Lines, Lines, Lines!!!
Point-Slope Form
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Lesson Plan

I. Topic: Point-Slope Form

II. Goals and Objectives:
A. The students will understand the difference between slope-intercept and point-slope form.
B. The students will learn how to write an equation in point-slope form.
C. The students will solve problems by writing equations in point-slope form.

III. Massachusetts Learning Standards:

1. 8.P.5
Identify the slope of a line as a measure of its steepness and as a constant rate of change from its table of values, equation, or graph. Apply the concept of slope to the solution of problems.

2. 8.P.6
Identify the roles of variables within an equation, e.g., y = mx + b, expressing y as a function of x with parameters m and b.

3. 8.P.7
Set up and solve linear equations and inequalities with one or two variables, using algebraic methods, models, and/or graph.

4. 10.D.1
Select, create, and interpret an appropriate graphical representation for a set of data and use appropriate statistics to communicate information about the data.

5. 10.G.8
Find linear equations that represent lines either perpendicular or parallel to a given line and through a point, e.g., by using the "point-slope" form of the equation.

6. 10.P.2
Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or geometric description of the line, e.g, by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope.

7. 10.P.8
Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Use technology when appropriate. Include mixture, rate, and work problems.

IV. Materials:
A. Whiteboard with dry-erase markers (Blackboard with chalk could also be used.)
B. Ruler.
C. Pencils.
D. Calculator.
E. Graphing Paper.
F. Point-Slope Form Worksheets (Practice Worksheet, Quiz Worksheet).

V. Presentation Outline:
A. Introduction. "A Point and A Slope. What is the Point-Slope Form?"

B. Write an equation in Point-Slope Form given a slope and a point.
Examples

C. Write an equation given two points.
Examples

VI. Presentation:
A. Presentation Notes
B. Power Point Presentation

VII. Independent Practice: Point-Slope Form Worksheet
A. Class work: # 1 - 19 Odds

B. Homework: #2 - 20 Evens

C. Due 2 days from given day. Allow students to complete those questions which they did not complete in class.

VIII. Topic Assessment: Point-Slope Form Quiz
A. Answer questions from homework.

B. 5-Question Quiz: 10 – 15 minutes

C. 10-Question Quiz: 15 – 20 minutes.

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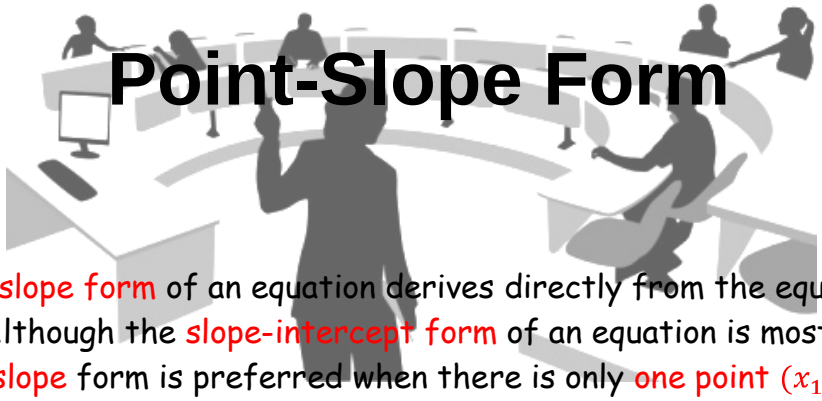


Point-Slope Form

Introduction

The point-slope form of an equation derives directly from the equation of the slope of a line. Although the slope-intercept form of an equation is most commonly used, the point-slope form is preferred when there is only one point (x_1, y_1) and the slope 'm' of a given or desired line. Hence the name Point-Slope coming from one point and one slope.

Definitions and Formula

An equation which is in the form $y - y_1 = m(x - x_1)$ is said to be in the point-slope form.

How do we come across this formula?

- We are familiar with the slope formula.

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

- When we multiply the denominator to both sides we get:

$$(x_2 - x_1) \cdot m = \frac{y_2 - y_1}{x_2 - x_1} \cdot (x_2 - x_1)$$

$$(x_2 - x_1) \cdot m = y_2 - y_1$$

- The reflexive property allows us to flip the two sides.

$$y_2 - y_1 = m(x_2 - x_1)$$

- But if we only have one point, then the equation becomes:

$$y - y_1 = m(x - x_1)$$

Key Concepts

(x, y) ← x and y represent all of the points on the line.

(x_1, y_1) ← These represent one point on the line

'm' (lower case m) ← is the symbol used to represents the slope.

The following lines are in the different ways we have learned or will learn.

A. y = mx + b ← Slope-Intercept Form

B. $y - y_1 = m(x - x_1)$ ← Point-Slope Form

C. 6x – 5y = 10 ← Standard Form

D. y = # ← Horizontal Line (Zero Slope)

E. x = # ← Vertical Line (Undefined Slope)

Let's put our knowledge of the Point-Slope Form to use.

1. Write an equation in Point-Slope Form given a slope and a point.

A. Write an equation in Point-Slope Form given point (4, -3) and m = -1

i. Point-Slope Form. $y - y_1 = m(x - x_1)$

ii. Substitute the slope. $y - y_1 = -1(x - x_1)$

iii. Substitute the point. $y - (-3) = -1(x - 4)$

iv. Simplify. $y + 3 = -1(x - 4)$

B. Write an equation in Point-Slope form given point (-5, -1) and m = $\frac{1}{5}$

i. Point-Slope Form. $y - y_1 = m(x - x_1)$

ii. Substitute the slope. $y - y_1 = \frac{1}{5}(x - x_1)$

iii. Substitute the point. $y - (-1) = \frac{1}{5}(x - (-5))$

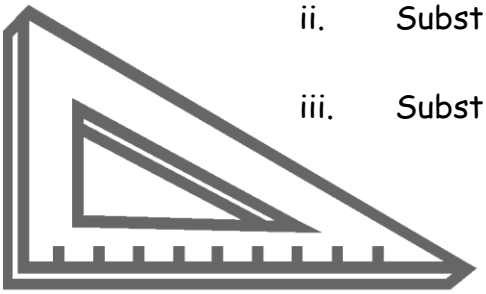
iv. Simplify. $y + 1 = \frac{1}{5}(x + 5)$

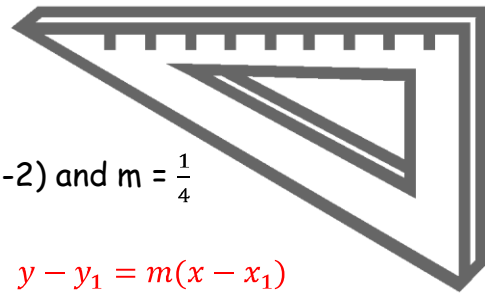
C. Write an equation in Point-Slope form given point (3, 5) and m = -2

i. Point-Slope Form. $y - y_1 = m(x - x_1)$

ii. Substitute the slope. $y - y_1 = -2(x - x_1)$

iii. Substitute the point. $y - 5 = -2(x - 3)$





D. Write an equation in Point-Slope form given point (-3, -2) and m = $\frac{1}{4}$

i. Point-Slope Form. $y - y_1 = m(x - x_1)$

ii. Substitute the slope. $y - y_1 = \frac{1}{4}(x - x_1)$

iii. Substitute the point. $y - (-2) = \frac{1}{4}(x - (-3))$

iv. Simplify. $y + 2 = \frac{1}{4}(x + 3)$

2. Write an equation in Point-Slope Form given two points.

Note:
(The following examples were used in the previous lesson on slopes)

A. Write the equation of the line in Point-Slope Form that passes through (-1, 4) and (1, -2).

1. Find the slope between the two points.

I. Let (-1, 4) = (x_1, y_1) and (1, -2) = (x_2, y_2).

II. Remember and re-write the slope formula. $m = \frac{y_2 - y_1}{x_2 - x_1}$

III. Substitute the values of the given question. $m = \frac{-2-4}{1-(-1)}$

IV. Simplify as much as possible. $m = \frac{-6}{2}$

V. Divide whenever possible. $m = -3$

Remember:
Point-Slope Form: $y - y_1 = m(x - x_1)$

2. Plug in the slope inside the Point-Slope Formula. $y - y_1 = -3(x - x_1)$

3. Sense (-1, 4) = (x_1, y_1) Substitute the values. $y - 4 = -3(x - (-1))$

4. Simplify. $y - 4 = -3(x + 1)$

B. Write the equation of the line in Point-Slope Form that passes through (5, -3) and (-4, 3).

1. Find the slope between the two points.

I. Let (5, -3) = (x_1, y_1) and (-4, 3) = (x_2, y_2).

II. Remember and re-write the slope formula. $m = \frac{y_2 - y_1}{x_2 - x_1}$

III. Substitute the values of the given question. $m = \frac{3-(-3)}{-4-5}$

IV. Simplify as much as possible. $m = \frac{6}{-9}$

V. Divide or reduce whenever possible. $m = -\frac{2}{3}$

2. Plug in the slope inside the Point-Slope Formula. $y - y_1 = -\frac{2}{3}(x - x_1)$

3. Sense (5, -3) = (x_1, y_1)Substitute the values. $y - (-3) = -\frac{2}{3}(x - 5)$

4. Simplify. $y + 3 = -\frac{2}{3}(x - 5)$

C. Write the equation of the line in Point-Slope Form that passes through (-1, 2) and (3, 4).

1. Find the slope between the two points.

I. Let (-1, 2) = (x_1, y_1) and (3, 4) = (x_2, y_2)

II. Remember and re-write the slope formula. $m = \frac{y_2 - y_1}{x_2 - x_1}$

III. Substitute the values of the given question. $m = \frac{4-2}{3-(-1)}$

IV. Simplify as much as possible. $m = \frac{2}{4}$

V. Divide or reduce whenever possible. $m = \frac{1}{2}$

2. Plug in the slope inside the Point-Slope Formula. $y - y_1 = \frac{1}{2}(x - x_1)$

3. Sense (-1, 2) = (x_1, y_1)Substitute the values. $y - 2 = \frac{1}{2}(x - (-1))$

4. Simplify. $y - 2 = \frac{1}{2}(x + 1)$

D. Write the equation of the line in Point-Slope Form that passes through (7, 0) and (6, -2).

1. Find the slope between the two points.

I. Let (7, 0) = (x_1, y_1) and (6, -2) = (x_2, y_2)

II. Remember and re-write the slope formula. $m = \frac{y_2 - y_1}{x_2 - x_1}$

III. Substitute the values of the given question. $m = \frac{-2-0}{6-7}$

IV. Simplify as much as possible. $m = \frac{-2}{-1} = \frac{2}{1} = 2$

2. Plug in the slope inside the Point-Slope Formula. $y - y_1 = 2(x - x_1)$

3. Sense $(7, 0) = (x_1, y_1)$ Substitute the values. $y - 0 = 2(x - 7)$

4. Simplify. $y = \frac{1}{2}(x + 1)$

(The '0' caused it to become the Slope-intercept Form)

Point-Slope Form
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Student Practice Worksheet

Name_____Date_____Grade_____

Find a Point-Slope equation for a line containing the given point and having the given slope.

1. (4, -3), m = -1

2. (-5, -6), m = 2

3. (-7, 2), m = 3

4. (3, 5), m = -2

5. (6, -2), m = -3

6. (5, -2), m = 2

7. (7, 0), m = 4

8. (0, 9), m = -2

9. (5, -1), m = $\frac{1}{5}$

10. (-3, -2), m = $\frac{1}{4}$

(Student Worksheet Continue)

Give the Point-Slope form of the equation that passes through the given points.

11. (0, 8) and (-1, 10)

12. (-6, 8) and (4, 8)

13. (4, 5) and (-3, 8)

14. (0, 9) and (2, 0)

15. (-1, 7), (8, -2)

16. (4, 0), (0, 5)

17. (5, 7), (-1, 3)

18. (0, 0), (-4, 3)

19. (-3, -5), (3, -15)

20. $(-\frac{1}{2}, \frac{1}{2})$, $(\frac{1}{4}, \frac{3}{4})$

Point-Slope Form

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Student Practice Worksheet

Answer Key

Name_____ Date_____ Grade_____

Find a Point-Slope equation for a line containing the given point and having the given slope.

1. (4, -3), m = -1

$y + 3 = -1(x - 4)$

2. (-5, -6), m = 2

$y + 6 = 2(x + 5)$

3. (-7, 2), m = 3

$y - 2 = 3(x + 7)$

4. (3, 5), m = -2

$y - 5 = -2(x - 3)$

5. (6, -2), m = -3

$y + 2 = -3(x - 6)$

6. (5, -2), m = 2

$y + 2 = 2(x - 5)$

7. (7, 0), m = 4

$y - 0 = 4(x - 7)$ or $y = 4(x - 7)$

8. (0, 9), m = -2

$y - 9 = -2(x - 0)$ or $y - 9 = -2x$

9. (5, -1), m = $\frac{1}{5}$

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

10. (-3, -2), m = $\frac{1}{4}$

$y + 2 = \frac{1}{4}(x + 3)$

(Student Worksheet Continue) – Answer Key

Give the Point-Slope form of the equation that passes through the given points.

11. (0, 8) and (-1, 10)

$y - 8 = -2(x - 0)$ or $y - 8 = -2x$

12. (-6, 8) and (4, 8)

$y - 8 = 0(x + 6)$ or $y = 8$

13. (4, 5) and (-3, 8)

$y - 5 = -\frac{3}{7}(x - 4)$

14. (0, 9) and (2, 0)

$y - 9 = \frac{9}{2}(x - 0)$ or $y - 9 = \frac{9}{2}x$

15. (-1, 7), (8, -2)

$y - 7 = -(x + 1)$

16. (4, 0), (0, 5)

$y - 0 = -\frac{5}{4}(x - 4)$ or $y = -\frac{5}{4}(x - 4)$

17. (5, 7), (-1, 3)

$y - 7 = \frac{2}{3}(x - 5)$

18. (0, 0), (-4, 3)

$y - 0 = -\frac{3}{4}(x - 0)$ or $y = -\frac{3}{4}x$

19. (-3, -5), (3, -15)

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

20. $(-\frac{1}{2}, \frac{1}{2})$, $(\frac{1}{4}, \frac{3}{4})$

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

Point-Slope Form
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Student Practice Worksheet
Rubric

Criteria					
	4	3	2	1	0
Mechanics	No math errors	No major math errors or serious flaws in reasoning.	May be some serious math error or flaws in reasoning.	Major math errors or serious flaws in reasoning.	Blank answers

Quiz Grading Rubric:

Problem	Total points of Correct Answer		Problem	Total points of Correct Answer	
1.			11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		
				Total:	_____

Point-Slope Form

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Quiz

Name_____Date_____Grade_____

Find a Point-Slope equation for a line containing the given point and having the given slope.

1. (6, 2), m = $\frac{2}{9}$

2. (1, 3), m = 1

3. (3, -4), m = $-\frac{4}{3}$

4. (-7, 4), m = 1

5. (9, -5), m = -6

Give the Point-Slope form of the equation that passes through the given points.

6. (1, 5) and (4, 2)

7. (-4, 2) and (1, -3)

8. (-5, -3) and (1, -1)

9. (0, 3) and (-2, 6)

10. (-8, 3) and (-4, 1)

Point-Slope Form

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Quiz

Answer Key

Name_____Date_____Grade_____

Find a Point-Slope equation for a line containing the given point and having the given slope.

1. (6, 2), m = $\frac{2}{9}$

$y - 2 = \frac{2}{9}(x - 6)$

2. (1, 3), m = 1

y – 3 = 1(x – 1)

3. (3, -4), m = $-\frac{4}{3}$

$y + 4 = -\frac{4}{3}(x - 3)$

4. (-7, 4), m = 1

y – 4 = 1(x + 7)

5. (9, -5), m = -6

y + 5 = -6(x – 9)

Give the Point-Slope form of the equation that passes through the given points.

6. (1, 5) and (4, 2)

y – 5 = -1(x – 1)

7. (-4, 2) and (1, -3)

y - 2 = -1(x + 4

8. (-5, -3) and (1, -1)

$y + 3 = \frac{1}{3}(x + 5)$

9. (0, 3) and (-2, 6)

$y - 3 = -\frac{3}{2}(x - 0)$

10. (-8, 3) and (-4, 1)

$y - 3 = -\frac{1}{2}(x + 8)$

Point-Slope Form
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Quiz
Rubric

Criteria					
	4	3	2	1	0
Mechanics	No math errors	No major math errors or serious flaws in reasoning.	May be some serious math error or flaws in reasoning.	Major math errors or serious flaws in reasoning.	Blank answers

Quiz Grading Rubric:

Problem	Total points of Correct Answer		Problem	Total points of Correct Answer	
1.			6.		
2.			7.		
3.			8.		
4.			9.		
5.			10.		

Total:_____