**SUPPLEMENTAL INSTRUCTION ACTIVITY**

**TOPIC:** Equations of Lines

**APPLICABLE COURSES:** All math courses starting from Math 058/059 and other courses in other divisions.

**LEARNING OUTCOME:** (What will students be able to do by the end of the workshop?)

- Students will study how to write the point-slope and slope-intercept forms of linear equations.

**CONTENT:** (What do students need to know to accomplish the outcome?)

1. Recall the definition of the slope. Recall the slopes of horizontal and vertical lines.

2. Introduce the Slope-Intercept and Point-Slope formulas.

3. Find the equation of a line in using the point-slope formula

a. given the point and the slope.

b. given two points.

4. Find the equation of a line given a point on the line and equation of a parallel/perpendicular line.

**METHOD:** (How will the instructor deliver content? Short lecture, handouts, Powerpoint, other audio-visual presentation)

Teach 1 (5 minutes)

Practice 1 (10 minutes)

Teach 2 and 3 (5 minutes)

Practice 3a (5 minutes)

Practice 3b (5 minutes)

Teach 4 (5 minutes)

Practice 4 (10 minutes)

Quiz (10 minutes)

Self-reflection (5-10 minutes)

The lesson is divided into segments composed of lecture and examples followed by student practice and sharing.

First, the instructor distributes the exercise worksheet and any supporting handouts.

Then the instructor presents segments 1 (definition of the slope, slopes of horizontal and vertical lines). After this brief lecture with examples, students individually think about how they will find the slope in the set of problems for the segment (2 min), and then complete them (5 min). Next, in pairs, students each take a turn to explain to their partner how they solved one of the problems (3 min). At the end of this 10 minute segment, the instructor posts the solutions/answers on the screen for students to check their work.

Follow the same lecture/practice procedure for segments 2 and 3 (Slope-Intercept and Point-Slope formulas) and segment 4 (parallel/perpendicular lines).

Note: If time is short, only one student explains his/her process to the partner for each segment of the lesson, taking turns for each segment.

Next students complete a quiz where they are asked to find equations of lines. After completing the quiz, the instructor posts the solutions/answers on the screen. Students check their results.

Then they complete the self-reflection activity. The instructor can also look over the quizzes while the students are completing the self-reflection activity to give feedback to students.

**ACTIVE LEARNING STRATEGIES:** (How will students apply their knowledge? Solve a problem, create a project, analyze a case, explain a process)

Students reflect on the exercises and teach each other by verbalizing the steps they took to reach their conclusions.

**ASSESSMENT METHOD:** (How will the instructor know that the students met the outcome? Check for understanding. )

(10 minutes.)

Students complete a quiz where they are asked to find equations of lines. After completing the quiz, the instructor posts the solutions/answers on the screen. Students check their results. The instructor can also look over the quizzes while the students are completing the self-reflection activity to give feedback to students.  
If students do not successfully complete the worksheet quiz, they may be referred to individual tutoring or a guided learning activity.

**SELF-REFLECTION ACTIVITY:** (What will the instructor do to get students to reflect on how they learned the content? What they learned, how they learned it, how they will apply it in their coursework)

(5 - 10 minutes.)

-Which segment of the equations of lines was most challenging for you?

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

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| ***Equations of Lines***  **Handout** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Objective: To practice writing the point-slope and slope-intercept forms of linear equations**

**Segment 1**: The slope of a straight line.

The slope of a line is a measure of the steepness of the line. The symbol for the slope is *m*.

Slope Formula

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

* 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: Find the slope of the line containing the points whose coordinates are:

1. (-1, 3) and (4, 5) (b) (2, -2) and (2, 7) (c) (-1, 5) and (0, 5)

**Segment 2**: Slope-Intercept and Point-Slope formulas.

There is a relationship between the slope and the y-intercept of a line and the line’s equation.

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 .

Another useful form of the equation of a line is the point-slope from, which can easily be derived from the slope formula.

The Point-Slope Form of the Equation of a Line

The equation of the line that has slope *m* and contains the point whose coordinates are can be found by the point-slope formula:

Practice: Fill in the blanks.

* If the equation is given in the form , you can quickly determine

the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

* The equation is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form.
* Name a point that passes through. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Note: 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 .

**Segment 3**: Find the equation of a line in using the point-slope formula.

Practice: Use the point-slope formula to find the equation of a line with the given information:

1. Passes through (-2, -1), (b) Passes through

(c) Passes through (3, 2) and (-3, -6) (d) Passes through (4, 1) and (-3, 1)

**Segment 4**: Find the equation of a line given a point on the line and equation of a parallel/perpendicular line.

* Two lines are parallel if and only if they have the same slope.
* Two lines are perpendicular if and only if their slopes are negative reciprocals.

Practice: Fill in the blanks.

* All lines parallel to the line will have a slope of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* All lines perpendicular to the line will have a slope of \_\_\_\_\_\_\_\_\_\_\_.

Practice: Determine the equation in slope-intercept form that satisfies each of the following:

1. Passes through (-3, 4) and is parallel to .
2. Passes through (-3, 4) and is perpendicular to .
3. Passes through (-3, 4) and is parallel to .

**SELF-REFLECTION ACTIVITY**

- Which segment of the equations of lines was most challenging for you?

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

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| ***Equations of Lines***  **Handout-KEY** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

**Objective: To practice writing the point-slope and slope-intercept forms of linear equations**

**Segment 1**: The slope of a straight line.

The slope of a line is a measure of the steepness of the line. The symbol for the slope is *m*.

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* Vertical line has , so the denominator of is 0. Thus, the **slope of any vertical line is undefined.**

Practice: Find the slope of the line containing the points whose coordinates are:

1. (-1, 3) and (4, 5) (b) (2, -2) and (2, 7) (c) (-1, 5) and (0, 5)

Ans: Ans: Slope is undefined Ans:

**Segment 2**: Slope-Intercept and Point-Slope formulas.

There is a relationship between the slope and the y-intercept of a line and the line’s equation.

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 .

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The Point-Slope Form of the Equation of a Line

The equation of the line that has slope *m* and contains the point whose coordinates are can be found by the point-slope formula:

Practice: Fill in the blanks.

* If the equation is given in the form , you can quickly determine

the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Ans: slope and the y-intercept

* The equation is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form. Ans: point-slope form
* Name a point that passes through. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Ans: (3, 4)

Note: 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 .

**Segment 3**: Find the equation of a line in using the point-slope formula.

Practice: Use the point-slope formula to find the equation of a line with the given information:

1. Passes through (-2, -1), (b) Passes through

Ans: Ans:

(c) Passes through (3, 2) and (-3, -6) (d) Passes through (4, 1) and (-3, 1)

Ans: Ans:

**Segment 4**: Find the equation of a line given a point on the line and equation of a parallel/perpendicular line.

* Two lines are parallel if and only if they have the same slope.
* Two lines are perpendicular if and only if their slopes are negative reciprocals.

Practice: Fill in the blanks.

* All lines parallel to the line will have a slope of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Ans:
* All lines perpendicular to the line will have a slope of \_\_\_\_\_\_\_\_\_\_\_. Ans:

Practice: Determine the equation in slope-intercept form that satisfies each of the following:

1. Passes through (-3, 4) and is parallel to .

Ans:

1. Passes through (-3, 4) and is perpendicular to .

Ans:

1. Passes through (-3, 4) and is parallel to .

Ans:

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| ***Equations of Lines***  **Quiz** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

1. Find the equation of the line in slope-intercept form that goes through the points and .

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Find the equation of the line in slope-intercept form that goes through (–3, 1) with slope .

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Find the equation of the line in the slope-intercept form that passes through the point (0, 3) and perpendicular to the line whose equation is .

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Find the equation of the line that passes through the point (-4, 3) and has an undefined slope.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Find the equation of the line in slope-intercept form that goes through the point (1, 4) and is parallel to 2x – 5y = 7.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| ***Equations of Lines***  **Quiz-KEY** | **Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |

1. Find the equation of the line in slope-intercept form that goes through the points and .

Answer: 

1. Find the equation of the line in slope-intercept form that goes through (–3, 1) with slope .

Answer: 

1. Find the equation of the line in the slope-intercept form that passes through the point (0, 3) and perpendicular to the line whose equation is .

Answer: 

1. Find the equation of the line that passes through the point (-4, 3) and has an undefined slope.

Answer: *x* = -4

1. Find the equation of the line in slope-intercept form that goes through the point (1, 4) and is parallel to 2x – 5y = 7.

Answer: