## Princeton High School

## Mathematics Department

## Algebra 2 Summer Assignment

# Packet is Optional

**Summer assignment vision and purpose**: The Mathematics Department of Princeton Public Schools aims to build confidence and competence in students as they strengthen their mathematical understanding. As such, students can complete the summer assignment in preparation for the coming school year. Success in mathematics is dependent on comprehending critical concepts. Such concepts will be extended and applied in more challenging contexts in successive years. For this reason, the department is supporting and providing summer assignments for students. These assignments will serve as a reinforcement of previously learned skills.

**Directions:** Please complete all of the following questions. ***Be sure to show all of your work and attach all completed work on additional pages. All graphs should be completed on graph paper.*** Questions are divided into subgroups based on skill and concept. Some procedures and examples have been provided to help reinforce or remind you of previously covered material. Also, please be sure to complete the following information:

**Evaluate Algebraic Expressions. Keep in mind that $(-2)^2 = 4$ and $-2^2 = -4$.**

1. Evaluate $-x^2 + 3x$ when $x = 2$

2. Evaluate $2x^2 - x + 1$ when $x = -1$.

3. Evaluate $6 - b^2$ when $b = 5$.

4. Evaluate $3d^2 + 4d$ when $d = -2$.

**Simplify Algebraic Expressions. Remember to distribute the negative sign to both terms in parenthesis.**

5. $3t + 5t^2 - 2t + 6t^2$

6. $7(q - 2) + 5q + 14$

7. $-4(m - 2) + 3(m + 1)$

8. $8d + 2d^2 - 3(d + d^2)$

**Solve Equations for Unknown.**

9. $-6t - 5 = 13$

10. $5a - 1 = 2a + 11$

11. $-2m + 3 = 7m - 6$

12. $4(2x - 1) = 3(x + 2)$

13. $5(x + 3) = -(x - 3)$

14. $\dfrac{1}{4}x + \dfrac{1}{2}x = 39$

15. $\dfrac{2}{3}x + \dfrac{5}{6} = x - \dfrac{1}{2}$

**Rewrite Formulas and Equations.**

16. Solve the formula $C = 2\pi r$ for $r$.

17. Solve the formula $P = 2l + 2w$ for $w$.

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**18.** Solve ab + bc = d for b.

**Solve Linear Inequalities. Then graph the solution. Remember to reverse the inequality when multiplying or dividing by a negative number!**

**19.** $7x - 12 \leq -x + 4$

**20.** $-8x + 9 > 2x - 1$

**21.** $0 < 3x - 6 \leq 3$

**22.** $-5 \leq 2x + 5 \leq -1$

**23.** $2x + 3 < 7$ or $x - 2 \geq 4$

**Solve Absolute value Equations and Inequalities. Remember that what is in the absolute value can be positive or negative, so write 2 equations/inequalities for every one absolute value equation/ inequality. Check your work and discard extraneous solutions.**

Example: $|x + 3| = 7$      Solution: (x+3) = 7    or    -(x+3) = 7

x+3 = -7

x=10    or      x=-10

**24.** $|2x - 5| = 9$

**25.** $|3x + 3| = 6x$

**26.** $|x - 3| > 5$

**27.** $|2x + 1| \geq 5$

**28.** $|x - 6| \leq 4$

**29.** $|x + 7| < 2$

**Use Problem Solving Strategies and Models to Solve Word Problems.**

**30.** The perimeter of a rectangular city park is 1080 yards. The width of the park is 240 yards. What is the length of the park?

**31.** A train travels at a rate of 44 miles per hour. How long will it take the train to travel 154 miles?

**32.** A piece of fabric is 52 inches long. You cut the fabric into two pieces. The first piece is

x inches long. The second piece is 14 inches longer than the first piece. Draw and label a diagram of the fabric. Then write and solve an equation to find $x$.

**Find Slope.** Note slope $= \dfrac{y_2 - y_1}{x_2 - x_1}$. Parallel lines have same slope and perpendicular lines have opposite reciprocal slope.

33. What is the slope of the line passing through the points (0, 0) and (1, 3)?

34. What is the slope of the line passing through the points (2, 1) and (3, −1)?

35. Tell whether the lines are *parallel, perpendicular, or neither.*
    Line 1: through (−1, −1) and (1, 3)
    Line 2: through (−2, −2) and (1, 4)

36. Tell whether the lines are *parallel, perpendicular, or neither.*
    Line 1: through (1, 5) and (0, 3)
    Line 2: through (2, −3) and (0, 1)

**Graph Equations**

37. $y = x + 1$

38. $y = 5x - 3$

39. $y = -3x + 2$

40. $x + 2y = 4$

41. $5x + 3y = 15$

42. $x = -1$

43. $y = 4$

44. Find an equation for the line in this graph.
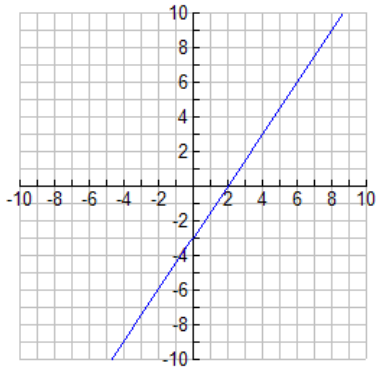
**Write Equations of Lines**

The **point-slope form** of the equation of a line is given by $y - y_1 = m(x - x_1)$, where $m$ is the slope and $(x_1, y_1)$ is a point on the line.

The **slope intercept form** of the equation of a line is $y = mx + b$.

**45.** Write an equation of a line with a slope of 4 and a y-intercept of $-1$
**46.** Write an equation of a line with a slope of $-5$ that passes through the point $(3, -2)$.
**47.** Write an equation of a line passing through $(2, 3)$ and parallel to $y = -x + 3$.
**48.** Write an equation of a line passing through $(0, 1)$ and perpendicular to $y = 2x + 1$.
**49.** Write an equation of a line passing through points $(1, -1)$, and $(4, 2)$.

**Solve Linear Systems.**

**Graph the equations and find the point of intersection.**

**50.** $y = 4x - 1$
$\quad\;\; y = 3x$

**51.** $x = -2$
$\quad\;\; y = 3$

**Solve using the substitution method.**
**EXAMPLE**:
$6x + 3y = 12$    Equation 1
$3x + y = 5$       Equation 2
Solution:
STEP 1: Solve Equation 2 for $y$.
$\qquad y = 5 - 3x$
STEP 2: Substitute the expression for $y$ into Equation 1 and solve for $x$.
$\qquad 6x + 3(5 - 3x) = 12$     Substitute $5 - 3x$ for $y$.
$\qquad x = 1$                  Solve for $x$.
STEP 3: Substitute the value of $x$ into Equation 2 and solve for $y$.
$\qquad 3(1) + y = 5$         Substitute 1 for $x$.
$\qquad y = 2$                  Solve for $y$.
$\qquad$ The solution is $(1, 2)$.

**52.** $2x + y = 4$

**53.** $3x + 6y = 3$

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$$3x - 5y = 6 \qquad\qquad x - 2y = 5$$

**Solve using the elimination method.**
**EXAMPLE:**
$x + 5y = 13$        Equation 1
$-4x - 7y = -13$       Equation 2
Solution:
STEP 1 : Multiply Equation 1 by 4 so that the coefficients of $x$ differ only in sign.

$x + 5y = 13$         × 4 ⟶        $4x + 20y = 52$

$-4x - 7y = -13$              $-4x - 7y = -13$
                                         _____
STEP 2:  Add the revised equations and solve for $y$.      $13y = 39$
                                                            $y = 3$
STEP 3:  Substitute the value of $y$ into Equation 1 and solve for $x$.
        $x + 5(3) = 13$        Substitute 3 for $y$ in Equation 1.
             $x = -2$        Solve for $x$.
 The solution is $(-2, 3)$.

**54.**   $7x + 2y = -5$                    **55**.   $5x - 6y = 4$
      $3x - 4y = -7$                        $2x + 3y = 7$

**Solve Quadratic Equations by Factoring.**
**EXAMPLE 1**
**<u>Factor trinomials of the form $x^2 + bx + c$</u>**

**Factor the expression $w^2 - 2w - 15$.**

**Solution**
You want $w^2 - 2w - 15 = (w + m)(w + n)$ where $mn = -15$ and $m + n = -2$.

| Factors of −15: $m, n$ | −1, 15 | 1, −15 | −3,5 | 3, −5 |
|---|---|---|---|---|

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| Sum of factors: $m + n$ | 14 | −14 | 2 | −2 |
|---|---|---|---|---|

Notice that $m = 3$ and $n = -5$. So, $w^2 - 2w - 15 = (w + 3)(w - 5)$.

**EXAMPLE 2**
**Factor with special patterns**

**Factor the expression.**

   **a.**  $g - 20g + 100 = g^2 - 2(g)(10) + 10^2$           Perfect square trinomial
                  $= (g - 10)^2$

   **b.**  $z^2 - 64 = z^2 - 8^2$                        Difference of two squares
                  $= (z + 8)(z - 8)$

**Factor:**

   **56.**  $y^2 + 3y - 4$

   *57.*  $j^2 - 11j + 30$

   *58.*  $s^2 + s - 5$

   **59**.  $s^2 - 4$

   **60**.  $d^2 + 14d + 49$

   **61**.  $25a^2 - k^2$

**Simplify Square roots, Rationalize Denominator, Add, Subtract, and Multiply Square Roots**

**62.**  $\sqrt{147}$

**63.**  $\sqrt{200}$

**64.**  $\sqrt{5} \cdot \sqrt{50}$

**65.**  $2 \cdot 3\sqrt{5}$

**66.** $\sqrt{\dfrac{13}{121}}$

**67.** $\sqrt{\dfrac{7}{5}}$

**68.** $\sqrt{50} + \sqrt{8}$

**69.** $\sqrt{27} - \sqrt{3}$

**Solve Quadratic Equations by Finding Square Roots**

**70.** $-9d^2 = -405$

**71.** $11y^2 + 3 = 36$

**72.** Find the hypotenuse of a right triangle with legs 60 inches and 80 inches.

**Solve Quadratic Equations using Quadratic Formula.**

The **quadratic formula**: Let $a$, $b$, and $c$ be real numbers where $a \neq 0$. The solutions of the quadratic equation $ax^2 + bx + c = 0$ are

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Remember to set equation equal to zero before finding a, b, and c.

**73.** $x^2 + 4x = 2$

**74.** $2x^2 - 8x = 1$

**75.** $x^2 - 4x + 5 = 0$

**Use Properties of Exponents.  Do not use calculator!**

**76.** $(2^2 \bullet 5)^3$

**77.** $7^3 \bullet 7^{-1}$

**78.** $(8^0 \bullet 6^{-2})^{-1}$

**79.** $x^{-1}$

**80.** $t^7 t^2 t^8$

**81.** $(k^3 m^4)^2$

**82.** $\dfrac{g^5}{g^2}$

**83.** $\left(\dfrac{3x}{z^2}\right)^0$

**84.** $\dfrac{2x^3}{10x^5}$

## Add, Subtract and Multiply Polynomials

**85.** $(4x^3 - 2x^2 + 5) + (-x^3 - x^2 + 4x - 2)$

**86.** $(9x^2 - 8x + 3) - (2x^2 + x - 4)$

**87.** $(4d + 3)(4d - 5)$

**88.** $(4d + 3) + (4d - 5)$

**89.** $(2a + 5)^2$

**90.** $(z^2 - 5z + 3)(z - 1)$

**Addendum**
**Required for Accelerated Algebra II**
**Optional for Regular Algebra II**

**91.** Consider the graph of $Ax + By = C$. If $B \neq 0$ what is the slope and the y-intercept of the line?

**92.** Insert grouping symbols as needed to make $1 + 3 \cdot 2^2 = 49$ a true statement.

**93.** Solve $|x + 2| = |2x - 4|$ and explain your method to find the solution/solutions.

**94.** $-49 > 7(2x + 3)$

**95.** Write a linear equation whose graph is between the graphs of $x + y = 5$ and $x + y = -5$.

**96.** Find x so that the line through the points (x, 2) and (4, -6) has a slope of $-\dfrac{8}{3}$.

**97.** Find the value of k in the equation $5x + ky = 8$ if (3, -1) is a solution of the equation.

**98.** Determine if $x - 4y = 5$ and $4y - x = 2$ are perpendicular.

**99.** Find the vertices of the triangle whose sides contain the lines $5x - 3y = -7$, $x + 2y = 9$, and $3x - 7y = 1$.

**100.** Solve for y; $0.25y - 0.5x = 4.5$.

**101.** Write an equation in standard form for the line with x-intercept $-\dfrac{1}{2}$ and through the point $(8, -1)$.

**102.** Write an equation, in slope intercept form, for the line that contains the point (1, 4) and is perpendicular to the line 3x + 4y = -8.

**103.** Determine the constant k so that the graph of $3x + (k +1)y = k - 1$ will have a slope of 2.

**104.** Write an inequality that has $(10,15)$, $(-10, 20)$, $(-20, -25)$ and $(25, -10)$ in the solution set.

**105.** Factor: $5x^2 - 17x + 6$.

**106.** Factor: $3x^2 + 20x - 7$.