



## Concept: Equation of a Straight Line

Name:

### PART A: COMPUTER COMPONENT

**Instructions:** Select the computer program *Understanding Graphing* (Neufeld).  
Follow the instructions to the Main Menu.  
Select *Equation of a Straight Line* from the Main Menu.



Work through all sections of the following **in order**:

- *Graph  $y=mx+b$*
- *Slope y-intercept Equations*
- *Exercises: Slope, y- intercept*
- *Parallel & Perpendicular Lines*

Notice: You will not be finishing the entire topic before stopping to complete some **OFF COMPUTER EXERCISES**.

ADDITIONAL REQUIRED MATERIALS: Graph Paper



As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Parallel & Perpendicular Lines* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

### NOTES

▷ The y intercept is the value of the  $y$  coordinate at the point where the x coordinate is zero.

▷ We can graph a straight line by finding one point (*the easiest point is found by determining the  $y$  -intercept and then using the slope to sketch the line*).

▷ The equation of a straight line can be expressed in the form  $y = \underline{mx + b}$ .

Where  $m$  is the slope and  $b$  is the y-intercept.

▷ When 2 lines are parallel, the lines will never intersect. Their slopes are the same.

▷ When 2 lines are perpendicular, the lines meet at 90 degrees. Their slopes are negative reciprocal.



When you have completed **PART A: NOTES**, move on to **PART A: OFF COMPUTER EXERCISES** below.

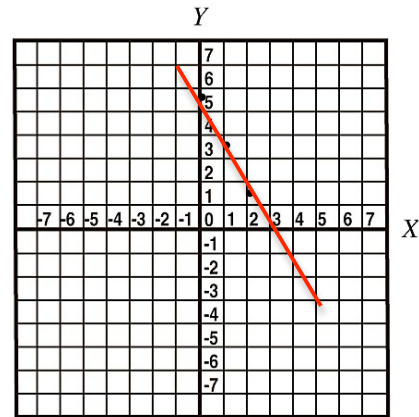
**OFF COMPUTER EXERCISES**

REMEMBER: You will require extra sheets of graph paper for this section.

1. For each of the 2 lines below, you are given the slope and the y-intercept. For each line, write the equation and graph it on grid paper using the slope and y-intercept. Then, check your graph by finding a third point on the line.

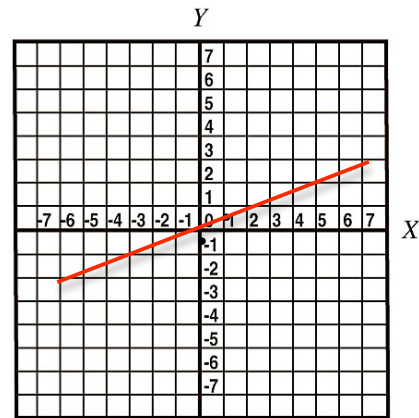
(a) Slope of  $-2$ , y-intercept of  $5$

Equation:  $y = mx + b$  therefore,  $y = -2x + 5$



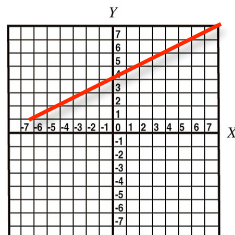
(b) Slope of  $\frac{1}{2}$ , y-intercept of  $0$

Equation:  $y = mx + b$  therefore,  $y = \frac{1}{2}x$

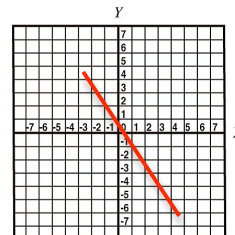


2. Use the slope and the y intercept to graph each of the following lines. Then, use a 3<sup>rd</sup> point on the line to check your graph.

(a)  $y = \frac{2x}{5} + 3$



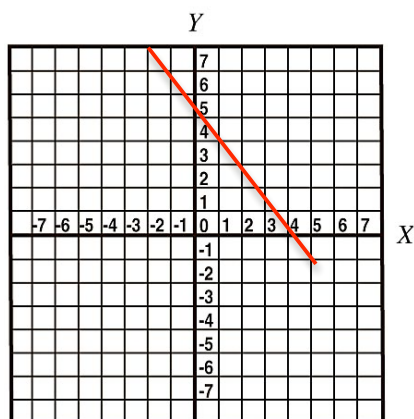
(b)  $y = \frac{-3x}{2} - 1$



3. A line has an x-intercept of 4 and a y-intercept of 5. *Graph this line.*

Equation:

$$5x + 4y = 20$$



4. You are given the line.  $y = 3x + 2$

(a) The slope is 3.

(b) The y intercept is 2.

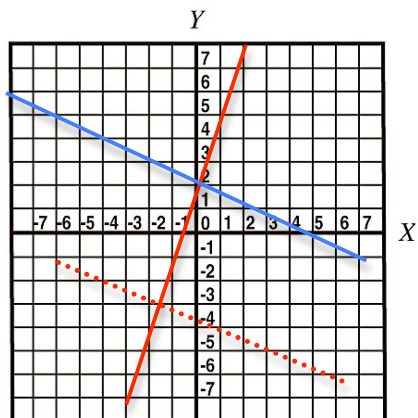
(c) *Use the y intercept and the slope to graph this line on grid paper.*

(d) The slope of a line, which is perpendicular to the line above, is  $-\frac{1}{3}$

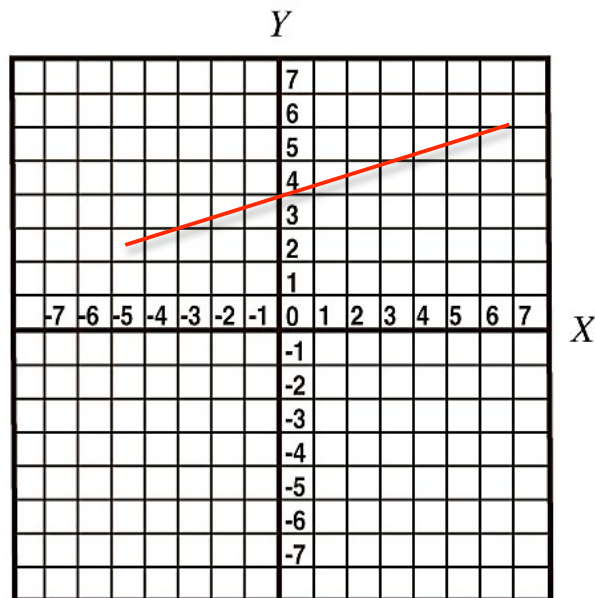
(e) On the grid paper, draw many lines which are perpendicular to  $y = 3x + 2$ .

(f) Use a red pencil to draw the particular perpendicular line, which has y intercept  $-4$ . *What is the equation of this red line?*

Equation:



5. Raul packages CDs and is paid according to  $y = .25x + 4$ , where  $y$  is his earnings and  $x$  is the number of CD's packaged.
- (a) Graph this equation.
- (b) Find the slope and interpret its meaning. *The slope is \$0.25, which is interpreted as being paid \$0.25 for each CD that is packaged.*
- (c) Find the  $y$  intercept and interpret its meaning. *The  $y$ -intercept is 4, which is interpreted as being paid a one-time rate of \$4.00.*



## Concept: Equation of a Straight Line

Name: \_\_\_\_\_

### PART B: COMPUTER COMPONENT

**Instructions:** Return to the program *Understanding Graphing* (Neufeld). Follow the instructions to the Main Menu. Select *Equation of a Straight Line* from The Main Menu. Use the *Jump To Menu* to select *Slope-Point Form of the Equation*.



Work through all sections of the following topics **in order**:

- *Slope-Point Form of the Equation*
- *Special Cases*
- *Example to Summarize*
- *Word Problems/Applications*
- *Point of Intersection of Two Lines*
- *Match- Equation, Graph, Points, Words*

ADDITIONAL REQUIRED MATERIALS: Graph Paper



As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Match- Equation, Graph, Points, Words* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

### NOTES

#### 1. Slope-Point Form of the Equation

▷ Copy out the question and both solutions to Example 1.

**Example 1: The Question:** Write the equation of a line that passes through the point  $(-2, 3)$ , has a slope of 3.

<u>Solution 1</u>	<u>Solution 2</u>
<p><b>Express the equation in slope y-Intercept form.</b></p> $y = mx + b$ <p>We know <math>x = -2</math>, <math>y = 3</math> and <math>m = 3</math> We can substitute the values in to the</p> <p>Equation: <math>y = mx + b</math></p> $3 = (3)(-2) + b$ $b = 9$ <p>Equation <math>y = 3x + 9</math></p>	<p><b>Express the equation in slope point form</b></p> <p>We know that we are given <math>(x_1, y_1)</math> and <math>(x_2, y_2)</math> then <math>m = \frac{y_2 - y_1}{x_2 - x_1}</math></p> <p>We know that one point is <math>(-2, 3)</math> We let the other point be <math>(x, y)</math> any point on this line</p> $3 = \frac{y - 3}{x - (-2)} = \frac{y - 3}{x + 2}$ <p>, multiply each side by <math>(x + 2)</math></p> $3(x + 2) = y - 3$ $3x + 6 = y - 3$ $y = 3x + 9$

2. Example to Summarize

**Question:** Write the equation of a line, which passes through the point  $(2, 3)$  and is perpendicular to the line  $2x + 3y + 4 = 0$

**The Solution:**

Step 1: Write the equation given to us in the form  $y = mx + b$ .

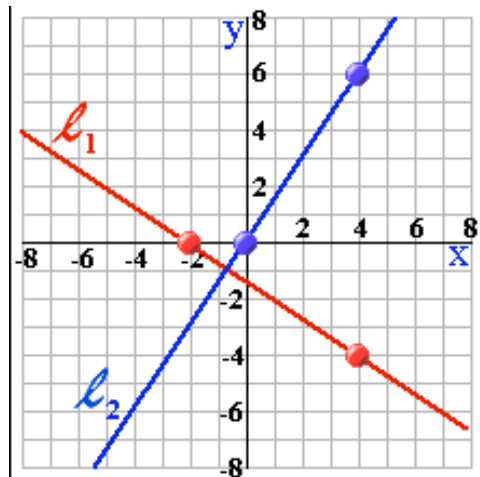
Step 2: Sketch the line from Step 1 (we called it  $l_1$ ).

Step 3: Then, the slope of  $l_2$  (which is perpendicular to  $l_1$ ) is  $\frac{3}{2}$

Step 4: There are two ways to approach this problem from this point on.  
Provide your own copy of the two solutions below.

<b>Solution 1 [Slope-y-intercept]</b>	<b>Solution 2 [Slope-point form]</b>
$3y = -2x - 4$ $y = \frac{-2}{3}x - \frac{4}{3}$ $y = mx + b$ $3 = \left(\frac{-2}{3}\right)(2) + b$ $b = 0$ $y = \frac{3}{2}x$	<p>Let <math>P(x, y)</math> be on <math>L_2</math></p> $\frac{3}{2} = \frac{y - 3}{x - 2}$ <p>Multiply each side by...</p> $(x - 2): y - 3 = \frac{3}{2}(x - 2)$ <p>Then <math>y = \frac{3}{2}x</math></p>

Step 5: Sketch  $l_2$  using the same axis used in Step 2.



### 3. Word Problems

- Record one of the problems, *from the computer exercises*, below. Then note and summarize the *Steps* involved. (*Answers/ Responses will vary*)

**Question:**

**The Solution:**

*Step 1:*

### 4. Point of Intersection of Two Lines

- The point of intersection of two lines is also called the *Solution* of the system.

When you reach the end of **PART B: Taking Notes**, move on to **PART B: Questions** below.  
Record your solutions in your notebook. Use grid paper when required to do so.

**OFF COMPUTER EXERCISES**

1. Write the equation of the line that,

(a) passes through the point (3,4) and has slope  $-3$ .

Equation:  $y = mx + b$   
 $x = 3, y = 4, m = -3$   
 $4 = (-3)(3) + b$   
 $b = 13$   
 $y = -3x + 13$

(b) passes through the point  $(-1, -4)$  and has slope  $\frac{1}{2}$ .

Equation:  $y = mx + b$   
 $x = -1, y = -4, m = \frac{1}{2}$   
 $-4 = (\frac{1}{2})(-1) + b$   
 $b = -3.5$   
 $y = \frac{1}{2}x - 3.5$

2. The baseball team went for ice cream after their game. Cones cost \$2 each and sundaes cost \$3 each. Let  $x$  be the number of cones bought and  $y$  be the number of sundaes bought.

(a) If the coach spent \$40 in total, write the equation that represents the above situation.

Equation:  $2x + 3y = 40$

(b) *What are the different combinations of purchases of number of cones ( $x$ ) and number of sundaes ( $y$ ) that could occur?*

(Record all possible answers in the table below.)

<b>x</b>	20	17	14	11	8	5	2
<b>y</b>	0	2	4	6	8	10	12

(c) Record the above information on a graph. Each point on the graph should represent another combination possibility.

Note: Do not join the points since only some points on the line represent possible combinations.

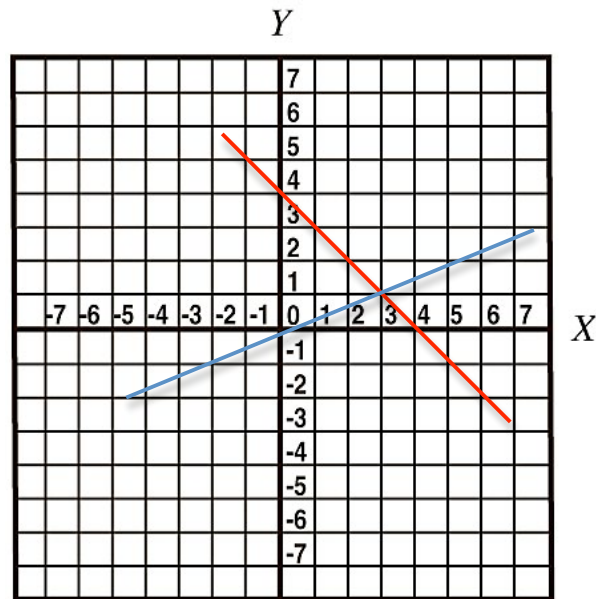
3. A car is expected to decrease in value according to the equation  $y = -2000x + 40000$
- (a) Find the slope and interpret its meaning. *The slope is -2000, which represents the value the car depreciates from year to year.  $x =$  number of years.*
- (b) Find the y-intercept and interpret its meaning. *The y-intercept is 40000, which represents the purchase price of the vehicle.*
4. Graph the following lines on grid paper  $x + y = 4$  and  $2y = x - 1$ .

What is the solution to this system?

$$y = mx + b$$

$$y = -x + 4 : \text{red line}$$

$$y = y = \frac{1}{2}x - \frac{1}{2} : \text{blue line}$$



**WHEN YOU REACH THE END OF PART B : QUESTIONS**

**Instructions :** Return to the program *Understanding Graphing* (Neufeld).  
 Follow the instructions to the Main Menu.  
 Select *Equation of a Straight Line* from the Main Menu.  
 Use the *Jump To Menu* to select *Practice Questions*.  
 Do 1 or 2 sets of 5 questions.

**Be prepared to hand this package along with all detailed solutions, including completed graphs, in to your teacher.**