

ADVANCED ALGEBRA/ ADVANCED ALGEBRA HONORS

SUMMER ASSIGNMENT 2019

Name _____

In the attached packet, complete all of the questions on each page. Bring your completed packet with shown work to class on the first day of school. This will count as your first test grade (10 points will be taken off each day it is late). It will be graded on completeness rather than correctness, but you are still responsible for understanding the material and must see the teacher for extra help in the beginning of the school year if you did not understand the concepts.

Section #1: Properties of Rational Numbers/Number Sets

COMMUTATIVE: CHANGING the **ORDER** of the numbers in an addition or multiplication expression does not change the value

$$\text{Ex: } a + b = b + a \quad a \cdot b = b \cdot a$$

ASSOCIATIVE: Keeping the **SAME ORDER** of the numbers, but **CHANGING** the **GROUPING** in an addition or multiplication expression does not change the value

$$\text{Ex: } x + (y + z) = (x + y) + z$$

DISTRIBUTIVE: MULTIPLY the number in front of the parenthesis to every number inside of the parenthesis

$$\text{Ex: } 3(x + 2) = 3x + 3(2)$$

ADDITIVE IDENTITY: When you add 0 to any number, you always get that number back.

0 is the Additive Identity

$$\text{Ex: } 33 + 0 = 33$$

MULTIPLICATIVE IDENTITY: When you multiply any number by 1, you always get that number back.

1 is the Multiplicative Identity

$$\text{Ex: } 2 \cdot 1 = 2$$

ADDITIVE INVERSE: Additive Inverse is the **OPPOSITE** of the number. When you add the two numbers, your result is the additive identity (0).

$$\text{Ex: } 8 + (-8) = 0$$

MULTIPLICATIVE INVERSE: Multiplicative Inverse is the **RECIPROCAL** (flip the number). When you multiply the two numbers, your result is the multiplicative inverse (1).

$$\text{Ex: } 4 \cdot \frac{1}{4} = 1$$

CLOSURE: A set of numbers is **CLOSED** under an operation when if you perform the operation to any two numbers in the set you get back a number in that set.

Ex: Even numbers are closed under addition: Whenever you add any two even numbers, you will always get an even number back.

Odd numbers are NOT closed under addition: Whenever you add any two odd numbers, you will NOT always get back an odd number.

1.	Identify the property shown: a. $-8 + 8 = 0$ b. $(3 \times 5) \times 10 = 3 \times (5 \times 10)$ c. $7 \times 9 = 9 \times 7$ d. $(9 + 2) + 4 = 9(2 + 4)$ e. $12(1) = 12$ f. $2(5 + 11) = 2 \times 5 + 2 \times 11$
2.	Find the Additive Inverse $-\frac{34}{12}$
3.	Find the Additive Inverse 30.5

4.	Find the Multiplicative Inverse (reciprocal) $-\frac{34}{12}$
5.	Find the Multiplicative Inverse (reciprocal) 30.5

Section #2: Evaluating Numerical Expressions

1.	Evaluate: $ -23 $
2.	Evaluate: $ 4 $
3.	Evaluate: $-17 + -23$
4.	Evaluate: $9 + (-9)$
5.	Evaluate: $-\frac{17}{12} - \frac{4}{12}$
6.	Evaluate: $-11 - (-4)$
7.	Evaluate: $7 - (-14)$
8.	Evaluate : $\frac{9}{12} \cdot \frac{4}{5} - \frac{10}{3}$
9.	Evaluate : $14.1 \cdot 0.2$
10.	Evaluate : $\frac{9}{12} \div \frac{3}{4}$
11.	Evaluate: $\frac{-11}{34}$
12.	Evaluate each of the following: <ul style="list-style-type: none"> a. 4^4 b. $(-2)^5$ c. -2^5 d. 5^3 e. 2^8 f. $13+20 - 9$ g. $6 \cdot 2 + 35 \div 5$ h. $24 - 8 \cdot 12 \div 4$

Section #3: Translating Expressions and Evaluating Algebraic Expressions

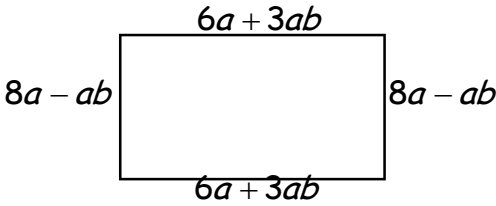
OPERATION	KEY WORD/PHRASE	EXAMPLE	TRANSLATION
Addition (+)	plus	A number plus three	$x + 3$
	more than	Ten more than a number	$x + 10$
	the sum of	The sum of a number and five	$x + 5$
	the total of	The total of six and some number	$6 + x$
	increased by	A number increased by two	$x + 2$
	added to	Eleven added to a number	$x + 11$
Subtraction (-)	minus	A number minus seven	$x - 7$
	less than	Four less than a number	$x - 4$
	the difference of	The difference of a number and three	$x - 3$
	less	Nine less a number	$9 - x$
	decreased by	A number decreased by twelve	$x - 12$
	subtracted from	Six subtracted from a number	$x - 6$
Multiplication (x)	times	Eight times a number	$8x$
	the product of	The product of fourteen and a number	$14x$
	twice; double	Twice a number; double a number	$2x$
	multiplied by	A number multiplied by negative six	$-6x$
	of	Three fourths of a number	$\frac{3}{4}x$
Division (÷)	the quotient of	The quotient of a number and seven	$\frac{x}{7}$
	divided by	Ten divided by a number	$\frac{10}{x}$
	the ratio of	The ratio of a number to fifteen	$\frac{x}{15}$
Powers (xⁿ)	the square of; squared	The square of a number; a number squared	x^2
	the cube of; cubed	The cube of a number; a number cubed	x^3
Equals (=)	equals	Seven less than a number equals ten.	$x - 7 = 10$
	is	Three times a number is negative six.	$3x = -6$
	is the same as	Eight is the same as twice a number.	$8 = 2x$
	yields	Twelve added to a number yields five.	$x + 12 = 5$
	amounts to	Nine less a number amounts to twenty.	$9 - x = 20$

1.	<p>Translate from words to an algebraic expression (Use Word Chart):</p> <ol style="list-style-type: none"> 3 times a number increased by 4 6 less than a number 8 times a number decreased by 2 8 times, a number decreased by 2 The quotient of p and q 12 less than twice a number The difference of p and q The price of one calculator if 3 calculators cost m dollars
2.	<p>Write the given algebraic expression using words (Use Word Chart):</p> <ol style="list-style-type: none"> $n - 2$ $3n - 4$

	c. $9 \div n$ d. $15 + 3n$ e. $88 \cdot n$
3.	Evaluate $2 c - 4d $ for $c = 30$ and $d = 8$
4.	Evaluate $6 y $ for $y = -3$
5.	Evaluate $6 y - x $ for $y = -3$ and $x = -10$
6.	Evaluate $ s - t $ for $s = 5$ and $t = -2$
7.	Evaluate $ s - t $ for $s = 5$ and $t = -2$
8.	Evaluate the expression for the given values of x and y <ol style="list-style-type: none"> $(3x)^3 - 7y^2$ when $x = 3$ and $y = 2$ $5\left(\frac{x}{y}\right) - x$ when $x = 6$ and $y = \frac{2}{3}$ $\frac{(x+3)^2}{3y-2}$ when $x = 2$ and $y = 4$ $\frac{2x+y}{3y+x}$ when $x = 10$ and $y = 6$ $\frac{4y-x}{3(2x+y)}$ when $x = -3$ and $y = 3$

Section #4: Operations with Polynomials

1.	Combine like terms: $13y + 4y$
2.	Combine like terms: $13y - 14y$
3.	Combine like terms: $c - 20c$
4.	Combine like terms: $4x - 14x + 16x$
5.	Simplify: <ol style="list-style-type: none"> $x - (4x + 9)$ $7y - 6(x + 3y)$ $13t - 8 - (14 - 7t)$ $6a - 8(4s - 7)$ $-9(m - 8) - 7(m + 4)$ $3(4x - 5y) - 2(7x + 3y)$ $4x^2 + x - 3x - 6x^2$ $5(n^2 + n) - 3(n^2 - 2n)$ $8(y - x) - 2(x - y)$
6.	What is the sum of $2m^2 + 3m - 4$ and $m^2 - 3m - 2$?
7.	The sum of $8x^2 - x + 4$ and $x - 5$ is _____.
8.	Simplify the expression $2x^2 - x^2$.
9.	Simplify: $(3 - 6n^5 - 8n^4) + (-6n^4 - 3n - 8n^5)$
10.	The expression $(2x^2 + 6x + 5) - (6x^2 + 3x + 5)$ is equivalent to _____.
11.	Simplify: $(12a^5 - 6a - 10a^3) + (10a - 2a^5 - 14a^4)$
12.	What is the result when $-2x^2 + 4x + 2$ is subtracted from $x^2 + 6x - 4$?

13.	The sum of $3x^2 + x + 8$ and $x^2 - 9$ can be expressed as _____.
14.	Subtract $2x^2 - 5x + 8$ from $6x^2 + 3x - 2$ and express the answer as a trinomial.
15.	Write an expression that is equivalent to $(x^2 - 5x - 2) - (-6x^2 - 7x - 3)$.
16.	What is the result when $2x^2 + 3xy - 6$ is subtracted from $x^2 - 7xy + 2$?
17.	What is the sum of $x^2 - 3x + 7$ and $3x^2 + 5x - 9$?
18.	Given the following rectangle, find the perimeter in terms of a and b. <div style="text-align: center;">  </div>
19.	Simplify: $20y^3 \cdot 7y^2$
20.	Simplify: $5a \cdot 4a \cdot 4a$
21.	Simplify: $(-5ab^2)(11ab)$
22.	Simplify the following: $(y^4)^5$
23.	Simplify: $(2x^3)^2$
24.	Simplify: $\frac{54x^8y^9}{6x^5y^5}$
25.	Simplify: $\frac{-36a^7}{6a^8}$
26.	Simplify: $\frac{49b^3}{7b^{10}}$
27.	Simplify: $3^0 + (4 \cdot 5^0)$
28.	Simplify: $\frac{4x^3 - 10x^2 + 6x}{2x}$
29.	Simplify: $\frac{x^3 + 4x^2 + x}{x}$
30.	Simplify: $\frac{9x^2y - 6xy^2}{3xy}$

31.	Simplify: $\frac{6x - 12x^2 - 18x^3}{6x}$
32.	Simplify: $\frac{9x^3a^3 + 9x^2a^5 + 12x^5a^2}{3xa}$

Section #5: Solving Linear Equations

1.	Determine if the given value of x is a solution to the equation: a. $3x - 9 = -15$; $x = -2$ b. $-37 + 7 = 5$; $x = 4$
2.	Solve for the given variable: a. $12x - 14 = 70$ b. $-8y + 5 = 45$ c. $2x + 8x = 120$ d. $4y - 13 = -13$ e. $-4y - 13 = 13$ f. $5x - 8x = 117$ g. $3a + 1 = -4a + 6$ h. $\frac{5}{8}x - \frac{1}{2} = \frac{3}{4}$ i. $0.7p + 0.3 = 3.1$ j. $3(a + 4) = 7a$ k. $15 = 3(7y - 2)$ l. $7n - (3n - 5) = 21$ m. $x + (x - 7) = (x + 5) - (x + 2)$ n. $6x - 2x - x - 5 + 20 = 36$ o. $5(x - 3) - 30 = 10$ p. $8b - 4(b - 2) = 24$ q. $\frac{3}{4}x + 5 = \frac{1}{2}x - 27$

Section #6: Solving Literal Equations (Formulas)

1.	Solve the following equations for the given variable a. $C = 2\pi r$ for r b. $V = lwh$ for h c. $A = \frac{1}{2}bh$ for b d. $P = a + b + c$ for c e. $A = P + Prt$ for r f. $Q = 2\pi r + h$ for r
2.	The perimeter of a rectangle is 42 inches. ($P = 2L + 2W$) If the length of the rectangle is twice the width, what are the measures of the length and width of the rectangle?
3.	If $A = bh$, find the height, h, if $b = 8$ inches and $A = 72$ square inches.
4.	If $A = \frac{1}{2}bh$, find the base, b, if $A = 24$ square feet and $h = 8$ feet.

Section #7: Solving Word Problems Involving Linear Equations

1.	Three times a number increased by 25 is 13. What is the number?
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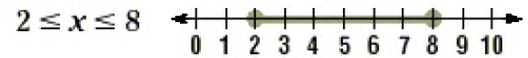
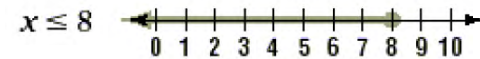
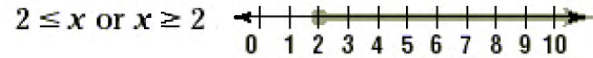
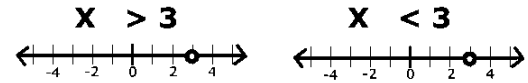
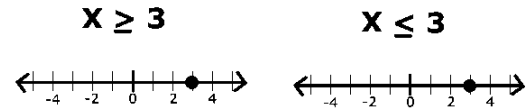
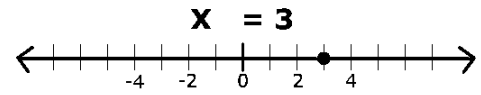
2.	Two-thirds of a number increased by forty is nineteen. What is the number?
3.	Nineteen less than twice a number is 25. What is the number?
4.	The product of nine and a number exceeds 71 by 10. What is the number?
5.	Find two consecutive integers whose sum is 95.
6.	Find two consecutive integers such that twice the second is 14 more than the first.
7.	John's father is 5 times older than him. If the sum of their ages is 42, how old is John and his father.
8.	Seven more than four times a number is the same as five less than eight times the number. What is the number.
9.	Find two consecutive odd integers such that three times the first plus two times the second is 39.
10.	For 1980 through 1998, the population, P , (in thousands) of Hawaii can be modeled by $P = 13.2t + 965$ where t is the number of years since 1980. What is the population of Hawaii in 1998? What was the population increase from 1980 to 1998?
11.	In 1996 there were approximately 115,000 physical therapy jobs in the United States. The number of jobs is expected to increase by 100 each year. Write an expression that gives the total number of physical therapy jobs each year since 1996. Evaluate the expression for the year 2010.
12.	You buy a Blu-Ray Players for \$149 and plan to rent movies. Each rental costs \$3.85. Write an expression that gives the total amount you spend watching movies on your Blu-Ray player, including the price of the player. Evaluate the expression if you rent 20 movies.
13.	You buy used car with 37, 148 miles on the odometer. Based on your regular driving habits, you plan to drive the car 15,000 miles each year that you own it. Write an expression for the number of miles that appears on the odometer at the end of each year. Evaluate the expression to find the umber of miles that will appear on the odometer after you have owned the car for 4 years.
14.	You are taking part in a charity walk-a-thon where you can either walk or run. You walk at 4 km per hour and run at 8 km per hour. The walk-a-thon lasts three hours. Money is raised based on the total distance you travel in the 3 hours. Your sponsors donate \$15 for each km you travel. Write an expression that gives you the total amount of money you raise. Evaluate the expressions if you walk for two hours and run for one hour.
15.	A 15 cm piece of wood is cut into two pieces. One is 7 cm longer than the other. How long are the two pieces?
16.	A used – car dealer drops the price of a used car 23% to a sale price of \$693. What was the former price?
17.	You are taking a physics course. There will be four tests. You have scored 86, 93, and 89 on the first three tests. You must make a total of 360 or more to get an A. What score on the last test will give you an A?
18.	A car rents for \$14.40 per day plus 12 cents for mile. You have budgeted to rent a car for 1 day. How many miles can you travel and will stay within your budget?

Section #8: Solving Linear Inequalities

Solve an Inequality:	<u>Graphing Inequalities</u>
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$$\begin{array}{r}
 3 + 2x < -3x - 7 \\
 -2x \quad -2x \\
 \hline
 3 < -5x - 7 \\
 +7 \quad +7 \\
 \hline
 10 < -5x \\
 \frac{10}{-5} > \frac{-5x}{-5} \\
 -2 > x
 \end{array}$$

** Don't forget to change the direction of the inequality if you divide by a negative



1. Solve each of the following inequalities and graph on the number line.

- a. $t + 9 > 5$
- b. $p + 4 > 7$
- c. $a - 5 \leq -6$
- d. $y - 2 \leq 3$
- e. $-7x \geq 28$
- f. $2p + 5 < 17$
- g. $5x + 2 > 3x + 10$
- h. $8 + 2x \leq 6x - 20$
- i. $4x + 49 < 9 - x$
- j. $9x - 99 \geq 18x$
- k. $3(x - 4) > 15$
- l. $28 < 4(5 - 2x)$
- m. $3(2n + 1) \geq 4n + 9$
- n. $-4(2n - 6) < n + 6$
- o. $2(7n - 1) \geq 3(5 - n)$
- p. $7n - 2(n + 5) < 3n - 16$
- q. $4(1 - 3n) - 14 > 4(2n + 3) - 9n$
- r. $-\frac{x}{2} + 20 \leq 4$
- s. $7 - \frac{x}{10} \geq 12$
- t. $-18 > \frac{x}{6} - 10$
- u. $-\frac{3}{2}x + 9 \leq 24$
- v. $-12 \geq 8 - \frac{4}{3}x$
- w. $\frac{3}{10}x + 21 < 0$
- x. $1 + 5(x - 8) \leq 2 - (x + 5)$
- y. $4n - 5(n - 3) > 3(n + 1) - 20$

Section #9: Basic Factoring Including Factoring Completely (GCF, Trinomial, DOTS)

1. Greatest Common Factor (GCF)

- Find the greatest common factor from each term
 - Place the GCF in front of a set of parenthesis
 - Divide each term in the original polynomial to figure out what is left in the parenthesis
- Ex: $16x^2 - 24x = 8x(2x - 3)$

2. TWO TERMS:

a. Difference of Two Perfect Squares (DOTS)

- Are the two terms perfect squares and being subtracted?
 - Set up two sets of parenthesis, one with a plus in middle and another with a minus in the middle
 - Start each parenthesis with the square root of the first term and end each parenthesis with the square root of the second term

Ex: $(x^2 - 9) = (x + 3)(x - 3)$

3. THREE TERMS:

a. Trinomial A/M $1x^2+bx+c$

- Find two numbers that add to the middle term and multiply to the last term.

Ex: $x^2 + 6x + 9 = (x + 3)(x + 3)$

****Factoring Completely:** Factor the expression using all 3 factoring methods in the order that they appear above.

1.	Factor: $13s - 13c$
2.	Factor: $2\pi rh + 2\pi r$
3.	Factor: $9a - 3b$
4.	Factor: $6x - 30y - 18s$
5.	Factor each of the following completely: <ol style="list-style-type: none"> $4x^2 - 100$ $3x^2y^4 + 9xy^3 - 6x^2y^2$ $x^2 - 4x - 36$ $x^2 + 6x + 8$ $12x^6 - 27y^2$ $8x^3 - 18x^2 + 9x$ $9x^2 - 64y^2$ $100 - x^2$ $4x^2 - 8x$ $x^2 + 3x - 18$ $2x^2 + 8x + 8$ $6x^2y + 12xy - 18x^2y$ $10n - n^2$ $-3y^2 - 15y$ $a^3x + 5a^2x^2 - 2ax$ $4ab^2 - 6a^2b$ $x^2 - 16x + 15$ $x^2 - 26x + 48$ $x^2 + 7x - 30$ $-22x - 48 + x^2$ $x^2 - 56 - 10x$ $30 + x - x^2$ $3x^3 - 300x$ $x^4 - 1$

Section #10: Solving basic Quadratic Equations (GCF, Trinomial, DOTs)

The standard form of a quadratic equation is $ax^2 + bx + c = 0$, where a , b & c are real numbers and $a \neq 0$.

Example 1: Solve

$$x^2 + 4x - 5 = 0$$

Step 1: Write the equation in standard form:	$x^2 + 4x - 5 = 0$
Step 2: Factor completely.	$(x + 5)(x - 1) = 0$
Step 3: Apply the Zero Product Rule	$x + 5 = 0$ or $x - 1 = 0$
Step 4: Solve the linear equations in step 3.	$x = -5$ or $x = 1$

1. Solve for the given variable:

- a. $(t + 7)(t - 6) = 0$
- b. $(2a - 5)(3a - 1) = 0$
- c. $y(y - 9) = 0$
- d. $m(m + 5) = 0$
- e. $x^2 - 7x + 6 = 0$
- f. $x^2 + 3x - 4 = 0$
- g. $x^2 + 12x + 20 = 0$
- h. $x^2 - 13x - 48 = 0$
- i. $3x^2 + 15x + 18 = 0$
- j. $4x^2 + 4x - 48 = 0$
- k. $-2x^2 + 8x + 10 = 0$
- l. $x^3 + 4x^2 + 3x = 0$
- m. $x^2 - 36 = 0$
- n. $x^4 - 81 = 0$
- o. $4x^2 - 9 = 0$
- p. $x^2 + 2x + 1 = 0$
- q. $3 + x(x - 1) = 5$
- r. $64 + 16x + x^2 = 0$
- s. $y^2 - 3y = 28$
- t. $x^2 = x + 30$
- u. $5y^2 = 45$
- v. $3x^2 - 3x = 7x - 3$
- w. $3x^2 - 12 = 0$
- x. $x(x + 3) = 40$
- y. $\frac{x}{5} = \frac{3}{x + 2}$
- z. $\frac{3x}{4} = \frac{x^2}{8}$