

* Answers Only
 * Be sure to show all work.

Algebra I Summer Review Packet

Operations with Signed Numbers

Adding and Subtracting Signed Numbers

Adding Signed Numbers

Like Signs	Different Signs
Add the numbers and carry the sign	Subtract the numbers and carry the sign of the larger number
$(+) + (+) = +$ $(+3) + (+4) = +7$	$(+) + (-) = ?$ $(+3) + (-2) = +1$
$(-) + (-) = -$ $(-2) + (-3) = (-5)$	$(-) + (+) = ?$ $(-5) + (+3) = -2$

Subtracting Signed Numbers

Don't subtract! Change the problem to **addition** and change the sign of the **second** number. Then use the addition rules.

$(+9) - (+12) = (+9) + (-12) = -7$	$(+4) - (-3) = (+4) + (+3) = 7$
$(-5) - (+3) = (-5) + (-3) = -8$	$(-1) - (-5) = (-1) + (+5) = 4$

Simplify. Do not use a calculator for this section.

1. $9 + -4 = 5$	2. $20 - -6 = 26$
3. $-8 + 7 = -1$	4. $7 - 10 = -3$
5. $-14 - 6 = -20$	6. $-6 - -7 = 1$
7. $-30 + -9 = -39$	8. $5 - 9 = -4$
9. $14 - 20 = -6$	10. $-8 - 7 = -15$
11. $-2 + 11 = 9$	12. $1 - -12 = 13$

Multiplying and Dividing Signed Numbers

Like Signs If the signs are the same, the answer is <i>positive</i>	Different Signs If the signs are different, the answer is <i>negative</i>
$(+)(+) = +$ $(+3)(+4) = +12$	$(+)(-) = -$ $(+2)(-3) = -6$
$(-)(-) = +$ $(-5)(-3) = +15$	$(-)(+) = -$ $(-7)(+1) = -7$
$(+)/(+) = +$ $(+12) / (+3) = +4$	$(+)/(-) = -$ $(+6) / (-3) = -2$
$(-)/(-) = +$ $(-12) / (-4) = +3$	$(-)/(+) = -$ $(-7) / (+1) = -7$

Simplify. Do not use a calculator for this section.

1. $(-5)(-3) = 15$	2. $\frac{-7}{-1} = 7$
3. $\frac{-6}{2} = -3$	4. $(3)(-4) = -12$
5. $(2)(4) = 8$	6. $\frac{8}{-4} = -2$
7. $\frac{-12}{-4} = 3$	8. $(-2)(7) = -14$
9. $(-1)(-5) = 5$	10. $\frac{-20}{-1} = 20$
11. $\frac{-16}{8} = -2$	12. $(2)(-5) = -10$

Order of Operations

Evaluate each expression.

1] $(-3) \cdot 8 + (-7 - 5) = -36$	2] $9 \cdot 5 - 64 \div 16 + (-42) = -1$
3] $-7 + 4 + (2^3 - 8 \div 4) = 3$	4] $6 + (-20) - 7 \cdot 4 + 5^2 = -17$
5] $-54 \div 9 + (3^3 - 60) = -39$	6] $\frac{18 - 24 \div 4}{4^2 - (-4)} = \frac{15}{20}$
7] $6(-3 - 7) \div 15 + (-15) = -19$	8] $5(14 - 39 \div 3) + 12 \cdot \frac{1}{4} = 8$
9] $-162 + [6(17 - 14)^2] \div 3 = -144$	10] $\frac{4[10 - (27 \div 9)]}{(3 - 7)^2} = \frac{7}{4}$ or $1\frac{3}{4}$

Evaluating Expressions

Example: Evaluate the following expression when $x = 7$ and $y = -2$:

$$\begin{aligned} & 2x + 8y \\ &= 2(7) + 8(-2) \\ &= 14 + (-16) \\ &= -2 \end{aligned}$$

Evaluate each expression when $a = -3$, $b = 4$, $c = -5$, and $d = \frac{1}{2}$.

1] $a + b - c = 6$

2] $3a - 2b = -17$

3] $4c - 3b - 9 = -41$

4] $-18d - 4a = 3$

5] $\frac{6a-12}{2c} = 3$

6] $ab - 7c - 30d = 8$

7] $-4a - 2b - 3c = 19$

8] $2bc - ad = -38.5$

Combining Like Terms

What is a <i>term</i> ?	The parts of an algebraic expression that are separated by an addition or subtraction sign are called <i>terms</i> .
What are <i>like terms</i> ?	Terms with the same variable factors are called <i>like terms</i> . 2n and 3n are <i>like terms</i> , but 4x and 3y are <u>NOT like terms</u> because their variable factors x and y are different.

To simplify an expression, you must combine the *like terms*.

Practice. Simplify each expression.

1. $6n + 5n = 11n$	2. $25b + 15b = 40b$
3. $37z + 4z = 41z$	4. $x - 5x = -4x$
5. $3n + 1 - 2n + 8 = n + 9$	6. $4f + 5f - 6 + 8 = 9f + 2$
7. $7t + 9 - 4t + 3 = 3t + 12$	8. $2k + 4 - 8k - 1 = -6k + 3$
9. $4r + 3r + 6y - 2y = 7r + 4y$	10. $8g + 9h - 4g - 5h = 4g + 4h$
11. $2m + 3n - 4m + 5n = -2m + 8n$	12. $a + 5b - 2a + 9b = -a + 14b$

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Distributing and Combining Like Terms

Distributive Property	For any numbers a , b , and c , $a(b + c) = ab + ac$ and $(b + c)a = ba + ca$; $a(b - c) = ab - ac$ and $(b - c)a = ba - ca$.
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Practice. Simplify each expression.

13. $-3(2x + 1) = -6x - 3$	14. $5(2x + 7) = 10x + 35$
15. $-5(-3x - 4) = 15x + 20$	16. $4(2x - 1) + 9 = 8x + 5$
17. $7(x - 3) + 5x = 12x - 21$	18. $5 + 8(2x + 1) = 16x + 13$
19. $4 - 5(x + 3) = -5x - 11$	19. $2(3x + 1) + 3(5x - 3) = 21x - 7$
20. $3(7x - 1) - 2(3x + 9) = 15x - 21$	21. $4(3x + 7) + 5x + 9 = 17x + 37$

Complete the following tables. Then graph the data on the grid provided.

Problem

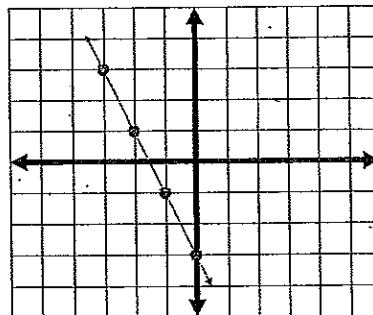
$y = -2x - 3$

X	Y
-3	3
-2	1
-1	-1
0	-3

Work

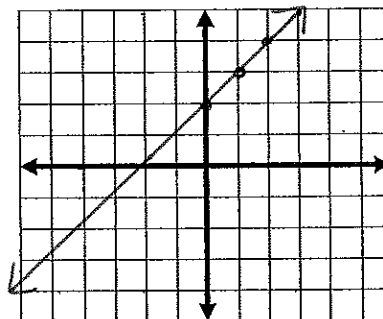
$x = -3$
 $y = -2(-3) - 3 = 6 - 3 = 3$
 therefore $(x,y) = (-3,3)$
 $x = -2$
 $y = -2(-2) - 3 = 4 - 3 = 1$
 therefore $(x,y) = (-2,1)$
 $x = -1$
 $y = -2(-1) - 3 = 2 - 3 = -1$
 therefore $(x,y) = (-1,-1)$
 $x = 0$
 $y = -2(0) - 3 = 0 - 3 = -3$
 therefore $(x,y) = (0,-3)$

Graph



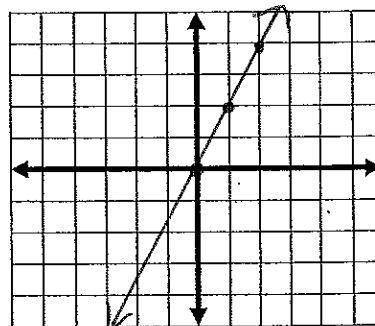
14. $y = x + 2$

X	Y
0	2
1	3
2	4



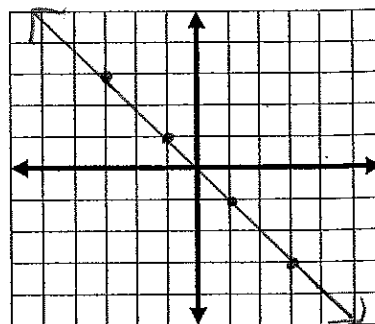
15. $y = 2x$

X	Y
0	0
1	2
2	4
3	6



16. $y = -x$

X	Y
-3	3
-1	1
1	-1
3	-3



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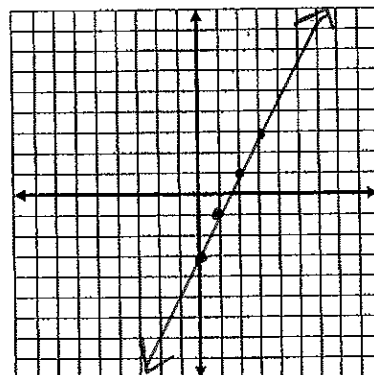
Problem

Work

Graph

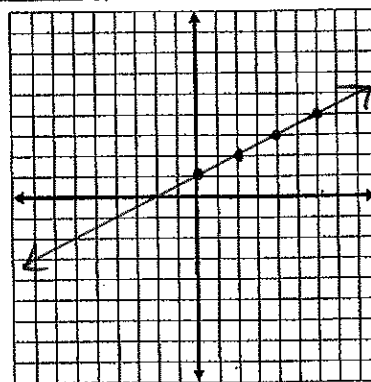
17. $y = 2x - 3$

X	Y
0	-3
1	-1
2	1
3	3



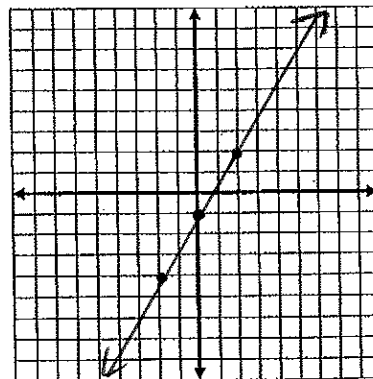
18. $y = \frac{1}{2}x + 1$

X	Y
0	1
2	2
4	3
6	4



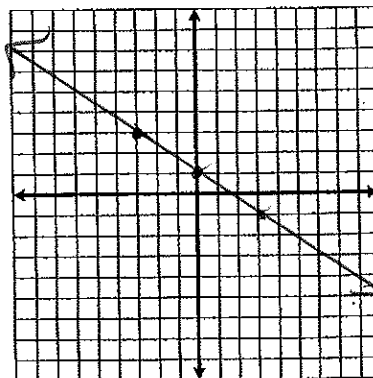
19. $y = \frac{3}{2}x - 1$

X	Y
-2	-4
0	-1
2	2



20. $y = -\frac{2}{3}x + 1$

X	Y
-3	3
0	1
3	-1



Solve Proportions If a proportion involves a variable, you can use cross products to solve the proportion. In the proportion $\frac{x}{5} = \frac{10}{13}$, x and 13 are called **extremes**. They are the first and last terms of the proportion. 5 and 10 are called **means**. They are the middle terms of the proportion. In a proportion, the product of the extremes is equal to the product of the means.

Means-Extremes Property of Proportions

For any numbers a , b , c , and d , if $\frac{a}{b} = \frac{c}{d}$, then $ad = bc$.

Example 1:

$$\frac{x}{5} = \frac{10}{13}$$

$$x \cdot 13 = 5 \cdot 10$$

$$13x = 50$$

$$\frac{13x}{13} = \frac{50}{13}$$

$$x = \frac{50}{13}$$

Example 2:

$$\frac{x+1}{4} = \frac{3}{4}$$

$$4(x+1) = 3 \cdot 4$$

$$4x + 4 = 12$$

$$-4 \quad -4$$

$$4x = 8$$

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

$$x = 2$$

Practice: Solve each proportion.

$$1. \frac{x}{21} = \frac{3}{63}$$

$$x = 1$$

$$4. \frac{9}{y+1} = \frac{18}{54}$$

$$y = 26$$

$$2. \frac{-3}{x} = \frac{2}{8}$$

$$x = -12$$

$$5. \frac{a-8}{12} = \frac{15}{3}$$

$$a = 68$$

$$3. \frac{0.1}{2} = \frac{0.5}{x}$$

$$x = 10$$

$$6. \frac{3+y}{4} = \frac{-y}{8}$$

$$y = -2$$

Solving Equations

To solve an equation means to find the value of the variable. We solve equations by isolating the variable using opposite operations.

Example:

Solve.

$$\begin{array}{rcl}
 3x & -2 = & 10 \\
 & +2 & +2 \\
 \hline
 3x & = & 12 \\
 3 & & 3 \\
 \hline
 x & = & 4
 \end{array}$$

Isolate 3x by adding 2 to each side

Isolate x by dividing each side by 3

Simplify

Opposite Operations:
 Addition (+) and Subtraction (-)
 Multiplication (x) and Division (÷)

Please remember
 To do the same step on each side of the equation

Check your answer.

$$3(4) - 2 = 10$$

Substitute the value in for the variable

$$12 - 2 = 10$$

Simplify

$$10 = 10$$

Is the equation true? If yes, you solved it correctly!

Always check your work by substitution!

Try these.

<p>1. $x + 3 = 5$</p> <p style="text-align: center; font-size: 1.5em;">$x = 2$</p>	<p>2. $w - 4 = 10$</p> <p style="text-align: center; font-size: 1.5em;">$w = 14$</p>
<p>3. $c - 5 = -8$</p> <p style="text-align: center; font-size: 1.5em;">$c = -3$</p>	<p>4. $3p = 9$</p> <p style="text-align: center; font-size: 1.5em;">$p = 3$</p>
<p>5. $-7k = 14$</p> <p style="text-align: center; font-size: 1.5em;">$k = -2$</p>	<p>6. $-x = -17$</p> <p style="text-align: center; font-size: 1.5em;">$x = 17$</p>
<p>7. $\frac{h}{3} = 5$</p> <p style="text-align: center; font-size: 1.5em;">$h = 15$</p>	<p>8. $\frac{m}{8} = 7$</p> <p style="text-align: center; font-size: 1.5em;">$m = 56$</p>
<p>9. $\frac{4}{5}d = 12$</p> <p style="text-align: center; font-size: 1.5em;">$d = 15$</p>	<p>10. $\frac{3}{8}j = 6$</p> <p style="text-align: center; font-size: 1.5em;">$j = 16$</p>

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11. $2x - 5 = 11$ $x = 8$	12. $4n + 1 = 9$ $n = 2$
13. $5j - 3 = 12$ $j = 3$	14. $2x + 11 = 9$ $x = -1$
15. $-3x + 4 = -8$ $x = 4$	16. $-6x + 3 = -9$ $x = 2$
17. $\frac{f}{3} + 10 = 15$ $f = 15$	18. $\frac{a}{7} - 4 = 2$ $a = 42$
19. $\frac{b+4}{2} = 5$ $b = 6$	20. $\frac{x-6}{5} = 3$ $x = 21$

Use substitution to determine whether the solution is correct.

21. $4x + 5 = 7$ $x = 3$ No	22. $-2x + 5 = 13$ $x = 4$ No
23. $6 - x = 8$ $x = 2$ No	24. $1 - x = 9$ $x = -8$ Yes

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Solving Complex Equations.

25. $5 + 3r = 5r - 19$

$$r = 12$$

26. $8x + 12 = 4(3 + 2x)$

Infinitely Many

27. $-5x - 10 = 2 - (x + 4)$

$$x = -2$$

28. $6(-3m + 1) = 5(-2m - 2)$

$$m = 2$$

29. $3(d - 8) - 5 = 9(d + 2) + 1$

$$d = -8$$

30. $5 - 2(x + 1) = 4(x - 5) - 1$

$$x = 4$$

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Practice. Translate each phrase into a mathematical statement

1. Seven plus five times a number is greater than or equal to -9 $7 + 5x \geq -9$
2. Eight times a number increased by 6 is 62 $8x + 6 = 62$
3. One half of a number is equal to 14 $\frac{1}{2}x = 14$
4. 6 less than 8 times some number $8x - 6$
5. A number divided by 9 $\frac{n}{9}$
6. p decreased by 5 $p - 5$
7. Twice a number decreased by 15 is equal to -27 $2n - 15 = -27$
8. 9 less than 7 times some number is -6 $7x - 9 = -6$
9. The sum of a number and eight is less than 2 $n + 8 < 2$
10. Eleven increased by a number is -12 $11 + n = -12$

Matching. Put the letter of the algebraic expression that best matches the phrase.

- | | | |
|----------|------------------------------|------------------|
| <u>b</u> | 1. Two more than a number | a. $2x$ |
| <u>d</u> | 2. Two less than a number | b. $x + 2$ |
| <u>e</u> | 3. Half of a number | c. $2 - x$ |
| <u>a</u> | 4. Twice a number | d. $x - 2$ |
| <u>c</u> | 5. Two decreased by a number | e. $\frac{x}{2}$ |

Careful! Pay attention to subtraction. The order makes a difference. Translate to an algebraic expression then reread to check!

Word Problems

Translate each word problem into an algebraic equation, using x for the unknown, and solve.

- Write a "let x =" for each unknown
- write an equation
- solve the equation
- solve the equation
- substitute the value for x into the let x statements to answer the questions.

For example.

Kara is going to Maui on vacation. She paid \$325 for her plane ticket and is spending \$125 each night for her hotel. How many nights can she stay in Maui if she has \$1200?

Step 1: What are you asked to find? Let variables represent what you are asked to find.

How many nights can Kara stay in Maui?

Let x = The number of nights Kara can stay in Maui

Step 2: Write an equation to represent the relationship in the problem

$$325 + 125x = 1200$$

Step 3: Solve the equation for the unknown

$$\begin{array}{r r r r} 325 & + 125x & = & 1200 \\ \underline{-325} & & & \underline{-325} \\ & 125x & = & 875 \\ & x & = & 7 \end{array}$$

Kara can spend 7 nights in Maui

Word Problems Practice Set

1. A video store charges a one-time membership fee of \$12.00 plus \$1.50 per video rental. How many videos can Steward rent if he spends \$21?

6 videos

2. Bicycle City makes custom bicycles. They charge \$160 plus \$80 for each day that it takes to build the bicycle. If you have \$480 to spend on our new bicycle, how many days can it take Bicycle City build the bike?

4 days

3. Darell went to the mall and spent \$41. He bought several t-shirts that each cost \$12, and he bought 1 pair of socks for \$5. How many t-shirts did Darell buy?

3 t-shirts