal Equations
Tuesday Wednesday	8/20/19 (A) 8/21/19 (B)	1.5 Notes: Solving Inequalities
Thursday Friday	8/22/19 (A) 8/23/19 (B)	1.6 Notes: Solving Compound Inequalities
Monday Tuesday	8/26/19 (A) 8/27/19 (B)	1.7 Notes: Solving Absolute Value Equations
Wednesday Thursday	8/28/19 (A) 8/29/19 (B)	Ch 1 Practice Test Study! Test next class! Any late/missing HW is due next class!
Friday Tuesday	8/30/19 (A) 9/01/19 (B)	**Ch 1 Test** HW: None! ☺

NOTE: You should be prepared for daily quizzes.
Every student is expected to do every assignment for the entire unit.

Students who complete every assignment this semester will earn a 2% bonus for their semester grade.

HW reminders:

- If you cannot solve a problem, get help **before** the assignment is due.
- Missing the notes or a worksheet? Go to www.washoeschools.net/DRHSmath
- Need help? Check out Earl's website: www.mathguy.us

1.2 Notes: Solving Linear Equations

Key Vocabulary

Solving an equation:
isolate a variable

Linear Equation:
graph is a line
$y = 3x$ $y = x + 2$

Combining Like Terms: (simplify)
ex: $3x + 5x = 8x$
ex: $5a - 2b + 3a = 8a - 2b$

Distributive Property:
ex: $3(x - 6) = 3x - 18$
ex: $2x(a - b) = 2x a - 2x b$

Addition Property of Equality:
If $a = b$, then $a + c = b + c$

Subtraction Property of Equality:
If $a = b$, then $a - c = b - c$

Multiplication Property of Equality:
If $a = b$, then $a \cdot c = b \cdot c$

Division Property of Equality:
If $a = b$, then $\frac{a}{c} = \frac{b}{c}$

Examples 1 – 3: Solve for the variable in each equation.

1) $6x - 8 = 12$

$+8 \quad +8$

$\frac{6x}{6} = \frac{20}{6}$

$x = \frac{20}{6} = \boxed{\frac{10}{3}}$

2) $-3 = -2.1x + 3.3$

$-3.3 \quad -3.3$

$\frac{-6.3}{-2.1} = \frac{-2.1x}{-2.1}$

$\boxed{3 = x}$

3) $\frac{8}{11}n + 5 = -7$

$-5 \quad -5$

$\left(\frac{11}{8}\right) \cdot \frac{8}{11}n = -12 \cdot \left(\frac{11}{8}\right)$

$\boxed{n = -\frac{33}{2}}$

You try 4 – 6! Solve for the variable in each equation.

4) $\frac{4}{3}a - 1 = 1$

$+1 \quad +1$

$\left(\frac{3}{4}\right)\frac{4}{3}a = 2\left(\frac{3}{4}\right)$

$a = \frac{6}{4} = \boxed{\frac{3}{2}}$

5) $-4 = -6h - 4$

$+4 \quad +4$

$\frac{0}{-6} = \frac{-6h}{-6}$

$0 = h$

$\boxed{h = 0}$

6) $-4.4b - 3 = 17$

$+3 \quad +3$

$\frac{-4.4b}{-4.4} = \frac{20}{-4.4}$

$\boxed{b = -4.54}$

Combining Like Terms:

Like terms = terms with same variable and exponent.
Combine by + or − the coefficients.

Example 7: What is the value of a in the equation shown? $5a - 7a + 9 = 20$

$-2a + 9 = 20$
$-9 \quad -9$
$-2a = 11$
$\frac{-2a}{-2} = \frac{11}{-2}$
$a = -\frac{11}{2}$

You try #8! Solve for g in the equation shown: $25 - 5g + 8g = 7$

$25 + 3g = 7$
$-25 \quad -25$
$3g = -18$
$\frac{3g}{3} = \frac{-18}{3}$
$g = -6$

The Distributive Property:

Example 9: Solve the equation for the variable: $2(7 - 5h) = 20$.

$14 - 10h = 20$
$-14 \quad -14$
$-10h = 6$
$\frac{-10h}{-10} = \frac{6}{-10}$
$h = -\frac{6}{10} = -\frac{3}{5}$

Now solve the same equation with a different strategy! $2(7 - 5h) = 20$

$\frac{2(7-5h)}{2} = \frac{20}{2}$
$7 - 5h = 10$
$-7 \quad -7$
$-5h = 3$
$\frac{-5h}{-5} = \frac{3}{-5}$
$h = -3/5$

Example 10: What is the value of x in the equation shown? $\frac{2(x+4)}{3} - 8 = 32$

$+8 \quad +8$
$(3)\ \frac{2(x+4)}{3} = 40\ (3)$
$2(x+4) = 120$
$2x + 8 = 120$
$-8 \quad -8$
$2x = 112$
$\frac{2x}{2} = \frac{112}{2}$
$x = 56$

Solve this same equation by using a different method. $\frac{2(x+4)}{3} - 8 = 32$

$+8 \quad +8$
$\left(\frac{3}{2}\right)\ \frac{2(x+4)}{3} = 40\ \left(\frac{3}{2}\right)$
$x + 4 = 60$
$-4 \quad -4$
$x = 56$

Associative Property (of addition or multiplication):
Terms can be grouped together differently with addition or multiplication. Note: the order of the numbers is not changed.

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

Sample: $(3 \cdot 5)2 = 3(5 \cdot 2)$

Commutative Property (of addition or multiplication):
Terms that are added (or multiplied) can b written in any order.

Sample: $3 + 2 = 2 + 3$

Sample: $3 \cdot 2 = 2 \cdot 3$

Example 11: The equation below is solved step-by-step. Write the property that describes each step.

Solution	Property used
$\frac{4(3x+2)+5x}{7} = -9$	Given equation
$4(3x+2)+5x = -63$	multiplication
$12x+8+5x = -63$	distributive prop.
$12x+5x+8 = -63$	commutative prop
$17x = -71$	combine like terms & subtraction
$x = -\frac{71}{17}$	Division prop of =.

Example 12: Solve for the variable. $-\frac{1}{6}(5y+20) = -3$ (-6) (-6)

$5y + 20 = 18$
$-20 \quad -20$
$\frac{5y}{5} = \frac{-2}{5}$

$y = -2/5$

Example 13: Three friends split the cost of ordering pizza, and they each pay \$13. Which of the following equations models this situation, if p is the cost of the pizza?

A) $p = \frac{13}{3}$
B) $3p = 13$
C) $\frac{13}{p} = 3$
D) $\frac{p}{3} = 13$

You try #14: Trevor hires a landscaping company in order to xeriscape his yard. The company charges \$800 per day, plus \$120 per hour for labor. The job takes the company 3 days to complete, and the total charge was \$4560. Which equation below correctly models this situation, if h is the number of hours of labor needed to complete the job?

A) $120h + 800 = 4560$
B) $120h + 2400 = 4560$
C) $800h + 120 = 4560$
D) $800h + 360 = 4560$

Example 15: Four friends use an online code to get discounts on concert tickets. They spent \$312 for the four tickets.

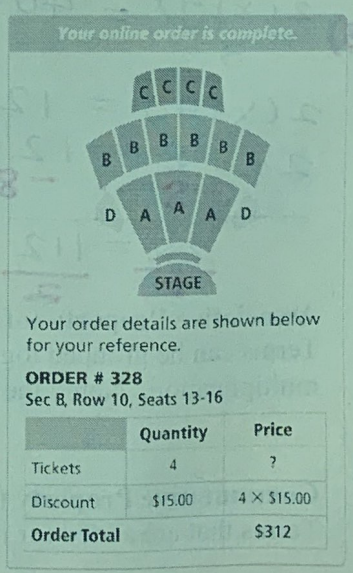
Part A: Which of the following equations models this situation for the cost T of the tickets, without the discount?

Option 1: $4T + 15 = 312$
Option 2: $4T - 15 = 312$
Option 3: $4T + 60 = 312$
Option 4: $4T - 60 = 312$

Part B: What was the price of one ticket, T, without the discount?

$4T - 60 = 312$
$+60 \quad +60$
$\frac{4T}{4} = \frac{372}{4}$

$T = 93$



1.3 Notes: Solving Equations with Variables on Both Sides

Warm-up:

1) Find x: $15 - 2(x - 4) = 31$

$-15 \quad -15$

$-2(x-4) = 16$

$\frac{-2}{} \quad \frac{16}{-2}$

$x - 4 = -8$

$+4 \quad +4$

$x = -4$

2) Find x: $\frac{1}{4}(2x - 3) = 8$ $\cdot 4$

$2x - 3 = 32$

$+3 \quad +3$

$\frac{2x}{2} = \frac{35}{2}$

$x = 35/2$

Solving Equations with the Same Variable on Both Sides

1. Simplify by combining like terms
2. Group variables on one side and constants on the other.
3. Isolate the variable.

Examples 1 – 4: Solve for the variable.

1) $5n - 8 = -6n + 30$

$+6n \quad +6n$

$11n - 8 = 30$

$+8 \quad +8$

$\frac{11n}{11} = \frac{38}{11}$

$n = \frac{38}{11}$

2) You try! $50 - 2a = 34 + 16a$

$+2a \quad +2a$

$50 = 34 + 18a$

$-34 \quad -34$

$\frac{16}{18} = \frac{18a}{18}$

$a = \frac{16}{18} = \frac{8}{9}$

3) $20g + 31 - 24g = 16 - g$

$-4g + 31 = 16 - g$

$+4g \quad +4g$

$31 = 16 + 3g$

$-16 \quad -16$

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

$g = 5$

4) You try! $13 + 7b = 4b + 6 - 12b$

$13 + 7b = -8b + 6$

$+8b \quad +8b$

$13 + 15b = 6$

$-13 \quad -13$

$\frac{15b}{15} = \frac{-7}{15}$

$b = -7/15$

Example 5: Solve for b:

$$5b - 3(2b + 1.8) = -6b + 9$$

$5b - 6b - 5.4 = -6b + 9$

$-b - 5.4 = -6b + 9$

$+6b \quad +6b$

$5b - 5.4 = 9$

$+5.4 \quad +5.4$

$\frac{5b}{5} = \frac{14.4}{5}$ $\quad b = 2.88$

Example 6: You try! Solve for w:

$$6 - 3(2 - 4w) + 8w = 12w - 1$$

$6 - 6 + 12w + 8w = 12w - 1$

$0 \quad 20w = 12w - 1$

$-12w \quad -12w$

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

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

Example 7: Solve for x:

$$(4)\left[-\frac{3}{4}(3x - 5)\right] = \left[\frac{5}{4}(2x + 19)\right](4)$$

$-3(3x - 5) = 5(2x + 19)$

$-9x + 15 = 10x + 95$

$+9x \quad +9x$

$15 = 19x + 95$

$-95 \quad -95$

$\frac{-80}{19} = \frac{19x}{19}$ $\quad x = -4.2$

Example 8: You try! Solve for the variable:

$$(5)\left[\frac{1}{5}(2 - 7k)\right] = \left[-2(4k + 3)\right](5)$$

$2 - 7k = -10(4k + 3)$

$2 - 7k = -40k - 30$

$+40k \quad +40k$

$2 + 33k = -30$

$-2 \quad -2$

$33k = -32$

$k = -\frac{32}{33}$

Example 9: Solve for y: $(7)\left[\frac{3}{7}(5y - 21)\right] = [2(3 - 4y) - 5](7)$

$3(5y - 21) = 14(3 - 4y) - 35$

$15y - 63 = 42 - 56y - 35$

$15y - 63 = -56y + 7$

$+56y \quad +56y$

$71y - 63 = 7$

$+63 \quad +63$

$\frac{71y}{71} = \frac{70}{71}$ $\quad y = \frac{70}{71}$

Exploration: Solve for x: $4x + 6 = 2(2x + 3)$

$4x + 6 = 4x + 6$

$-4x \quad -4x$

$6 = 6$

What do you think this means? All values of x will satisfy the equation!

Vocabulary terms:

Identity:
An equation that is true for all values of the variable.

ex $2x + 3 = 2x + 3$

No Solution:
There is no value of x that makes the equation true.

ex $2x + 5 = 2x + 8$

Example 10: Solve for h: $5(7+2g) = 3g + 18 + 7g$

$35 + 10g = 10g + 18$

$-10g \quad -10g$

$35 \neq 18$ false!

NO solution

Example 10: Which of the following equations has no solution? Choose all that apply.

A) $6x - 7 = 4x + 10 - 17 + 2x$

$6x - 7 = 6x - 7$

B) $3x - 2(5x + 4) = -7x + 1$

$3x - 10x - 8 = -7x + 1$

$-7x - 8 = -7x + 1$

$-8 \neq 1$

NO solution

C) $8x + 5 = 8x + 2$

$-8x \quad -8x$

$5 \neq 2$

NO solution

D) $3x - 9 = 3(x - 3)$

$3x - 9 = 3x - 9$

Example 11: Sarah has a gift card worth \$60 that loses \$3 each month that it isn't used. Max has a gift card worth \$50 that loses \$2 each month that it isn't used. After how many months will they be worth the same amount?

Let x = # of months

Sarah: $60 - 3x$

max: $50 - 2x$

$60 - 3x = 50 - 2x$

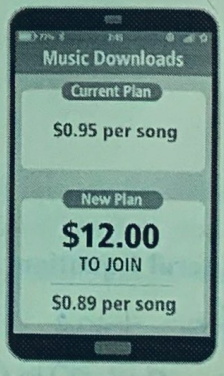
$+3x \quad +3x$

$60 = 50 + x$

$-50 \quad -50$

$10 = x$

Example 12: Cameron pays \$0.95 per song with his current music service. A new music service charges \$0.89 per song plus a joining fee of \$12. At how many songs will both services charge the same amount?



Let x = # of songs

Cameron: $0.95x$

Service: $0.89x + 12$

$0.95x = 0.89x + 12$

$-0.89x \quad -0.89x$

$\frac{0.06x}{0.06} = \frac{12}{0.06} \rightarrow x = 200$

1.4 Notes: Literal Equations and Formulas

Warm-up:

1) Find x: $3\cdot\left[1-\frac{2}{3}(x-5)\right]=(2)3$

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

$3-2x+10=6$

$-2x+13=6$

$-2x=-7$

$\frac{-2x}{-2}=\frac{-7}{-2}$

$x=7/2$

2) Find x: $5(2x+3)+7x=6x+10-4x$

$10x+15+7x=2x+10$

$17x+15=2x+10$

$-2x \quad -2x$

$15x+15=10$

$-15 \quad -15$

$15x=-5$

$x=-1/3$

3) Explain the difference between an equation with no solution and an equation that is an identity. How do you know which is which?

Literal Equation: use properties of equality to solve for the indicated variable. Answer may not be a number.

For Examples 1 – 6, solve for the requested variable.

1) $A = bh$; solve for h

$\frac{A}{h} = \frac{bh}{h}$

$b = \frac{A}{h}$

2) $5a + 2b = 40$; solve for a

$-2b \quad -2b$

$\frac{5a}{5} = \frac{40}{5} - \frac{2b}{5}$

$a = 8 - \frac{2}{5}b$

3) $V = \frac{1}{3}lwh$; solve for w.

$3(V) = \left(\frac{1}{3}lwh\right)3$

$\frac{3V}{lh} = \frac{l \cdot w \cdot h}{l \cdot h}$

$w = \frac{3V}{lh}$

You try!

4) $V = \frac{1}{3}Bh$; solve for B.

$3 \cdot (V) = \left(\frac{1}{3}Bh\right)3$

$\frac{3V}{h} = \frac{Bh}{h}$

$B = \frac{3V}{h}$

5) $SA = 6lw$; solve for l.

$\frac{SA}{6w} = \frac{6lw}{6w}$

$l = \frac{SA}{6w}$

6) $3x + 2y = 12$; solve for y.

$-3x \quad -3x$

$\frac{2y}{2} = \frac{12}{2} - \frac{3x}{2}$

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

Example 7: Janet wants to calculate the time it takes to earn a certain amount of interest on a principle amount in an investment with simple interest. If the formula for simple interest is $I = prt$, then what formula could she use to solve for time t?

$\frac{I}{pr} = \frac{p \cdot r \cdot t}{p \cdot r}$

$t = \frac{I}{pr}$

Example 8: Rob is an electrical engineer who works with lots of wires. He needs to calculate the length of the wire L (in meters) using the electrical resistance R of the wires (in ohms), the resistivity ρ (in ohm meters), and the area of the wire A (in square cm). The formula for electrical resistance is $R = \frac{\rho L}{A}$. What equation can he use to solve for the length of the wire?

$(A) \cdot R = \frac{\rho L}{A} \cdot (A)$

$\frac{AR}{\rho} = \frac{\rho L}{\rho} \rightarrow L = \frac{AR}{\rho}$

Example 9: In a half hour, Sarah is meeting her friends at the lake, which is 6 mi from her house. At what average speed must she ride her bike to get there on time, if $d = rt$, where d is distance, r is rate, and t is time in hours?

(rate) $\frac{d=rt}{t \quad t}$

$\frac{d}{t} = r$

$r = \frac{6\text{ mi}}{0.5\text{ hr}}$

$r = 12\text{ mi/hr}$

Example 10: The formula for the area of a trapezoid is $A = \frac{1}{2}h(b_1 + b_2)$. Solve the equation for the height h. Then find the height of the trapezoid if its area A is 50 square cm, and the bases b_1 and b_2 are 6 cm and 12 cm.

$(2)[A] = [\frac{1}{2}h(b_1 + b_2)](2)$

$\frac{2A}{b_1+b_2} = \frac{h(b_1+b_2)}{b_1+b_2}$

$h = \frac{2A}{b_1 + b_2}$

$h = \frac{2(50)}{6+12} = \frac{100}{18}$

$h = 5.5\text{ cm}$

Example 11: According to Teo's bread recipe, he should bake the bread at 190°C for 30 minutes. His oven measures temperatures in °F. To what temperature in °F should he set his oven? Note: use $C = \frac{5}{9}(F - 32)$ where C is degrees in Celsius and F is degrees in Fahrenheit.

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

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

$+32 \quad +32$

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

$F = \frac{9}{5}(190) + 32$

$F = 374°$

Example 12: Given the equation: $A = \frac{1}{2}h(b_1 + b_2)$. Which of the following shows the correct solution for b_1? Choose all that apply.

A) $\frac{2A}{h} - b_2$

B) $\frac{2A-hb_2}{h}$

C) $\frac{A}{2h} + b_2$

D) $\frac{A-b_2}{2h}$

$2 \cdot A = \frac{1}{2}h(b_1 + b_2) \cdot 2$

$2A = h(b_1 + b_2)$

$2A = hb_1 + hb_2$

$-hb_2 \quad -hb_2$

$\frac{2A-hb_2}{h} = \frac{h \cdot b_1}{h}$

$\frac{2A}{h} - \frac{hb_2}{h} = b_1$

$\frac{2A}{h} - b_2 = b_1$

1.5 Notes: Solving Inequalities in One Variable

Warm-up:

1) Solve for a: $\frac{2}{3}(a-4)=\frac{4}{5}(2+3a)$ $\cdot 15$

$5 \cdot 2(a-4) = 3 \cdot 4(2+3a)$

$10(a-4) = 12(2+3a)$

$10a - 40 = 24 + 36a$

$-10a \quad -10a$

$-40 = 24 + 26a$

$-24 \quad -24$

$\frac{-64}{26} = \frac{26a}{26}$

$a = -\frac{64}{26} = \boxed{\frac{-32}{13}}$

2) Solve for b, in terms of a: $3ab - 2 = 8$

$+2 \quad +2$

$\frac{3ab}{3a} = \frac{10}{3a}$

$\boxed{b = \frac{10}{3a}}$

Exploration: Consider each inequality below. Find as many values for x as possible that would make each statement true.

A) $x < -3$

$-2, -4, -10, -15$

B) $x \geq 2.4$

$2.6, 3, 7, 19, 20$

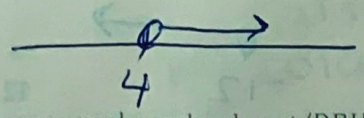
Examples 1 – 3: Solve each inequality for the variable. Then graph the solution set.

1) $3a - 5 > 7$

$+5 \quad +5$

$\frac{3a}{3} > \frac{12}{3}$

$\boxed{a > 4}$



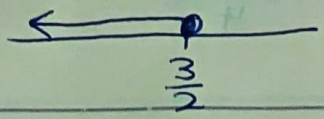
2) $4 \geq 2x + 1$

$-1 \quad -1$

$\frac{3}{2} \geq \frac{2x}{2}$

$\frac{3}{2} \geq x$

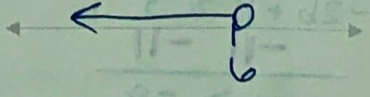
$\boxed{x \leq \frac{3}{2}}$



$\left(\frac{3}{2}\right)\frac{2}{3}b < -4\left(\frac{3}{2}\right)$

$b < \frac{-12}{2}$

$\boxed{b < 6}$



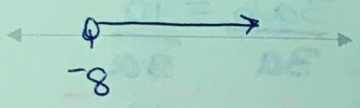
You Try! #4 – 6: Solve each inequality for the variable. Then graph the solution set.

1) $\frac{1}{4}a - 1 > -3$

$+1 \quad +1$

$4 \cdot \frac{1}{4}a > -2 \cdot 4$

$a > -8$

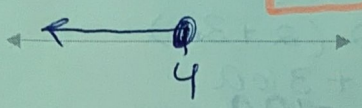


2) $4 \geq 4x - 12$

$+12 \quad +12$

$\frac{16}{4} \geq \frac{4x}{4} \rightarrow 4 \geq x$

$x \leq 4$

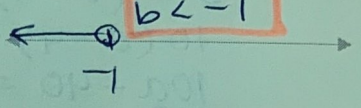


3) $6b + 2 < -4$

$-2 \quad -2$

$\frac{6b}{6} < \frac{-6}{6}$

$b < -1$



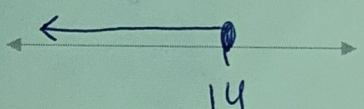
Example 7: Grace's mom told her she could spend up to \$25 at the movie theater. Her ticket cost \$11.00. Which inequality below correctly models this situation, if Grace spends d dollars? This graph the solution set.

A) $d + 11 < 25$
B) $d - 11 \leq 25$
C) $d + 11 \leq 25$
E) $d - 11 < 25$

$d + 11 \leq 25$

$-11 \quad -11$

$d \leq 14$



Multiplying or Dividing Both Sides of an Inequality by a Negative

The direction of the inequality symbol is reversed when both sides ~~of equation~~ are multiplied or divided by a negative value.

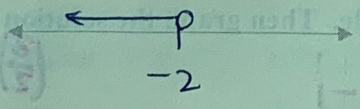
Examples 8 – 11: Solve for the variable. Graph the solution on the provided number line.

8) $-5n + 3 > 13$

$-3 \quad -3$

$\frac{-5n}{-5} > \frac{10}{-5}$

$n < -2$



9) $4x + 8 \leq 7x + 3$

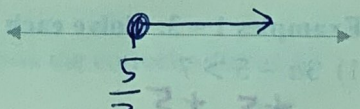
$-7x \quad -7x$

$-3x + 8 \leq 3$

$-8 \quad -8$

$\frac{-3x}{-3} \leq \frac{-5}{-3}$

$x \geq \frac{5}{3}$



You try #10 – 11!

10) $7b + 11 \geq 9b + 3$

$-9b \quad -9b$

$-2b + 11 \geq 3$

$-11 \quad -11$

$\frac{-2b}{-2} \geq \frac{-8}{-2}$

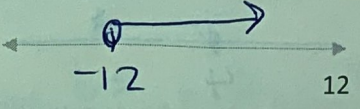
$b \leq 4$

11) $-\frac{d}{2} + 3 < 9$

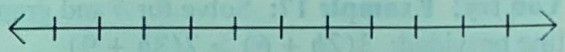
$-3 \quad -3$

$(-2) \cdot -\frac{d}{2} < 6 \cdot (-2)$

$d > -12$



Example 12: Solve for x and graph the solution on the number line provided: $-5x + 3(2x + 8) - 12 < 22$



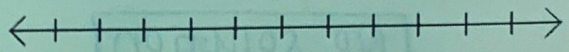
$-5x+6x+24-12<22$

$x+12<22$

$-12 \quad -12$

$x<10$

You try! 13) Solve for the variable and graph the solution on the number line. $3 - 2(5a - 1) < 7a + 10$



$3-10a+2<7a+10$

$-10a+5<7a+10$

$-7a \quad -7a$

$-17a+5<10$

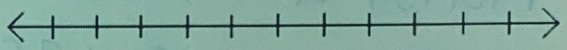
$-5 \quad -5$

$-17a<5$

$-17 \quad -17$

$a > -\frac{5}{17}$ Flip the sign!

Example 14) Solve for x and graph the solution on the number line provided: $\frac{5x-3}{6} \leq 4$



$\cdot 6 \quad \cdot 6$

$5x-3 \leq 24$

$+3 \quad +3$

$\frac{5x}{5} \leq \frac{27}{5}$

$x \leq \frac{27}{5}$

Example 15: Solve for b and graph the solution on the number line provided: $4(2b + 8) < 4(2b - 3)$

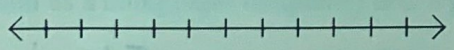
$8b+32<8b-12$

$-8b \quad -8b$

$32 < -12$

False!

NO solution



Example 16: Solve for h and graph the solution on the number line provided: $4(h - 1) \geq 2(2h - 2)$

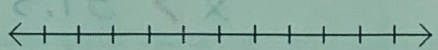
$4h-4 \geq 4h-4$

$-4h \quad -4h$

$-4 \geq -4$

True!

Infinitely many

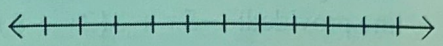


Infinitely Many Solutions versus No Solution

The variable is eliminated and the resulting inequality is:

- False → NO solution
- True → Infinitely many solutions

You try! Example 17: Solve for h and graph the solution on the number line provided: $3(2h + 6) > 2(3h + 9)$



$6h + 18 > 6h + 18$

$-6h \quad -6h$

$18 > 18$

False!

NO solution

Example 18: Derek wants to order some roses online. For what number of roses is it less expensive to order from Florist A? Florist B?

Florist A: $4.75 per blue rose plus $40 delivery charge.

Florist B: $5.15 per red rose plus $25 delivery charge.

Let x = # of roses

Florist A: $4.75x + 40$

Florist B: $5.15x + 25$

$4.75x + 40 < 5.15x + 25$

$-5.15x \quad -5.15x$

$-0.4x + 40 < 25$

$-40 \quad -40$

$\frac{-0.4x}{-0.4} < \frac{-15}{-0.4}$ flip the sign!

$x > 37.5$

If Derek buys 38 roses or more, then Florist A is less expensive.

If Derek buys 37 or fewer, then florist B is ~~more~~ less expensive.

1.6 Notes: Solving Compound Inequalities

Warm-up:
Sarah said the solution for the equation below is $x > 3$. Describe her mistake in words. What is the correct solution?

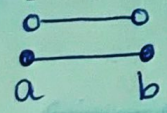
$-5(x-2) > -5$
$-5x + 10 > -5$
$-5x > -15$
$x > 3$

Didn't reverse sign when dividing by a negative.

Correct: $x < 3$

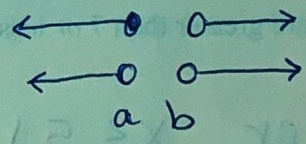
Compound Inequalities:

"And" $a < x < b$ or $a \leq x \leq b$



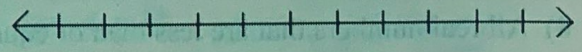
"Or" $x \leq a$ or $x > b$

$x < a$ or $x > b$



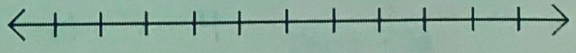
Explore:
Part A) Write down all numbers that you can think of that are less than 4 and greater than -2. Then express this solution as a compound inequality and a graph on a number line.

$-2 < x < 4$

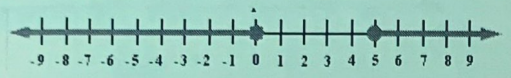


Part B) Write down all numbers that you can think of that are less than -2 or greater than 4. Then express this solution as a compound inequality and a graph on a number line.

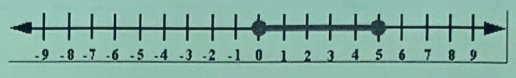
$x < -2$ or $x > 4$



Examples 1 – 4: For each graph below, write a compound inequality.

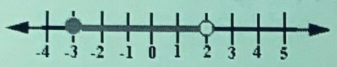
1) 

$x \leq 0$ or $x \geq 5$

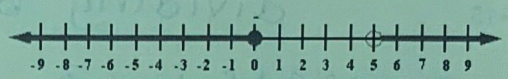
2) 

$0 \leq x \leq 5$

You try!

3) 

$-3 \leq x < 2$

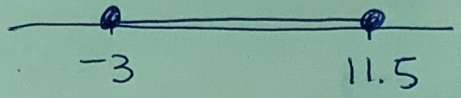
4) 

$x \leq 0$ or $x > 5$

Examples 5 – 6: Translate the verbal phrase into an inequality. Then graph the inequality.

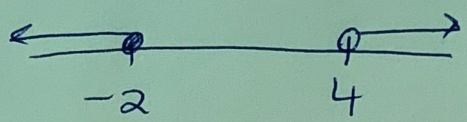
5) All real numbers that are less than or equal to 11.5 *and* greater than or equal to -3.

$-3 \leq x \leq 11.5$



6) All real numbers that are greater than 4 *or* less than or equal to –2.

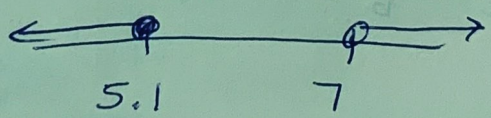
$x > 4$ or $x \leq -2$



You try! Examples 7 – 8: Translate the verbal phrase into an inequality. Then graph the inequality.

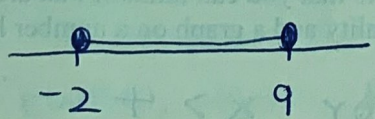
7) All real numbers that are greater than 7 *or* less than or equal to 5.1.

$x > 7$ or $x \leq 5.1$



8) All real numbers that are less than or equal to 9 *and* greater than or equal to -2.

$-2 \leq x \leq 9$



Examples 9 – 14: Solve and graph each compound inequality.

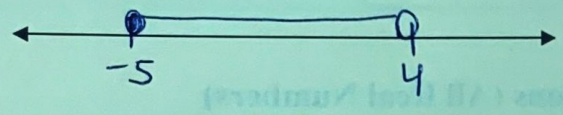
9) $-1 \le 9 + 2n < 17$

$-9 \quad -9 \quad -9$

$-10 \le 2n < 8$

$\frac{-10}{2} \le \frac{2n}{2} < \frac{8}{2}$

$-5 \le n < 4$

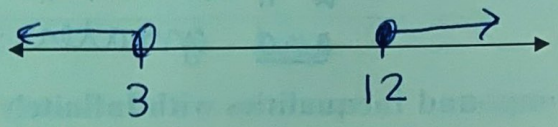


10) $2x + 4 < 10$ or $\frac{x}{2} - 3 \ge 3$

$-4 \quad -4 \qquad +3 \quad +3$

$\frac{2x}{2} < \frac{6}{2} \qquad 2 \cdot \frac{x}{2} \ge 6 \cdot 2$

$x < 3$ OR $x \ge 12$



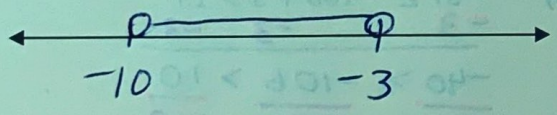
You try #11 and 12!

11) $-36 < 3p - 6 < -15$

$+6 \quad +6 \quad +6$

$\frac{-30}{3} < \frac{3p}{3} < \frac{-9}{3}$

$-10 < p < -3$

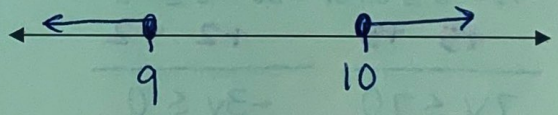


12) $2n + 7 \ge 27$ or $3 + 3n \le 30$

$-7 \quad -7 \qquad -3 \quad -3$

$\frac{2n}{2} \ge \frac{20}{2} \qquad \frac{3n}{3} \le \frac{27}{3}$

$n \ge 10$ OR $n \le 9$



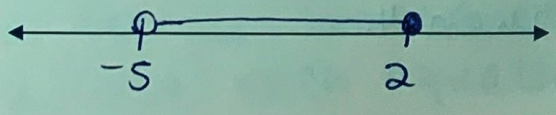
13) $-1 + 5n > -26$ and $7n - 2 \le 12$

$+1 \quad +1 \qquad +2 \quad +2$

$\frac{5n}{5} > \frac{-25}{5} \qquad \frac{7n}{7} \le \frac{14}{7}$

$n > -5$ and $n \le 2$

$-5 < n \le 2$



14) $6 + 7m < 6m - 5$ or $3m - 7 < 5 + 6m$

$-6m \quad -6m \qquad -3m \quad -3m$

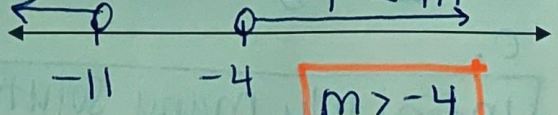
$6 + m < -5 \qquad -7 < 5 + 3m$

$-6 \quad -6 \qquad -5 \quad -5$

$m < -11 \qquad -12 < 3m$

$\frac{-12}{3} < \frac{3m}{3}$

$-4 < m$

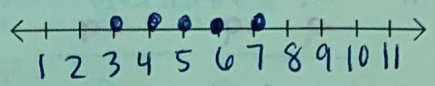


$m > -4$

Explore:

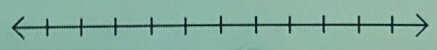
Part A: Write down as many numbers as you can that are less than 8 or greater than 2. Then draw a graph to represent the solution.

6, 5, 4, 3, 7



Part B: Write down as many numbers as you can that are less than 2 and greater than 8. Then draw a graph to represent the solution.

a # cannot be less than 2 and greater than 8



Compound Inequalities with Infinitely Many Solutions (All Real Numbers)

Compound Inequalities with No Solution

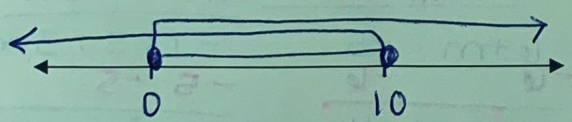
Examples 15 – 16: Solve each compound inequality, and graph its solution.

15) $7v - 5 \leq 65$ or $-3v - 2 \leq -2$

$+5 \quad +5 \qquad +2 \quad +2$

$\frac{7v}{7} \leq \frac{70}{7} \qquad \frac{-3v}{-3} \leq \frac{0}{-3}$

$v \leq 10$ OR $v \geq 0$



All #'s are less than 10 OR greater than 0.

Infinitely many solutions

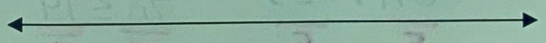
16) $-37 \geq -10b + 3 > 13$

$-3 \qquad -3 \quad -3$

$\frac{-40}{-10} \geq \frac{-10b}{-10} > \frac{10}{-10}$

$4 \leq b < -1$

NO solution



a # cannot be less than -1 and greater than 4.

1.7 Notes: Solving Absolute Value Equations

Warm-up:

1) How far is the number 13 from 0? How far is -13 from 0?

They are both 13 units from 0.

2) $|-5|$ means the "absolute value of -5", which is 5. What is the value of $|5|$?

5

Absolute Value:

The distance from 0 to a number.

Turns everything positive.

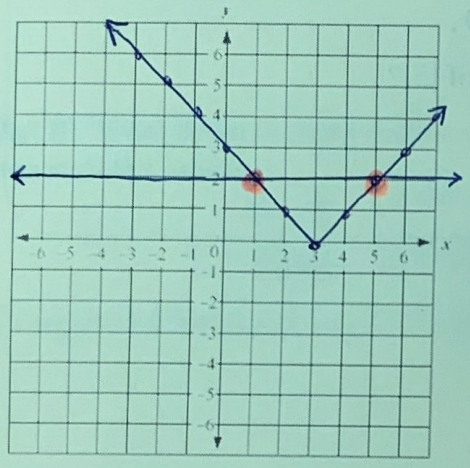
Solving Absolute Value Equations:

$|ax+b| = c$

1. Isolate the absolute value
2. Set up two equations $ax+b=c$ & $ax+b=-c$
3. Solve each equation

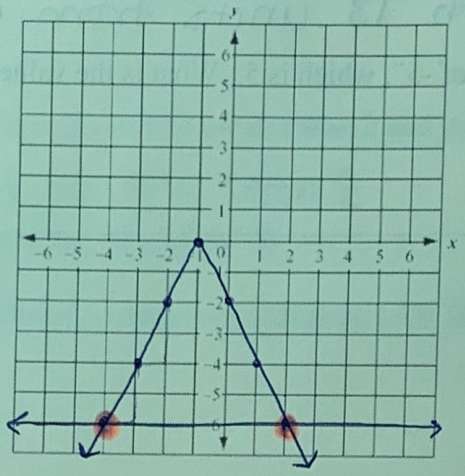
Explore: Your teacher will graph the following absolute value equations on Desmos. Sketch each graph and solution below.

A) $|x-3|=2$



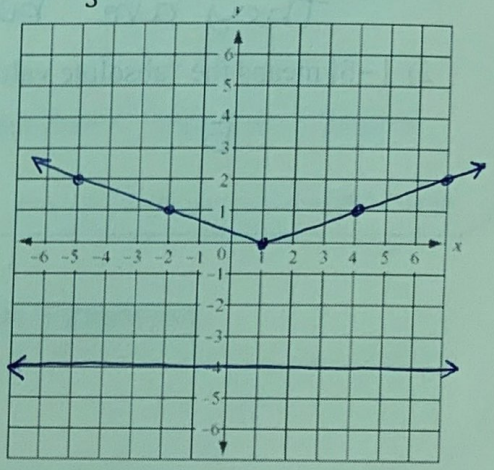
Solution(s): $x=1, x=5$

B) $-2|x+1|=-6$



Solution(s): $x=-4, x=2$

C) $\frac{1}{3}|x-1|=-4$



Solution(s): None

Examples 1 – 3: Solve for x in each equation below.

1) $|x|=6$

$x=6, x=-6$

2) $|4x-3|=6$

$4x-3=6$ $\quad$ $4x-3=-6$

$+3\ +3$ $\quad$ $+3\ +3$

$\frac{4x}{4}=\frac{9}{4}$ $\quad$ $\frac{4x}{4}=\frac{-3}{4}$

$x=\frac{9}{4}$ $\quad$ $x=-3/4$

3) $|x|-3=6$

$+3\ +3$

$|x|=9$

$x=9 \quad x=-9$

You try! Examples 4 – 5: Solve for x in each equation below.

4) $|x|=10$

$x=10, x=-10$

5) $|3x+1|=16$

$3x+1=16$ $\quad$ $3x+1=-16$

$-1\ -1$ $\quad$ $-1\ \ -1$

$\frac{3x}{3}=\frac{15}{3}$ $\quad$ $\frac{3x}{3}=\frac{-17}{3}$

$x=5$ $\quad$ $x=\frac{-17}{3}$

Examples 6 – 8: Solve for x in each equation below.

6) $\frac{3|x|}{3}=\frac{6}{3}$

$|x|=2$

$x=2 \quad x=-2$

7) $\frac{3|x+2|}{3}=\frac{6}{3}$

$|x+2|=2$

$x+2=2$ $\quad$ $x+2=-2$

$-2\ -2$ $\quad$ $-2\ \ -2$

$x=0$ $\quad$ $x=-4$

8) $3|x|+2=6$

$-2\ \ -2$

$\frac{3|x|}{3}=\frac{4}{3}$

$|x|=\frac{4}{3}$

$x=\frac{4}{3} \quad x=-\frac{4}{3}$

You try! Examples 9 – 10: Solve for x in each equation below.

9) $5|x| - 1 = 9$

$+1 \quad +1$

$5|x| = 10$

$\frac{5}{5} \quad \frac{10}{5}$

$|x| = 2$

$x = 2 \quad x = -2$

10) $\frac{1}{5}|x| - 4 = 2$

$+4 \quad +4$

$5 \cdot \frac{1}{5}|x| = 6 \cdot 5$

$|x| = 30$

$x = 30 \quad x = -30$

Absolute Value Equations with No Solution

The absolute value of a # cannot be negative.

$|x| \neq -\#$

Examples 11 – 14: Solve for x, if possible.

11) $|x| + 16 = 10$

$-16 \quad -16$

$|x| = -6$

NO solution

12) $-5|x| - 1 = -11$

$+1 \quad +1$

$-5|x| = -10$

$\frac{-5}{-5} \quad \frac{-10}{-5}$

$|x| = 2$

$x = 2 \quad x = -2$

13) $-2|x - 4| = 20$

$\frac{-2}{-2} \quad \frac{}{-2}$

$|x-4| = -10$

NO solution

14) $-2|-3x + 1| + 6 = -4$

$-6 \quad -6$

$-2|-3x+1| = -10$

$\frac{-2}{-2} \quad \frac{-10}{-2}$

$|-3x+1| = 5$

$-3x+1 = 5$ or $-3x+1 = -5$

$-1 \quad -1$ $\quad$ $-1 \quad -1$

$-3x = 4$ $\quad$ $-3x = -6$

$\frac{-3}{-3} \quad \frac{4}{-3}$ $\quad$ $\frac{-3}{-3} \quad \frac{-6}{-3}$

$x = -\frac{4}{3}$ $\quad$ $x = 2$

You try #15 - 16! Solve for the variable.

15) $2|b+5|-8=-4$

$+8 \quad +8$

$\frac{2|b+5|}{2} = \frac{4}{2}$

$|b+5| = 2$

$b+5=2 \quad b+5=-2$

$-5 \quad -5 \quad -5 \quad -5$

$b=-3 \quad b=-7$

16) $\frac{1}{3}|5a+2|+11=2$

$-11 \quad -11$

$3 \cdot \frac{1}{3}|5a+2| = -9 \cdot 3$

$|5a+2| = -27$

NO solution

Example 17: Which of the equations below have no solution? Choose all that apply.

A. $-5|x+6| = 10$

$\frac{-5}{-5} \quad \frac{10}{-5}$

$|x+6| = -2$

NO solution

B. $|x+31|-8=-2$

$+8 \quad +8$

$|x+31| = 6$

C. $3|2x+1| = -12$

$\frac{3}{3} \quad \frac{-12}{3}$

$|2x+1| = -4$

NO solution

D. $-8|x-4|-6=-10$

$+6 \quad +6$

$\frac{-8|x-4|}{-8} = \frac{-4}{-8}$

$|x-4| = \frac{1}{2}$