

# Summer Packet

## Algebra II

Welcome to Algebra II. The topics in Algebra II can be abstract but they have practical applications and serve as a foundation for further study in mathematics and other college level mathematics. Mathematics is a series of building blocks. A student of mathematics must have sufficient Algebra I skills to be proficient in Algebra II.

This Review Packet was prepared for students to be able to review material from Algebra I. The summer packet is to be completed by the first day of school. This packet covers all review skills.

### Algebra Resources

- [Khan Academy](#) Take control of your **learning** by working on the skills you choose at your own pace. ... **Math**, science, computer programming, history, art, economics, and more.
- [Algebasics](#) has video tutorials explaining the basics of algebra, equations, ratio and proportion, absolute value, polynomials, factoring, linear equations, radicals, applications, and much more.
- [Algebra-Class.com](#) offers help with solving equations, graphing equations, writing equations, inequalities, functions, exponents and monomials, polynomials, and the quadratic equation. It also has a list of resources.
- [Algebra.help](#) contains lessons on topics that include equations, simplifying, factoring, distribution, and trinomials, as well as equation calculators and worksheets. This site also has an extensive list of math resources and study tips.
- [Algebra Help](#) covers topics such as fractions, percents, decimals, algebraic expressions, addition, multiplication, and word problems. Each section includes explanations and examples.
- [College-Cram.com](#) allows students to choose the algebra subject they are struggling with from a drop down menu, select the appropriate chapter, and pick your resources. The pages will feature formula solvers, bottomless worksheets, flashcards, quizzes, interactive overviews, and brief lessons and study sheets.
- [Interactive Mathematics](#) has a large section on algebra, including information on factoring and fractions, the quadratic equation, exponents and radicals, systems of equations, matrices and determinants, and inequalities.
- [Math Expression](#) has videos, worksheets, and lessons to help you develop your algebra skills. Math topics include algebra, exponents, symmetry, fractions, measurements, angles, and more. The site also includes a list of useful resources.
- [Purplemath](#) contains lessons with explanations on everything from absolute value and negative numbers to intercepts, variables, and factoring. In addition, this site includes a forum that allows students to ask questions and receive answers, as well as a list of homework tips and guidelines.

## Part One: Order of Operations

Directions: Simplify each problem in the space provided, circling your final answer. Final answer should have all positive exponents and be in simplest form. No decimal approximations allowed.

### Properties

1. Grouping symbols
2. Exponents
3. Multiplication or Division  
In order from left to right
4. Addition or Subtraction  
In order from left to right

<p>Example: <math>2^3 - (4 + 3 * 5)</math>  <math>= (2 * 2 * 2) - (4 + 3 * 5)</math>  <math>= (8) - (4 + 15)</math>  <math>= 8 - (19)</math>  <math>= -11</math></p>	<p>1. <math>(15 - 8) \times 3 + 5 + 48 - 6</math></p>	<p>2. <math>18 \div 9 \times (5 - 2) + 7</math></p>
<p>3. <math>4^3 + 2 + 8 - 60 \div 3 \times 6 - 3</math></p>	<p>4. <math>(a^2 - b) \div 6</math>, using <math>a = 6, b = 12</math></p>	<p>5. when <math>x = -5</math></p>
<p>6. <math>2x^2 - 2x + 24</math> when <math>x = 2</math></p>	<p>7. <math>\frac{3x^2 + 5}{12x - 4}</math>, when <math>x = -1</math></p>	<p>8. <math>(a + \sqrt{16}) \left( \frac{1}{a^2} - \frac{a}{3} \right)</math> when <math>a = 2</math></p>

### Equations of a Line

- *Slope-intercept form:*  $y = mx + b$
- *Point-slope form:*  $y - y_1 = m(x - x_1)$
- *Standard form:*  $Ax + By = C$
- *Slope:*  $m = \frac{y_2 - y_1}{x_2 - x_1}$

## Part Two: Linear Equations

Directions: Solve each problem in the space provided, circling your final answer. Recall: to find x-intercept set  $y=0$  and to find y-intercept set  $x=0$ . To find equation of a line find slope and then use slope and point to solve for y-intercept.

<p>Example: Write the equation of a line that has slope <math>m = -\frac{4}{9}</math> and y-intercept <math>b = -3</math>.</p> <p>Use <math>y = mx + b</math> then substitute values for <math>m</math> and <math>b</math> and simplify</p> $y = -\frac{4}{9}x + -3$ $y = -\frac{4}{9}x - 3$	<p>9. Find the slope of the line containing the points <math>(4, -3)</math> and <math>(-6, 4)</math>.</p>	<p>10. Write the equation of a line that has slope <math>m = -\frac{4}{9}</math> and passes through the point <math>(18, -2)</math>.</p>
<p>11. Write the equation of the line containing the points <math>(1, 3)</math> and <math>(5, 11)</math>.</p>	<p>12. Write the equation of the line containing the point <math>(-4, 6)</math> and parallel to <math>3x - 2y = 8</math>.</p>	<p>13. Write the equation of the line containing the point <math>(3, 56)</math> and perpendicular to <math>3x - 2y = 8</math>.</p>

### Part Three: Rules of Exponents

Directions: Simplify each problem in the space provided, circling your final answer. Final answer should have all positive exponents.

#### Properties

$$a^m \cdot a^n = a^{m+n}$$

$$(a^m)^n = a^{mn}$$

$$(ab)^m = a^m b^m$$

$$a^{-m} = \frac{1}{a^m}, a \neq 0$$

$$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$$

<p>Example:</p> $(2a)^{-3}$ $= \frac{1}{(2a)^3}$ $= \frac{1}{(2a)} * \frac{1}{(2a)} * \frac{1}{(2a)}$ $= \frac{1}{2^3 a^3} = \frac{1}{8a^3}$	<p>14. <math>(7x)^{-2}</math></p>	<p>15. <math>(2x^2y)^0(3xy)^3</math></p>
<p>16. <math>\frac{a^3}{a} - \frac{4a^6}{a^4}</math></p>	<p>17. <math>(4x^3)^3</math></p>	<p>18. <math>\left(\frac{5u^2}{2v^2}\right)^2</math></p>
<p>19. <math>(3^{-1} + 2^{-1})^2</math></p>	<p>20. <math>\left(\left(\frac{3}{4}\right)^2 + 1\right)^2</math></p>	<p>21. <math>\left(\frac{x^2y^8z^2}{xy^2z^6}\right)^2</math></p>

## Part Four: Simplifying Radicals

Directions: Simplify each problem in the space provided, circling your final answer. Final answer should have all positive exponents and be rationalized. No decimal approximations allowed.

### Properties

$$\bullet \sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$$

$$\bullet \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

$$\bullet a^{\frac{m}{n}} = \sqrt[n]{a^m} \text{ or } (\sqrt[n]{a})^m$$

$$\bullet \sqrt{x^2} = x$$

<p>Example:</p> $\begin{aligned} &\sqrt{24} \\ &= \sqrt{4 \cdot 6} \\ &= \sqrt{4} \cdot \sqrt{6} \\ &= 2\sqrt{6} \end{aligned}$	<p>22. <math>3\sqrt{700}</math></p>	<p>23. <math>\sqrt{\frac{100}{49}}</math></p>
<p>24. <math>3\sqrt{700} + 2\sqrt{7}</math></p>	<p>25. <math>(2\sqrt{6}) \cdot (3\sqrt{15})</math></p>	<p>26. <math>\sqrt{12} - \sqrt{48}</math></p>
<p>27. <math>\sqrt{75x^3} \cdot \sqrt{3x^3}</math></p>	<p>28. <math>\frac{50a}{2\sqrt{25a^2}}</math></p>	<p><b>BE CAREFUL:</b></p> $\sqrt[n]{a+b} \neq \sqrt[n]{a} + \sqrt[n]{b}$ $\sqrt[n]{a-b} \neq \sqrt[n]{a} - \sqrt[n]{b}$ $\sqrt[n]{a^n + b^n} \neq a + b$

## Part Five: Simplifying Polynomials

Directions: Simplify each problem in the space provided, circling your final answer. Final answer should have all positive exponents and be in simplest form. No decimal approximations allowed.

*Properties*

$$c(x + y) = cx + cy$$

$$(a + b)(c + d) = ac + ad + bc + bd$$

<p>Example:</p> $(4x^2 + 7x - 12) - (3x^2 + 5x + 2)$ $= 4x^2 + 7x - 12 - 3x^2 - 5x - 2$ $= 4x^2 - 3x^2 + 7x - 5x - 12 - 2$ $= x^2 - 2x - 14$	29. $(7x - 2y) - (3x + 5y)$	30. $-7x(2x - 9)$
31. $(-3x + y) + (2x - y)$	32. $(3x + 4)(2x - 9)$	33. $7(3x^2 + 10x) - 4x$
34. $3x^2 + 10x - 4(x - 7)$	35. $(3x^2 + 5)(2x - 3)$	36. $(-3x + y)(2x - y)$

## Part Six: Factoring

Directions: Factor each problem completely in the space provided, circling your final answer. Recall: if not factorable, it is “prime”.

### Strategies

1. *GCF*
2. Difference of Squares  $(a + b)(a - b) = a^2 - b^2$
3. Trinomials: factors of  $ac$  that add up to  $b$
4. Sum and Difference
$$a^2 + 2ab + b^2 = (a + b)^2$$
$$a^2 - 2ab + b^2 = (a - b)^2$$
5. Grouping

Example: $3b^2 + 15b + 18$ $= 3(b^2 + 5b + 6)$ $= 3(b + 3)(b + 2)$	37. $x^2 + 6x + 5$	38. $x^2 + x - 6$
39. $3x^3 + 18x^2 + 24x$	40. $4n^2 - 24n$	41. $144x^2 - 36$
42. $2x^2 + 7x - 4$	43. $2x^5 + 10x^4 + 12x^3$	44. $2x^3 + 3x^2 - 8x - 12$

## Part Six: Solving

Directions: Solve each problem completely in the space provided, circling your final answer. Recall: For quadratics you may need the zero-product property... if  $ab = 0$ , then  $a = 0$  or  $b = 0$ .

### Strategies

1. Factor out a GCF (if one exists).
2. Quadratic – factor, completing the square or quadratic formula.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. Cubic – try to factor by grouping.
4. Absolute value equations :  $|a+b| = c$   
 $a+b = c$  or  $a+b = -c$
5. Radical equations – raise each side to the root.

45. $3(x-7) + 5 = -2x - 8$	46. $\frac{x+1}{3} = 5$	47. $(x+4)(9x-3) = 0$
48. $x^2 + x - 12 = 0$	49. $x^2 + 2x - 35 = 0$	50. $x^2 + 3x = -1$
51. $ 1-4x  = 5$	52. $-4x + 7 \leq 5$	53. $2\sqrt{x} - 3 = 5$



## Part Seven: Systems of Equations

Directions: Solve each problem completely in the space provided, circling your final answer.

### Methods

1. Graphing.
2. Substitution
3. Elimination.

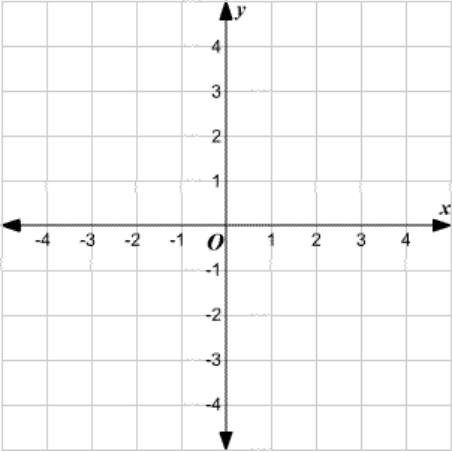
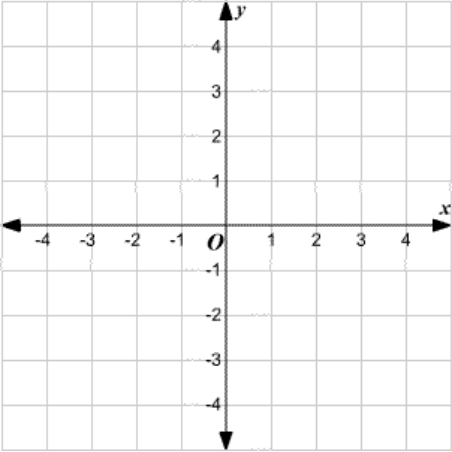
54. $\begin{cases} 3x + 2y = 2 \\ 9x - 8y = -4 \end{cases}$	55. $\begin{cases} y = -3x + 1 \\ 6x + 2y = 10 \end{cases}$	56. $\begin{cases} y = 2x - 2 \\ 7.5y = 15x - 15 \end{cases}$
---	---	---

## Part Eight: Systems of Inequalities

Directions: Solve each system of inequalities by graphing.

### Methods

Graph both inequalities on the same coordinate plane and their intersection (overlapping region) is the solution.  $<$  and  $>$  are dotted lines,  $\leq$  and  $\geq$  are solid line.

57. $\begin{cases} y < 3x + 2 \\ y \leq -2x + 1 \end{cases}$ 	58. $\begin{cases} y > -3x - 2 \\ 2x - 3y < 6 \end{cases}$ 
---	--