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| ***Graphing Linear Equations***  **Handout** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Objective: To practice graphing linear equations in two variables**

**Segment 1**: Finding several ordered pairs that are solutions of the linear equation to graph the line.

A linear equation in two variables is an equation that can be put in the form *Ax + By = C* , where *A, B,*  and *C* are real numbers and *A* and *B* are not both zero*.*

A solution of the equation is written as the ordered pair *(x, y)*.

Let’s review how to find the solution for equality. If we substitute a value for the variable *x*, then we can solve for *y.*

Practice: Which ordered pairs is a solution of the equation *3x – y = 10*?

1. (4, 0) (b) (3, -1) (c) (, 0)

When we have at least two of its solutions, we can graph the linear equation. The solutions will fall along a straight line. The complete set of solutions of this equation is represented by the line containing these points.

Note: If a point does not fall on the line, then that ordered pair is not a solution of the equation.

**Practice:** Fill in the blanks. Use one of the words in parentheses when choices are given.

* When finding the solution set for an equality, if you \_\_\_\_\_\_\_\_\_\_\_\_\_\_ for *y,*

then you can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a value for the variable *x*. **(solve, substitute, inspect)**

* When graphing the set of solutions for an equation, if a point does not fall

on the line, then that ordered pair \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ a solution of the

equation. **(is, is not)**

* When you have two sets of solutions, you can graph a linear equation.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(true, false)**

* When you plot the points of the set of solutions on a graph, they fall along

a straight line. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(true, false)**

**Practice:** Find at least two ordered pairs that satisfy each equation, and then draw

the line that is the graph of the equation.

1. 2*x* + *y* = - 4 (b) *y – x* = 7

|  |  |
| --- | --- |
| *x* | *y* |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| *x* | *y* |
|  |  |
|  |  |
|  |  |

|  |  |
| --- | --- |
| *x* | *y* |
|  |  |
|  |  |
|  |  |

**Segment 2**: Finding *x-* and *y-*intercepts of the linear equation to graph the line.

The points where the graph crosses the *x-*axis and *y-*axis are called intercepts.

* To find the y-intercept, let *x = 0*, and solve for y. You will get an ordered pair *( 0 , y ).*
* To find the x-intercept, let *y = 0*, and solve for x. You will get an ordered pair *( x , 0 ).*

Practice: Find x- and y-intercepts, and then draw the line that is the graph of the equation.

1. 2*x* - *y* = 4 (b) 4*x – y* = 0

|  |  |
| --- | --- |
| *x* | *y* |
| 0 |  |
|  | 0 |
|  |  |

|  |  |
| --- | --- |
| *x* | *y* |
| 0 |  |
|  | 0 |
|  |  |

|  |  |
| --- | --- |
| *x* | *y* |
|  |  |
|  |  |
|  |  |

Note: You can always find a third checkpoint.

**Segment 3**: Use the slope and the y-intercept of the linear equation to graph the line.

Let’s recall the slope formula and the slope-intercept form of the equation of the line.

Slope Formula

The slope of a line containing two points and is given by

The Slope-Intercept Form of the Equation of a Line

For any equation of the form, the slope if the line is *m* (the coefficient of *x*), and

the y-intercept is .

The slope and the y-intercept help us to graph a line. When we know the slope and the y-intercept of a line, we can determine the graph of a line and locate other points on the line.

Suppose we know the slope of a particular line is ¾ and the y-intercept is 2. Since the y-intercept is 2, we know one point on the line is (0, 2). First plot this point on the graph. Using the slope, we can find other points in the line. The slope is ¾ and we know . So, start at the y-intercept and move up 3 units along the y-axis, since 3 is positive. This represents the change in y. For the change in x, move 4 units to the right, to indicate a “run” of positive 4. Then connect the y-intercept and the point you have just found. You can continue “rise” of positive 3 and “run” of positive 4 to find more points.

Note that the slope of can also be expressed as, so moving down 3 units and 4 units to the left will also give us points on the line.

Note:

When we know the slope and the y-intercept of a line, we can determine the graph of the line and locate other points on the line.

Start from the y-intercept, and then use the slope to find a point.

For a lines with positive slopes,

-move up along the y-axis and over to the right, or

-move down along the y-axis and then to the left.

For lines with negative slopes,

-move up along the y-axis and over the left, or

-move down along the y-axis and then to the right.

**Practice:** Fill in the blanks using one of the words in the parentheses.

* To find points on a line with a positive slope, move either\_\_\_\_\_\_\_\_\_\_\_(**down, up**) and to the \_\_\_\_\_\_\_\_\_\_\_\_ (**left, right**) or\_\_\_\_\_\_\_\_\_\_(**down, up**) and to the\_\_\_\_\_\_\_\_\_\_\_\_\_ . (**left, right**)
* To find points on a line with a negative slope, move either\_\_\_\_\_\_\_\_\_\_\_(**down, up**) and to the \_\_\_\_\_\_\_\_\_\_\_\_ (**left, right**) or\_\_\_\_\_\_\_\_\_\_(**down, up**) and to the\_\_\_\_\_\_\_\_\_\_\_\_\_ . (**left, right**)
* The *y*-intercept of a line is the point at which the line crosses the\_\_\_\_\_\_\_\_\_\_\_. (***x*-axis, *y*-axis**)

Practice: For each graph, 1) Plot the *y*-intercept. 2) Use the slope to find a second point on the line. 3) Connect the points to draw the equation of the line.

1. (b) (c)

Note: We can use any given point (not necessarily the y-intercept) and its slope to determine the graph of the line.

**Segment 4**: Graphing horizontal and vertical lines

The liner equation in which one of the variables is missing is either a horizontal line or a vertical line.

* The graph of is a vertical line parallel to the y-axis that intersects the x-axis at *k*.
* The graph of is a horizontal line parallel to the x-axis that intersects the y-axis at .
* Horizontal line is neither increasing nor decreasing from left to right, and it has , thus the **slope of any horizontal line is *0****.*
* Vertical line has , so the denominator of is 0. Thus, the **slope of any vertical line is undefined.**

Practice: Graph the given line

1. (b) (c) Passing through *( 3, 1 )* with undefined slope

**SELF-REFLECTION ACTIVITY**

- Which segment of graphing linear equations was most challenging for you?

- What steps are you going to take to learn this subject?