FORMULAE FOR LINEAR EQUATIONS

If You Have...		You Can Use...	To Get...
two ordered pairs (x_1, y_1) and (x_2, y_2)	①	plotting their coordinates	line graph
	②	Slope Formula: $\frac{y_2 - y_1}{x_2 - x_1} = m$	slope (m)
slope (m) and at least one ordered pair (x_1, y_1)	①	plot the one coordinate and use the slope to locate other(s)	two or more ordered pairs or a line graph
	②	Point Slope Form: $y - y_1 = m(x - x_1)$	slope-intercept form and y-intercept $y = mx + b$
slope-intercept form $y = mx + b$	①	m and b	identify slope(m) and the y-intercept(b)
	②	solve for ordered pairs	two or more ordered pairs or a line graph
	③	properties of equations to place x and y on same side	Standard equation form $Ax + By = C$
Standard equation or any form of equation	①	solve for ordered pairs	two or more ordered pairs and a line graph
	②	properties of equations to isolate y, then list x first.	slope-intercept form $y=mx + b$, for m and b.

Examples:

1. Find the slope of a line that contains the points (1,-4) and (4,-1)
   - **a.** Identify and **label**: x_1 y_1 and x_2 y_2 (1 , -4) (4 , -1)
   - **b.** Fill in the **slope formula**: $\frac{y_2 - y_1}{x_2 - x_1} = m$ and **solve**: $\frac{-1 - (-4)}{4 - 1} = \frac{3}{3} = 1$
   - **c.** Answer: Slope is 1 and can be used to find other points as 1/1

2. Find the equation of the above line (containing the points (1, -4) and (4,-1))
   - **a.** Using the steps from example 1 above, we got slope. Now we have slope and a point (either (1, -4) or (4, -1)) and we can use the **point slope formula**:
   - **b.** Fill in the **point slope formula**: $y - y_1 = m(x - x_1)$ y - (-4) = 1(x - 1)
   - **c.** And **solve**:

y - (-4) = 1(x - 1)	*plan: 1) isolate y on left*
	2) x, then number on right
y - (-4) = x - 1	*distribute 1 across x and -1*
y + 4 = x - 1	*subtraction changes -4 to +4*
y + 4 - 4 = x - 1 - 4	*negative 4 to each side*
y = x - 5	

   - **d.** Answer: equation is y = x - 5

SPECIAL CASES:

If you see...	**It means...**
x = 6 or a vertical line	slope is undefined (run = 0)
y = 4 or a horizontal line	slope is 0 (rise = 0)
parallel to...	slopes are the same
perpendicular to...	slopes are negative inverse (e.g. perpendicular to a slope of 2/3 is a slope of -3/2)
perpendicular to a vertical line	slope of new line is 0
perpendicular to a horizontal line	slope of new line is undefined.

GRAPHING VOCABULARY

Elementary Algebra (Hubbard & Robinson) *from Chapter 2*

x-axis - Originally the number line, on a graph this is the darkened, center, horizontal line. Increasing positive values of x are progressively to the right of 0; negative values are progressively to the left of 0. (****along the x-axis, the value of y is 0)**

y-axis - This is the darkened, center, vertical line on a graph. Where it crosses the x-axis, its value is 0. Increasing positive values of y are progressively up from 0; negative values are progressively down from 0. (****along the y-axis, the value of x is 0)**

origin - Where the x-axis and y-axis cross, the value of each, *x* and *y,* is 0; therefore the coordinates of the origin are the ordered pair (0, 0).

coordinate plane - (also called the **rectangular coordinate system** or **Cartesian coordinate system**) The graph with the x- and y-axes, allowing for plotting of coordinates.

quadrants - Each of the four regions of the coordinate plane, divided by the x- and y-axes.

Quadrant I is the region bordered by the positive side of the x-axis and the positive side of the y-axis; therefore all x- and y-coordinates are positive.

Quadrant II is the region bordered by the negative side of the x-axis and the positive side of the y-axis; therefore all x-coordinates are negative and all y-coordinates are positive.

Quadrant III is the region bordered by the negative side of the x-axis and the negative side of the y-axis; therefore all x- and y-coordinates are negative.

Quadrant IV is the region bordered by the positive side of the x-axis and the negative side of the y-axis; therefore all x-coordinates are positive and all y-coordinates are negative.

ordered pair - A set of two variables, (x, y) which can be plotted on the coordinate plane.

coordinates (of a point) - The identification, using the ordered pair, (x, y), of a specific point on the coordinate plane.

plotting - Placing a point on the coordinate plane by using the ordered pair (x, y) as coordinates.

graphing - Plotting and connecting points on the coordinate plane.

GRAPHING VOCABULARY

Elementary Algebra (Hubbard & Robinson) *from Chapter 4*

slope (*m*) - The pattern of changes in coordinates that creates a line. This is written as a fraction in reduced form and can be described as the vertical change over the horizontal change, the rise over the run, the change in *y* over the change in *x*, or as $\frac{y_2 - y_1}{x_2 - x_1} = m$

undefined - When a solution in fractional form has 0 as the denominator. This happens when determining the slope of a vertical line, (x = 3) because the change in *x* $(x_2 - x_1) = 0$.

constant (k)- A numerical quantity that does not change.

y varies directly (with x) - This can be written as $y/x = k$ or as $y = kx$ and is also described as **y is proportional (to x)**. Used in the $y = kx$ form in graphing, be aware that *k* is equivalent with the slope of your line.

parallel lines - Two lines that will never intersect or cross. In graphing, this means that the two lines have the same slope.

perpendicular lines - Two lines that intersect or cross with right (90^o) angles. In graphing, this means that the two lines' slopes are the negative inverse of each other (e.g. one line may have a slope of -1/5; the perpendicular line's slope is +5/1 or 5).

parallelogram - Quadrilateral (four-sided figure) whose opposite sides are parallel. In graphing, this means that the lines forming opposite sides will have the same slopes.

rectangle - Parallelogram (meaning opposite sides are parallel) whose adjacent sides are perpendicular. In graphing, this means that the lines adjacent to one another will have slopes that are the negative inverse of each other.