As you prepare to enter into Algebra II next year, we have a lot of intriguing topics to learn about, many of which will build upon your prior knowledge to help you create connections to new concepts! Please make sure to refresh your memory of Algebra I over the summer through completing this packet.

Upon entering Algebra II in September, you will be expected to be proficient in your knowledge and skills regarding the included concepts. A strong conceptual understanding of these topics is essential for success in Algebra II.

The packet is divided into 10 sections, based on units covered. Please check out the links to the supplemental videos and extra practice problems, and complete all of the practice problems on white lined paper. You will be assessed on these concepts during the first week of school, so be sure to let your teacher know upon returning if you still need help understanding any of them. After checking your answers, please retry any problems you had incorrect, and come to school with a list of specific questions relating to any of the ideas/problems in this packet.

Our goal this year (and the goal in providing this assignment) is to help you and prepare you, not to stress you! :)

We are looking forward to an amazing year filled with learning! Have a wonderful summer!

> Sincerely,

The Cranford High School Math Department

## Answer Keys

Answers are also posted online. Please check your answers using these provided answer keys, and write down any questions you have. We strongly suggest you retry any problems you did not answer correctly, being sure to explain what your error was and how/why you fixed it as such according to the mathematical concepts required for solving. Also please keep in mind that in mathematics, oftentimes there are more than one correct solution strategies, so your work may not appear to match the answer key exactly - it is okay!

## A. Order of Operations

*Supplemental Video: https://www.khanacademy.org/math/pre-algebra/order-of-operations/order_of_operations/v/more-complicated-order-of-operations-example

## *Online Resources and Practice Problems:

https://www.ixl.com/math/algebra-1/order-of-operations-with-rational-numbers and http://www.regentsprep.org/regents/math/algebra/aop2/indexAOP2.htm

Directions: Use PEMDAS to evaluate the following problems.

1. $(-2)^{3} \cdot(4-8)$
2. $2^{2}-3(-2)-12$
3. $\frac{3-2\left(-1 \cdot 3^{2}\right)+6}{3+4 \cdot-3}$
4. Evaluate $y z(x-2)^{2}-9+y$, if $x=8, y=-1, z=-2$
5. Find and cross out the two errors in the work below:

$$
\begin{gathered}
\left(1-3^{4}\right)-2+-1 * 3 \\
(-2)^{4}-2+-1 * 3 \\
16-2+-3 \\
16-\frac{2}{3} \\
15 \frac{1}{3}
\end{gathered}
$$

6. Common Error Analysis: Why is $9-3|4-8|^{2}$ not equivalent to $6|4-8|^{2}$ ?

# Real Number System 

RATIONAL: written in form a/b i.e. fractions and repeating decimals.
INTEGER: whole numbers and their additive inverses. $\ldots-3,-2,-1,0,1,2,3 \ldots$
WHOLE: 0.1.2.3...
NATURAL (counting):

REAL: Includes all rational and irrational numbers.

IRRATIONAL: nonterminating, nonrepeating numbers, i.e. $\pi=3.14159$...

Directions: Classify each real number as real, rational, irrational, integer, whole, and/or natural number. State all that apply.
7. $\quad 3.82$
8. -23
9. 111
10. 0
11. $\pi$
12. $\sqrt{25}$
13. $\sqrt{8}$
14. 5.87452 ...

Directions: Decide whether each statement is sometimes, always, or never true.
15. A rational number is natural
17. A whole number is a natural number
19. A never-ending decimal number is irrational
C. Simplifying Algebraic Expressions

## *Supplemental Video:

https://www.khanacademy.org/math/algebra-basics/core-algebra-expressions/core-algebra-manipulating-expressions/e/combining_like_terms_2

## *Online Resources and Practice Problems:

https://www.ixl.com/math/algebra-1/simplify-variable-expressions-involving-like-terms-and-the-distributive-property, http://www.regentsprep.org/regents/math/algebra/AV1/indexAV1.htm, http://www.regentsprep.org/regents/math/algebra/av2/indexAV2.htm, and http://www.regentsprep.org/regents/math/algebra/an1/tdistrib.htm

## Simplify each expression.

20. $3 x-9(2 x-1) \quad$ 21. $(4 w+5)(3 w-12) \quad$ 22. $(8 x+3)^{2}$
21. $23 b-28 c+4 b(2+c)-b c$
22. Describe why $2 x^{2}-9 x^{2}$ is not equivalent to $-7 x^{4}$.
23. Describe why $(x-2)^{2}$ is not equivalent to $x^{2}-4$.

Write an algebraic expression for each situation. Use the variable $x$ to represent "a number":
26. five less than the product of a number and two
27. the quotient of five times a number and nine
28. twenty more than the sum of a number and one
29. the difference of a number and twelve

## D. Solving Basic Equations

*Supplemental Video: https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-solving-basic-equations/v/solving-equations-1
*Online Resources and Practice Problems:
https://www.ixl.com/math/algebra-2/solve-linear-equations
http://www.regentsprep.org/regents/math/algebra/ae2/indexAE2.htm

Solve for $x$. Simplify answers, if fractions, reduce to lowest terms.
$30.2 x-9=51$
32. $-2(x+9)=8 x-4$
34. $-5 n-3 n=-5(n+3)-4(n-1)$
36. $\frac{x+5}{3}=\frac{8}{x-5}$
38. $\frac{-(x+9)}{4}=\frac{8 x+1}{3}$
31. $3 x+2=-2 x-13$
33. $-13+7(3 x-1)=-4(-3+3 x)-2 x$
35. $3(2 x-4)=-2(8 x+5)$
37. $\frac{(x-2)}{5}=\frac{3 x}{9}$
39. Student A claims that the equation $9 v-27=-3(9-3 v)$ has no solution, while Student B claims the equation has infinitely many solutions. Who do you agree with? Support your position entirely, and explain why the other claim is incorrect.

## E. Solving \& Graphing Solutions to Basic Inequalities <br> *Supplemental Video:

https://www.khanacademy.org/math/algebra-basics/core-algebra-linear-equations-inequalities/core-algebra-linear-inequalities/v/multi-step-inequalities-2

## *Online Resources and Practice Problems:

https://www.ixl.com/math/algebra-1/graph-solutions-to-advanced-linear-inequalities https://www.ixl.com/math/algebra-1/graph-solutions-to-compound-inequalities http://www.regentsprep.org/regents/math/algebra/ae8/indexAE8.htm

Solve each inequality, and graph the solution on a number line.
40. $4(m-3)+14<22$

42. $2+3 x \leq 4 x+3 \leq 3 x+5$

44. $16 \mathrm{x} \leq 32$ or $-5 \mathrm{x} \leq-40$
41. $8 \mathrm{k}>-32$ and $-6 \mathrm{k}+1<49$

43. $13>-6 p-7 p$

45. $-7(5 g-2)+2 \geq-5 g-7(g+1)$

46. Rewrite the inequality so that the variable $y$ is isolated: $-12 x-9 y>27$.

## F. Solving Basic Word Problems

*Here are some problem solving steps that will help you throughout any math course! :)
In general, I suggest you first identify what you do know, then identify what you do not know. Organize this information. Then decide on a strategy for solving, and attempt to solve, being sure to check your work throughout. Modify your strategy as necessary. Always check your final answer for correctness and reasonableness.

## *Supplemental Videos:

https://www.khanacademy.org/math/cc-seventh-grade-math/cc-7th-variables-expressions/cc-7th-linear-eq-word-probs https://www.khanacademy.org/math/algebra/linear-word-problems/interpreting-linear-functions/e/interpreting-features-of-linear-functions https://www.khanacademy.org/math/algebra/linear-word-problems/constructing-linear-models/e/constructing-linear-functions-word-problems
https://www.khanacademy.org/math/algebra/linear-word-problems/linear-models-word-problems/e/constructing-and-interpreting-linear-functions
*Online Resources and Practice Problems:
https://www.ixl.com/math/algebra-2/solve-linear-equations-word-problems
47. On a certain horse farm, there are 12 more chestnut horses than bay horses, and twice as many gray horses as bay horses. In total, there are 52 horses. How many horses are bay?
48. A rectangular pool is going to be built in such a way that the width is two feet longer than double the length. The pool must have a perimeter of 208 feet. Determine the dimensions for the pool.
49. Ed Sheeran is performing at a benefit concert, for which most of the proceeds will be given to charity. Ed is going to give the charity $\$ 3,500$ of his own money, plus $85 \%$ of all of the ticket sales.
a. How much money must be made in ticket sales in order for the total donation to be at least $\$ 20,000$ ?
b. Assuming the concert venue holds 800 people and is expected to sell out, what would be a reasonable price for any given ticket? Support your answer.
50. The lengths of the sides of a triangle are in the ratio $2: 3: 4$, and the perimeter of the triangle is 36 inches. Determine the length of each side. Support your answer.

## G. Fraction Operations

*Supplemental Videos:
https://www.khanacademy.org/math/arithmetic/fractions

## *Online Resources and Practice Problems:

https://www.ixl.com/math/fractions
http://www.regentsprep.org/regents/math/algebra/av5/indexAV5.htm
Solve the problems. Show all work.
51. A recipe for 24 pancakes calls for $11 / 2$ cups of flour. You only want to make 8 pancakes. How much flour should you use?
52. Every tablespoon of a certain olive oil has 180 calories. You want to make a salad dressing that has no more than 75 calories from olive oil, since it will be used on a small amount of salad. Every tablespoon is equivalent to three teaspoons. How many teaspoons can you use?

Simplify each expression:
53. $\frac{3}{8}+\frac{1}{2}$
54. $\frac{2}{5}+\frac{3}{10}-\frac{1}{2}$
55. $\frac{11}{12}-\frac{7}{8}$
56. $\frac{1}{2} \cdot \frac{2}{5}+\frac{3}{4} \cdot \frac{2}{3}$
59. $\frac{2}{3} \bullet \frac{1}{9}$
60. $\frac{1}{2} \bullet \frac{2}{7} \bullet \frac{-1}{5}$
61. $1 \frac{11}{13} \bullet \frac{2}{3}$
62. $\frac{3}{4} \div \frac{1}{7}$
63. $\frac{8}{9} \div 2$
64. $3 \div \frac{2}{5}$

## H.Graphing Linear Functions

## *Supplemental Videos:

https://www.khanacademy.org/math/cc-eighth-grade-math/cc-8th-linear-equations-functions/8th-solutions-to-two-var-linear-equations/v/graphs-of-linear-equations

## *Online Resources and Practice Problems:

http://www.purplemath.com/modules/slopgrph.htm

## Use the given information to solve the problems.

65. What is the slope between the points $(9,7)$ and $(-3,13)$ ? Show and explain all work.
66. What is the slope between the points $(-4,5)$ and $(14,5)$ ? Show and explain all work.

What is the slope of each line?
67. $y=-x+12$
68. $-8 y=9-5 x$
69. $7 x=y-4$
70. $x=3$

Slope: $\qquad$
Slope: $\qquad$
Slope: $\qquad$
Slope: $\qquad$

Determine the x -intercept and y -intercept of each line.

73. A line is given by the equation $y=-1 / 2 x-5$. What is the slope of the parallel line?
74. A line is given by the equation $y=-9 x-3$. What is the slope of the perpendicular line?

Graph each line.
75. $5 y=-x-10$

76. $\mathrm{y}=-9$


## I. Factoring Polynomials

## *Supplemental Videos:

https://www.khanacademy.org/math/algebra/polynomial-factorization

## *Online Resources and Practice Problems:

http://www.coolmath.com/algebra/04-factoring/08-overview-01

Factor out the Greatest Common Factor (GCF) from all terms.
77. $5 x^{2}+10 x$
78. $20 x^{3} y+10 x y-30 x y^{2}$
79. $3 x^{3} y^{3}+6 x^{4} y^{4}+9 x^{5} y^{5}$

Factor using the Difference of Squares.
80. $x^{2}-9$
81. $x^{2}-49$
82. $4 x^{2}-9$

Factor the trinomial. (undo FOIL)
83. $x^{2}-3 x-10$
84. $x^{2}+8 x+12$
85. $x^{2}-11 x+24$

Factor completely, using a combination of the techniques above.
86. $2 x^{2}-50$
87. $3 x^{2} y-15 x y-18 y$
88. $5 x^{2} y-80 y$

## I. Exponent Properties

## *Supplemental Videos:

https://www.khanacademy.org/math/in-seventh-grade-math/exponents-powers/laws-exponents-examples/v/exponent-properties-1

## *Online Resources and Practice Problems:

https://www.mathplanet.com/education/algebra-1/exponents-and-exponential-functions/properties-of-exponents

Simplify using the properties of exponents.
89. $2 x y \cdot 4 x^{4} y^{3}$
90. $\left(4 m n^{2}\right)^{4}$
91. $\frac{4 a^{3} b^{3}}{3 b^{2}}$
92. $\left(y^{3}\right)^{2}$
93. $\left(3 m^{3} n^{0}\right)^{4}$
94. $\frac{2 u^{4}}{4 u^{2} v^{2}}$
95. $2 v^{3} \cdot 2 v \cdot v^{0}$
96. $4 a^{3} \cdot 4 a^{4}$
97. $\frac{u^{3} v^{3}}{u^{2} v^{2}}$

