DAY 1

Performance Objectives:

➢ When the slope is explicitly given, students will be able to substitute in to the slope-intercept form of a line 3 out of 3 times.

➢ Given two ordered pairs that lie on the line, students will be able to recall the slope formula from memory and use it to calculate the slope of the line 9 out of 10 times.

➢ Given an equation in point-slope form, students will be able to identify the slope, or convert the equation to slope-intercept form and then identify the slope 4 out of 5 times.

➢ When the y-intercept is explicitly given, students will be able to substitute in to the slope-intercept form of a line3 out of 3 times.

➢ Given a point that lies on the line and the slope of the line, students will be able to substitute the values appropriately into slope-intercept form and solve the resulting equation for the y-intercept 4 out of 5 times.

➢ Given the slope and the y-intercept, students will be able to substitute the values into slope-intercept form of the equation of a line 5 out of 5 times.

Resources and Materials Needed

Materials:

✓ Extra copies of the homework due today: *Review Problems A-Day 1* (See Appendix A)

✓ Answers for the homework due today: *Review Problems A-Day 1* (See Appendix B)

✓ Copies of review problems: *Review Problems B-Day 1* (See Appendix C)

✓ Answers for the review problems: *Review Problems B-Day 1* (See Appendix D)

- ✓ PowerPoint about writing an equation of a line given 2 points or a point and slope: *Presentation-Day 1* (See Appendix E)

- ✓ Exit Ticket: *ExitTicket-Day 1* (See Appendix F)

- ✓ Exit Ticket: *ExitTicket-Day 1 KEY* (See Appendix G)

- ✓ Copies of tonight's homework assignment: *Homework-Day 1* (See Appendix H)

Resources:

- ✓ Projector

- ✓ Computer with access to Microsoft Office: PowerPoint

- ✓ Computer with access to internet

- ✓ Khan Academy Video link: https://www.khanacademy.org/math/algebra/two-var-linear-equations/writing-slope-intercept-equations/v/equation-of-a-line-3

- ✓ Whiteboard with markers and eraser

Time: 45 minutes.

Step 1: Pre-Instructional Activities: Check students' homework (review of calculating slope, and identifying slope from point-slope form, and solving multi-step equations with the variable on one side) and project answers on the board, answer student questions about the homework. Hand-out review problems (more of the same types of problems from the homework with a "push" question at the end, as a preview to what the students will be learning about during the lesson) and have students complete independently. Go over those solutions and answer any questions. The handed-out problems include problems that the slope and the y-intercept are given, and all the student must do it substitute it in to the general form.

Step 2: Content Presentation: Students take notes while teacher presents the PowerPoint which includes both the step-by-step procedure how to write the equation of a line (in slope-intercept form) given two points that lie on the line and examples in the pattern of "I do, We do, You do."

The steps are as follows:

1) Use the slope formula and the two given points to calculate the slope of the line that passes through them.

2) Substitute that slope and one of the ordered pairs into slope intercept form.

3) Solve the resulting equation for the y-intercept.

4) Write the equation of the line with the slope and y-intercept that you found.

Alternatively:

1) Use the slope formula and the two given points to calculate the slope of the line that passes through them.

2) Substitute that slope and one of the ordered pairs into point-slope form.

3) Transform the equation from point-slope form to slope-intercept form. (Solve the resulting equation for the y.)

Answers for the problems in the presentation:

Find the slope: Use the slope formula.

1. $(4,\ 5)\ and\ (-2,\ 8)$
$$m = \frac{8-5}{-2-5} = \frac{3}{-7} = -\frac{3}{7}$$

2. $(-3,\ -1)\ and\ (5,\ 7)$
$$m = \frac{7-(-1)}{5-(-3)} = \frac{7+1}{5+3} = \frac{8}{8} = 1$$

Write the equation of a line with the given information: Simply substitute.

1. $y = 3x - 1$
2. $y = \frac{1}{2}x + 2$

Show students both ways; substituting into slope-intercept form and solving for the y intercept and substituting into point-slope form and converting to slope-intercept form; using same set of points so they can see that no matter which method they chose, their final equation in slope-intercept form would be the same.

Write the equation of a line given two points.

3.

$(2, 8) \, and \, (-5, 1)$

$$m = \frac{1-8}{-5-2} = \frac{-7}{-7} = 1$$

$8 = 1(2) + b$

$8 = 2 + b$

$-2 \quad -2$

$6 = b$

$y = x + 6$

$y - 8 = 1(x - 2)$

$y - 8 = x - 2$

$+8 \quad\quad +8$

$y = x + 6$

4.

$(-7, 3)$ *and* $(-4, 1)$

$$m = \frac{1-3}{-4-(-7)} = \frac{-2}{-4+7} = \frac{-2}{3} = -\frac{2}{3}$$

$$3 = -\frac{2}{3}(-7) + b$$

$$3 = -\frac{2}{3}(\frac{-7}{1}) + b$$

$$3 = \frac{14}{3} + b$$

$$-\frac{14}{3} \quad -\frac{14}{3}$$

$$\frac{9}{3} - \frac{14}{3} = b$$

$$-\frac{5}{3} = b$$

$$y = -\frac{2}{3}x - \frac{5}{3}$$

$$y - 3 = -\frac{2}{3}(x+7)$$

$$y - 3 = -\frac{2}{3}x - \frac{2}{3}(\frac{7}{1})$$

$$y - 3 = -\frac{2}{3}x - \frac{14}{3}$$

$$+3 \qquad\quad +3$$

$$y = -\frac{2}{3}x + \frac{9}{3} - \frac{14}{3}$$

$$y = -\frac{2}{3}x - \frac{5}{3}$$

5.

$(5, -6)$ *and* $(-2, 1)$

$$m = \frac{-1-(-6)}{-2-5} = \frac{-1+6}{-7} = \frac{5}{-7} = -\frac{5}{7}$$

$$-6 = -\frac{5}{7}(5) + b$$

$$-6 = -\frac{5}{7}(\frac{5}{1}) + b$$

$$-6 = -\frac{25}{7} + b$$

$$+\frac{25}{7} \quad +\frac{25}{7}$$

$$-\frac{42}{7} + \frac{25}{7} = b$$

$$-\frac{17}{7} = b$$

$$y = -\frac{5}{7}x - \frac{17}{7}$$

$$y + 6 = -\frac{5}{7}(x-5)$$

$$y + 6 = -\frac{5}{7}x + \frac{5}{7}(\frac{5}{1})$$

$$y + 6 = -\frac{5}{7}x + \frac{25}{7}$$

$$+6 \qquad\quad +6$$

$$y = -\frac{5}{7}x + \frac{42}{7} + \frac{25}{7}$$

$$y = -\frac{5}{7}x - \frac{17}{7}$$

6.

$(2, 4)\, and\, (1, -2)$

$m = \dfrac{-2-4}{1-2} = \dfrac{-6}{-1} = 6$

$4 = 6(2) + b$

$4 = 12 + b$

$-12 \quad -12$

$-8 = b$

$y = 6x - 8$

$y - 4 = 6(x - 2)$

$y - 4 = 6x - 12$

$\qquad +4 \qquad +4$

$y = 6x - 8$

After showing the students how to do the problem and doing a few together, examples 1 through 6, show them the video from Khan Academy: *Slope-intercept equation from two solutions example*. (Academy, 2011) This video is an example of how to write the equation of a line in slope intercept form when given two points. The presenter in the video does a nice job of briefly reviewing a prerequisite skill (slope formula, operations with signed numbers and operations with fractions) before immediately applying the skill within the problem. After the problem is introduced, pause the video and have the students try the problem. After giving them a few minutes to complete it, play the video. At the end of the video, take a poll of the students via the thumbs up/middle/down method.

Continue to work through more examples together, at first telling the students which method to use. This is to be sure they are familiar with both ways because they will need flexibility in the future in this unit.

As the lesson progresses, allow the students to choose which method they like best.

7.

$(5, -6)$ *and* $(-2, 1)$

$$m = \frac{-1-(-6)}{-2-5} = \frac{-1+6}{-7} = \frac{5}{-7} = -\frac{5}{7}$$

$$-6 = -\frac{5}{7}(5) + b$$

$$-6 = -\frac{5}{7}\left(\frac{5}{1}\right) + b$$

$$-6 = -\frac{25}{7} + b$$

$$+\frac{25}{7} \qquad +\frac{25}{7}$$

$$-\frac{42}{7} + \frac{25}{7} = b$$

$$-\frac{17}{7} = b$$

$$y = -\frac{5}{7}x - \frac{17}{7}$$

$$y + 6 = -\frac{5}{7}(x - 5)$$

$$y + 6 = -\frac{5}{7}x + \frac{5}{7}(5)$$

$$y + 6 = -\frac{5}{7}x + \frac{5}{7}\left(\frac{5}{1}\right)$$

$$y + 6 = -\frac{5}{7}x + \frac{25}{7}$$

$$\quad -6 \qquad\qquad -6$$

$$y = -\frac{5}{7}x + \frac{25}{7} - \frac{42}{7}$$

$$y = -\frac{5}{7}x - \frac{17}{7}$$

8. $(-3, -5)\,and\,(1, 9)$

$$m = \frac{9-(-5)}{1-(-3)} = \frac{9+5}{1+4} = \frac{14}{5}$$

$$-5 = \frac{14}{5}(-3)+b$$

$$-5 = \frac{14}{5}(\frac{-3}{1})+b$$

$$-5 = \frac{-42}{5}+b$$

$$+\frac{42}{5} \qquad +\frac{42}{5}$$

$$\frac{-25}{5}+\frac{42}{5} = b$$

$$\frac{17}{5} = b$$

$$y = \frac{14}{5}x+\frac{17}{5}$$

$$y+5 = \frac{14}{5}(x+3)$$

$$y+5 = \frac{14}{5}x+\frac{42}{5}$$

$$-5 \qquad\qquad +5$$

$$y = \frac{14}{5}x+\frac{25}{5}+\frac{42}{5}$$

$$y = \frac{14}{5}x+\frac{17}{5}$$

9.
$(-4, 6)$ *and* $(5, 6)$

$$m = \frac{6-6}{5-(-4)} = \frac{0}{5+4} = \frac{0}{9} = 0$$

$6 = 0(-4) + b$ $y - 6 = 0(x+4)$

$6 = 0 + b$ $y - 6 = 0x + 0$

$6 = b$ $y - 6 = 0$

                                                     $+6$ $+6$

$y = 0x + 6$ $y = 6$

$y = 6$

Step 3: Learner Participation: Learners will take notes and then complete examples throughout the presentation. The last few examples, learners may volunteer to write their answers on the board.

Step 4: Assessment: Review problems at beginning of class, working examples during the main presentation of content, and tonight's independent practice (homework assignment). In addition to questions about this content on summative assessments. At the end of the lesson students will complete the Exit Ticket-Day 1: Writing Equations of Lines- Introduction.

Step 5: Follow-Through Activities: Problem Trail Activity in the next lesson, as well as including this type of problem as future "Do-Nows" so learners continue to practice.

 (This lesson is modified from the lesson *Writing the Equation of Line Given Two Points* by Sarah Weaver from 2012.) (Weaver, 2012)