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. $\dfrac{a + d - c}{b}$	4. $(a - b)^2 + d(a + c)$
5. $4c - (b - a)$	6. $\dfrac{a}{b} - 5a$	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: $-18 = 6j$

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

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

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: $\dfrac{a}{7} - 12 = -9$

$$\frac{a}{7} - 12 = -9$$
$$+ 12 \quad + 12$$
$$\overline{\frac{a}{7}}$$
$$7 \times \frac{a}{7} = 3 \times 7$$

$\boxed{a = 21}$

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

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

$10x - 5 = 7x - 1$

$\quad - 7x \qquad - 7x$

$3x - 5 = -1$

$\quad + 5 \quad + 5$

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

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

Solve each equation, showing all work.

21. $f - 64 = -23$	22. $-7 = 2d$	23. $\dfrac{b}{-12} = -6$	24. $13 = m + 21$
25. $5x - 3 = -28$	26. $\dfrac{w + 8}{-3} = -9$	27. $-8 + \dfrac{h}{4} = 13$	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. $-2(y - 1) = 4y - (y + 2)$

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: $(\underset{x_1 \ \ y_1}{4, -2}), \ (\underset{x_2 \ \ y_2}{-3, 8})$

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

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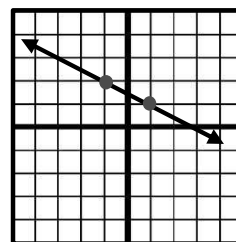
$$\text{Rate of Change} = \frac{\text{change in y}}{\text{change in x}}$$

ex:

		+2	+2	+2	
x	# months	3	5	7	9
y	Cost ($)	80	130	180	230
		+50	+50	+50	

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

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   y-intercept

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.

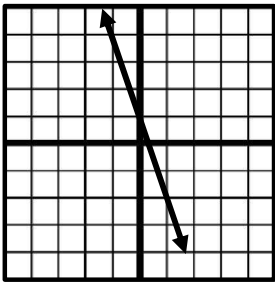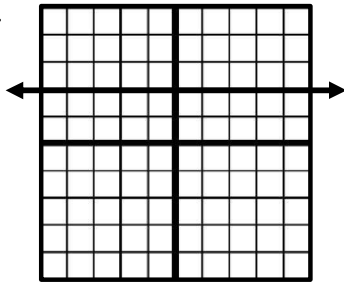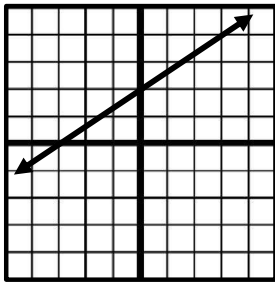3. Repeat to make more points and then connect the points with a line.

ex: $y = 2x - 4$

y-intercept: -4

slope: $2 = \frac{2}{1}$ ← rise
                    ← run
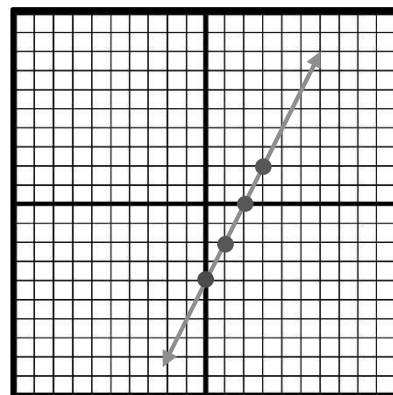
Find the slope of the line that passes through the points. Show your work.

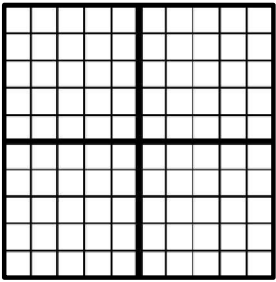| 61. (-5, 3), (2, 1)	62. (8, 4), (11, 6)	63. (9, 3), (9, -1)	64. (-4, -2), (-6, 4)
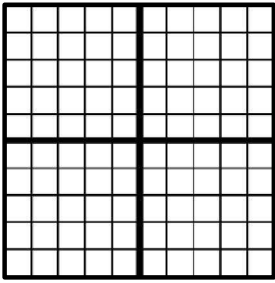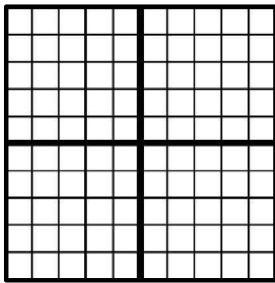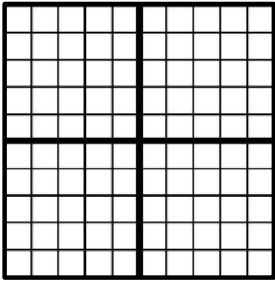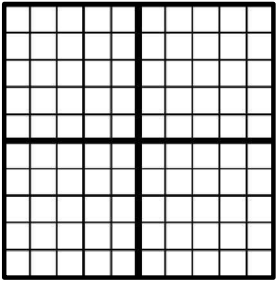
Find the rate of change. Show your work.

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