Amity Regional High School

Entering Algebra 1 Essential Skills

Welcome to Algebra 1 at Amity High School!

We're excited to have you join us this fall, and the Math Department is eager to help you reach your fullest potential in this exciting new chapter. Our Algebra 1 course is designed to challenge and inspire you, building on the foundational skills you've developed in Pre-Algebra. To help you prepare for the year ahead, we've put together a summer math packet aimed at keeping your skills sharp and ensuring a strong start to the course.

Our expectations in the Amity Math Department are high, and we believe that with effort and determination, every student can succeed. By completing this packet over the summer, you'll reinforce key concepts and be well-prepared for the rigorous, rewarding work we'll tackle together in Algebra 1. If you need a little extra support as you work through this packet aside from the guides provided, there are many excellent online resources available to help you. Websites like **Khan Academy**, **IXL**, and **Desmos** offer free tutorials, practice exercises, and interactive tools designed to reinforce math concepts and build confidence. Remember, it's okay to look for help—these resources are here to guide you and ensure you feel ready to succeed in Algebra 1.

We can't wait to see you in the fall, ready to dive into learning and growing in math! Have a great summer, and remember to take your time, review your work, and enjoy the process. See you soon!

Sincerely,
The Amity Algebra 1 Team

Evaluating Algebraic Expressions

1. Substitute the given values for the variables in the expression
2. Evaluate the expression using the order of operations
   - Parentheses/Brackets (inside to outside)
   - Exponents
   - Multiplication/Division (left to right)
   - Addition/Subtraction (left to right)

ex: $9x^2 - 4(y + 3z)$
for $x = -3$, $y = 2$, $z = 5$

$9(-3)^2 - 4(2 + 3 \cdot 5)$

$9(-3)^2 - 4(2 + 15)$

$9(-3)^2 - 4 \cdot 17$

$9 \cdot 9 - 4 \cdot 17$

$81 - 4 \cdot 17$

$81 - 68 = \boxed{13}$

The Distributive Property

1. Multiply the number outside the parentheses by each term in the parentheses.
2. Keep the addition/subtraction sign between each term.

ex: $5(8x - 3)$

$5(8x - 3)$

$5(8x) - 5(3)$

$\boxed{40x - 15}$

Simplifying Algebraic Expressions

1. Clear any parentheses using the Distributive Property
2. Add or subtract like terms (use the sign in front of each term to determine whether to add or subtract)

ex: $2(3x - 4) - 12x + 9$

$2(3x - 4) - 12x + 9$

$6x - 8 - 12x + 9$

$\boxed{-6x + 1}$

Evaluate each expression for $a = 9$, $b = -3$, $c = -2$, $d = 7$. Show your work.

1. $a - cd$	2. $2b^3 + c^2$	3. $\frac{a + d - c}{b}$	4. $(a - b)^2 + d(a + c)$
5. $4c - (b - a)$	6. $\frac{a}{b} - 5a$	7. $2bc + d(12 - 5)$	8. $b + 0.5[8 - (2c + a)]$

Simplify each expression using the Distributive Property.

9. $5(2g - 8)$	10. $7(y + 3)$	11. $-3(4w - 3)$	12. $(6r + 3)2$

Simplify each expression, showing all work.

13. $8(x + 1) - 12x$	14. $6w - 7 + 12w - 3z$	15. $9n - 8 + 3(2n - 11)$	16. $3(7x + 4y) - 2(2x + y)$
17. $(15 + 8d)(-5) - 24d + d$	18. $9(b - 1) - c + 3b + c$	19. $20f - 4(5f + 4) + 16$	20. $8(h - 4) - h - (h + 7)$

Solving One-Step Equations

1. Cancel out the number on the same side of the equal sign as the variable using inverse operations (addition/subtraction; multiplication/division)
2. Be sure to do the same thing to both sides of the equation!

ex: $-18 = 6j$

$\frac{-18}{6} = \frac{6j}{6}$

$-3 = j \rightarrow \boxed{j = -3}$

Solving Two-Step Equations

1. Undo operations one at a time with inverse operations, using the order of operations in reverse (i.e. undo addition/subtraction before multiplication/division)
2. Be sure to always do the same thing to both sides of the equation!

ex: $\frac{a}{7} - 12 = -9$

$\frac{a}{7} - 12 = -9$

$+12 \quad +12$

$7 \times \frac{a}{7} = 3 \times 7$

$\boxed{a = 21}$

Solving Multi-Step Equations

1. Clear any parentheses using the Distributive Property
2. Combine like terms on each side of the equal sign
3. Get the variable terms on the same side of the equation by adding/subtracting a variable term to/from both sides of the equation to cancel it out on one side
4. The equation is now a two-step equation, so finish solving it as described above

ex: $5(2x - 1) = 3x + 4x - 1$

$10x - 5 = 3x + 4x - 1$

$10x - 5 = 7x - 1$

$-7x \quad -7x$

$3x - 5 = -1$

$+5 \quad +5$

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

$\boxed{x = \frac{4}{3}}$

Solve each equation, showing all work.

21. $f - 64 = -23$	22. $-7 = 2d$	23. $\frac{b}{-12} = -6$	24. $13 = m + 21$
25. $5x - 3 = -28$	26. $\frac{w + 8}{-3} = -9$	27. $-8 + \frac{h}{4} = 13$	28. $22 = 6y + 7$
29. $8x - 4 = 3x + 1$	30. $-2(5d - 8) = 20$	31. $7r + 21 = 49r$	32. $-9g - 3 = -3(3g + 2)$
33. $5(3x - 2) = 5(4x + 1)$	34. $3d - 4 + d = 8d - (-12)$	35. $f - 6 = -2f + 3(f - 2)$	36. $-2(y - 1) = 4y - (y + 2)$

Scientific Notation

Standard Form to Scientific Notation: move the decimal after the first non-zero digit and eliminate any trailing zeros. Multiply by 10 to the power equal to the number of places you moved the decimal point. If the original number was greater than 1, the exponent is positive. If the number was less than 1, the exponent is negative.

ex: 0.0000571

0.0000571

Original number < 1, so negative exponent

$= 5.71 \times 10^{-5}$

Scientific Notation to Standard Form: move the decimal point the number of places indicated by the exponent. If the exponent is positive, move the decimal right. If negative, move left.

ex: 3.5×10^{3}

Positive exponent, so move decimal right

$3.500. = 3{,}500$

Negative Exponents & Simplifying Monomials

Zero Exponent: Any number raised to the zero power equals 1

ex: $y^0 = 1$

Negative Exponent: Move the base to the opposite side of the fraction line and make the exponent positive

ex: $x^{-4} = \frac{1}{x^4}$

Monomial x Monomial: Multiply the coefficients and add the exponents of like bases

ex: $(4x^3)(2x^5) = 8x^8$

Monomial ÷ Monomial: Divide the coefficients and subtract the exponents of like bases

ex: $\frac{a}{a^6} = a^{-5} = \frac{1}{a^5}$

Power of a Monomial: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents

ex: $(-2fg^5)^3 = -8f^3g^{15}$

Power of a Quotient: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents

ex: $\left(\frac{5d^3}{c}\right)^2 = \frac{25d^6}{c^2}$

Convert each number to Scientific Notation.

37. 67,000,000,000	38. 0.0009213	39. 0.00000000004	40. 3,201,000,000,000,000

Convert each number to Standard Form.

41. 5.92×10^{-5}	42. 1.1×10^{7}	43. 6.733×10^{-8}	44. 3.27×10^{2}

Simplify each expression. Write your answers using only positive exponents.

45. w^{-9}	46. $\frac{m^5}{m^2}$	47. $f^5 \cdot f^3$	48. $\left(\frac{h^2}{g}\right)^3$
49. $(a^5)^2$	50. $\frac{1}{b^{-3}}$	51. z^0	52. $4r^6 \cdot 3r \cdot 2r^2$
53. $\frac{qp^{-2}}{3q^{-3}}$	54. $\frac{8d^3}{2cd^{-2}}$	55. $(g^4h)^2 \cdot (2g^3h^{-1})^2$	56. $(6a)^0$
57. $(-3n^2k^4)^2$	58. $\left(\frac{w^5x^{-2}y}{w^2xy^4}\right)^3$	59. $\frac{6 \cdot 10^7}{2 \cdot 10^3}$	60. $(1.5 \cdot 10^{-6}) \cdot (4 \cdot 10^9)$

Slope & Rate of Change

Finding the Slope Given Two Points: Use the coordinates from the points in the slope formula:

$$\text{Slope } (m) = \frac{y_2 - y_1}{x_2 - x_1}$$

ex: (4, -2), (-3, 8)

x_1 y_1 x_2 y_2

$$m = \frac{8-(-2)}{-3-4} = \frac{10}{-7} = \boxed{-\frac{10}{7}}$$

Finding the Rate of Change From a Table: Determine the amount the dependent variable (y) is changing and the amount the independent variable (x) is changing.

$$\text{Rate of Change} = \frac{\text{change in y}}{\text{change in x}}$$

ex:

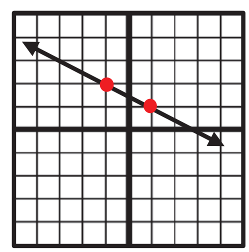
+2 +2 +2

	# months	3	5	7	9
x	# months	3	5	7	9
y	Cost ($)	80	130	180	230

+50 +50 +50

$$m = \frac{50}{2} = \boxed{\text{25 dollars/month}}$$

Finding the Slope From a Graph: Choose 2 points on the graph. Find the vertical change (rise) and horizontal change (run) between the 2 points and write it as a fraction $\frac{\text{rise}}{\text{run}}$. (Up is positive, down is negative, right is positive, and left is negative).



rise = +1
run = -2

$$m = \frac{1}{-2} = \boxed{-\frac{1}{2}}$$

Graphing Linear Equations

Slope-Intercept Form: $y = mx + b$

slope (m) y-intercept (b)

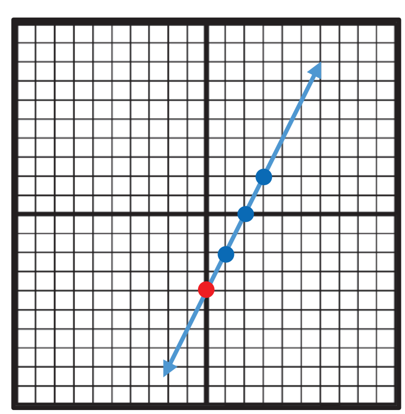
ex: $y = 2x - 4$

y-intercept: -4

slope: $2 = \frac{2}{1}$ ← rise ← run

How To Graph:

1. Make a point on the y-axis at the y-intercept.
2. Use the slope to determine where to make the next point. The numerator tells you the rise (how far up/down) and the denominator tells you the run (how far right/left) to make the next point.
3. Repeat to make more points and then connect the points with a line.



Find the slope of the line that passes through the points. Show your work.

61. (-5, 3), (2, 1)

62. (8, 4), (11, 6)

63. (9, 3), (9, -1)

64. (-4, -2), (-6, 4)

Find the rate of change. Show your work.

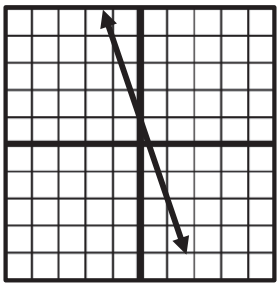
65.

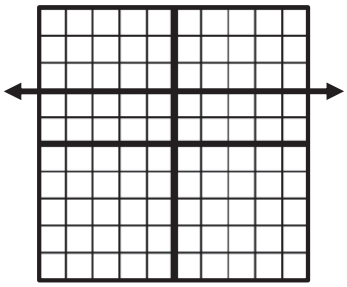
Number of Hours	3	6	9	12
Distance (in miles)	135	270	405	540

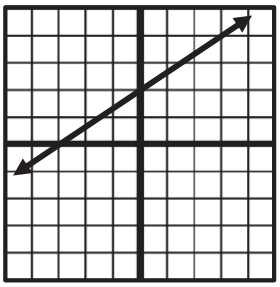
66.

Number of Weeks	1	3	5	7
Pounds	173	169	165	161

Find the slope of the line.

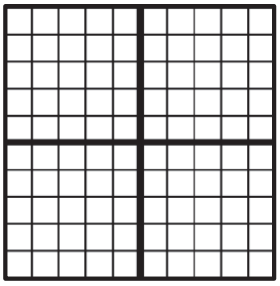
67. 

68. 

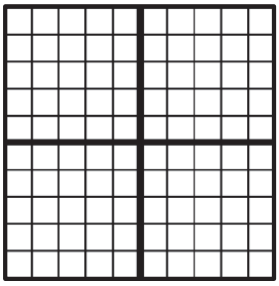
69. 

Graph the line.

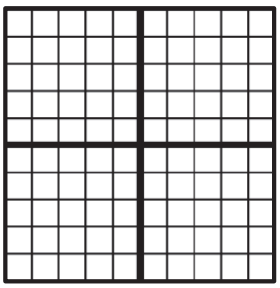
70. $y = -x - 3$



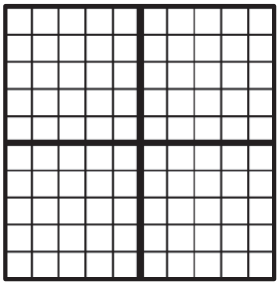
71. $y = \frac{1}{3}x + 2$



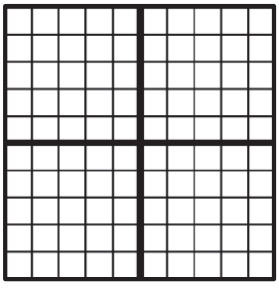
72. $y = -3x - 1$



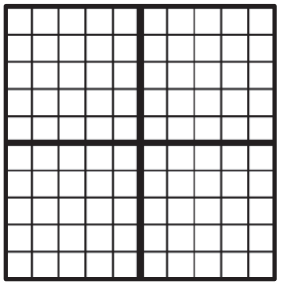
73. $y = -\frac{3}{2}x - 2$



74. $y = 2x + 1$



75. $y = \frac{1}{4}x$



Add or subtract.

1. $-9+(-15)$	2. $2+(-3)$	3. $\frac{2}{3}-\frac{7}{3}$
4. $-6-11$	5. $-13.2+8$	6. $-12-(-10)$

Multiply or Divide.

7. $2(-7)$	8. $-8 \cdot 2$	9. $9 \div 3$
10. $25 \div (-5)$	11. $-30 \div -6$	12. $\frac{-1}{7}(-7)$

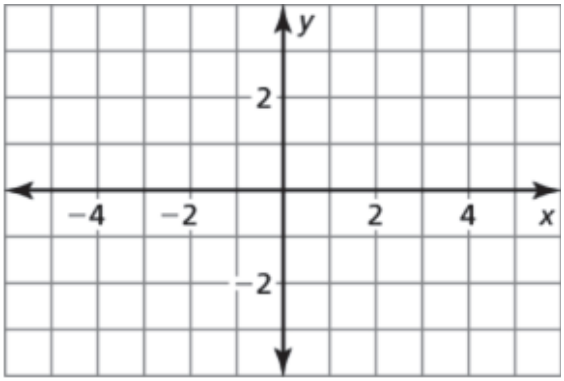
Complete the statement with <, >, or =.

19. 3 _____ 7	20. -1 _____ $\frac{5}{6}$
21. - 4 _____ -10.3	22. - 6 _____ $\lvert -3 \rvert$

Evaluate the expression for the given value of *x*.

23. $2x - 6; x = 9$	24. $-7 + 9x; x = -3$

Plot the point in the coordinate plane. Describe the location of the point.



25. A (4,-2) _____

26. B (-1,3) _____

27. C (-5,-3) _____

28. D (3,0) _____

Solve the equation for *y*.

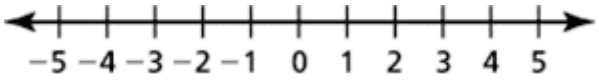
29. $2x - y = 3$	30. $3x + 2y = -4$

31. $0 = 7x - y + 12$

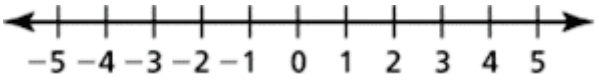
32. $-2y + x = 4y - 6$

Solve the inequality. Graph the solution.

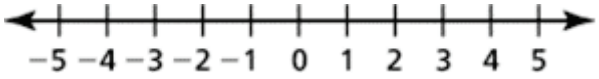
33. $p + 6 > 9$



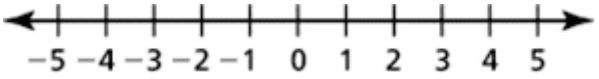
34. $3x - 4 < 2$



35. $-4m + 6 \leq 22$

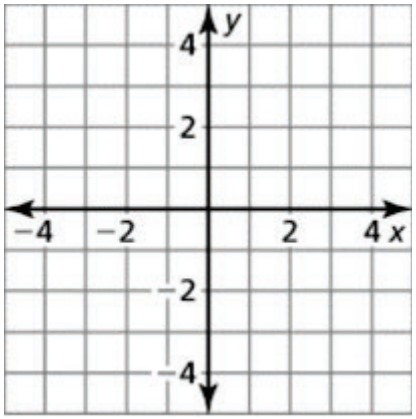


36. $5x + 1 \leq 3x - 9$

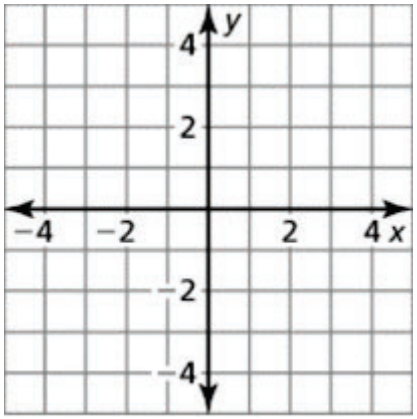


Graph the equation.

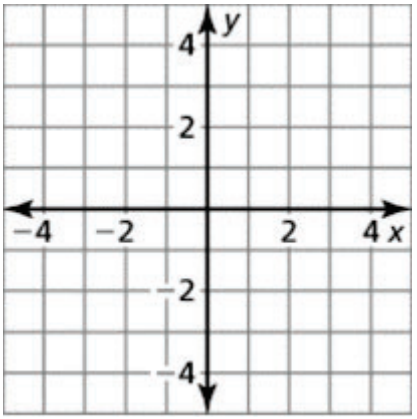
37. $y = 2x + 2$



38. $2y + x = 8$



39. $2x - 3y = 6$



Write an equation in slope intercept form from the given information:

24)

X	Y
-6	10
-3	15
0	20

25) parallel to $y = 3x + 6$ and has a y-intercept of 4

26) **Timmy has $42 to spend on hats and gloves. Each hat cost $6, and each pair of gloves cost $7. Help Timmy know many of each he can buy. Let *x* represent the number of hats purchased and *y* represent the number of gloves purchased.**

A. Write an equation in ***standard form*** that represents this situation.

B. What is the greatest number of hats Timmy can buy?

C. What is the greatest number of gloves Timmy can buy?

27) **Riko's pizza sells cheese pizzas for $12 plus $2 for each additional topping. Let *y* be the final cost of the pizza and *x* be the number of toppings.**

A. Write an equation in **slope intercept form** that represents this situation.

B. What does the slope mean?

C. What does the y-intercept mean?

D. If a person spent $24 on their pizza, how many toppings did they get?