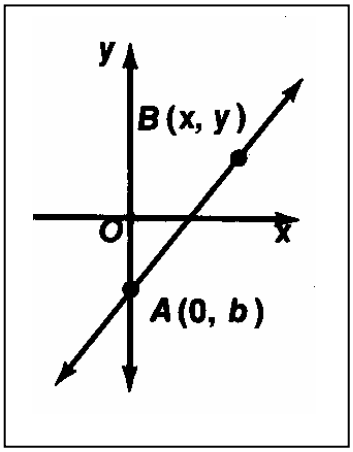
Slope-Intercept Form of a Linear Equation Examples

1. In the figure at the right, $\overleftrightarrow{AB}$ passes through points A(0, b) and B(x, y). Notice that b is the y-intercept of $\overleftrightarrow{AB}$. Suppose you want to find an equation for $\overleftrightarrow{AB}$. Let m represent the slope of the line.



m = $\frac{y-b}{x-0}$

m = $\frac{y-b}{x}$

mx = y – b

y = mx + b

Use the definition of slope. $\overleftrightarrow{AB}$ passes through (x, y) and (0, b), so that $x_2 = x$, $x_1 = 0$, $y_2 = y$, and $y_1 = b$. Solve for y.

2.

Slope-Intercept Form of a Linear Equation	**The slope-intercept form of the equation of a line is y = mx + b, where m is the slope and b is the y-intercept**

Let (x, y) and (x_1, y_1) be points on line AB. Then the slope, m is $\frac{y-y_1}{x-x_1}$.

Therefore, $m(x - x_1) = y - y_1$.

Derivation of point-slope form

3. Suppose you are given the slope and y-intercept of a line. You can find an equation of the line by substituting these values into the slope-intercept form of the equation. For example, if the slope of a line is $-\frac{2}{3}$ and its y-intercept is 14, an equation of the line is $y = -\frac{2}{3}x + 14$. The standard form of this equation is $2x + 3y = 42$.

Recall that the standard form of the equation of a line is Ax + By = C. If $B \neq 0$, the slope and y-intercept can be found by changing the equation to slope-intercept form.

4. **Example** – Find the slope-intercept form and the standard form of the equation of the line that has a slope of $\frac{2}{3}$ and passes through (6, 7).

First, substitute the slope and coordinates of the point into the slope-intercept form and solve for b.

y = mx + b

7 = ($\frac{2}{3}$)(6) + b

7 = 4 + b

3 = b

Substitute 7 for y, $\frac{2}{3}$ for m, and 6 for x.

Write the equation in slope-intercept form.

y = $\frac{2}{3}$x + 3

The standard form of this equation is 2x – 3y = -9

Substitute $\frac{2}{3}$ for m and 3 for b.

5. **Example** – find the slope-intercept form and the standard form of the equation of the line that has slope of 2 and passes through the point (–1, 3)

First, substitute the slope and coordinates of the point into the slope-intercept form and solve for b.

y = mx + b

3 = (2)(–1) + b

3 = –2 + b

5 = b

Substitute 3 for y, 2 for m, and 3 for x.

Write the equation in slope-intercept form.

y = 2x + 5

The standard form of this equation is 2x – y = –5

Substitute 2 for m and 5 for b.

6. **Example** – Find the slope-intercept form and the standard form of the equation of the line having slope $-\frac{1}{2}$ and passing through the point (3, 1).

First, substitute the slope and coordinates of the point into the slope-intercept form and solve for b.

y = mx + b

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

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

$\frac{5}{2}$ = b

Substitute 1 for y, $-\frac{1}{2}$ for m, and 3 for x.

Write the equation in slope-intercept form.

y = $-\frac{1}{2}$x + $\frac{5}{2}$

The standard form of this equation is x + 2y = 5

Substitute $-\frac{1}{2}$ for m and $\frac{5}{2}$ for b.

7. **Example** – Find the slope-intercept form of the equation of a line passing through (–2, 5) and (3, 0)

First use the two given points to find the slope of the line

m = $\frac{5-0}{-2-3}$

m = –1

Remember that m represents the slope of the line

Next, substitute the slope of the coordinates of one point in the slope-intercept form and solve the equation for b.

y = mx + b
5 = (–1)(–2) + b
3 = b

Using the point (3, 0) would yield the same result.

The slope-intercept form of the equation of the line is y = –x + 3

8. **Example** – Find the slope intercept form and the standard form of the equation of the line with x-intercept 4 and y-intercept $-\frac{2}{3}$.

Find the slope for (4, 0) and (0, $-\frac{2}{3}$)

m = $\frac{0-(-\frac{2}{3})}{4-0}$

m = $\frac{1}{6}$

Since y-intercept is $-\frac{2}{3}$

Substitute into slope-intercept form
y =mx + b

y = $\frac{1}{6}$x $-\frac{2}{3}$

Standard form is

x – 6y = 4

9. **Example** – Find the slope-intercept form and the standard form of the equation of the line passing through the points (2, –1) and (–1, –2).

Find the slope.

$\mathbf{m} = \dfrac{-1-(-2)}{2-(-1)}$

$\mathbf{m} = \dfrac{1}{3}$

Find y-intercept

$\mathbf{y = mx + b}$

$\mathbf{-1} = \dfrac{1}{3}\mathbf{(2) + b}$

$-\dfrac{5}{3} = \mathbf{b}$

substitute (2, –1) for x and y

Slope-intercept form

$\mathbf{y} = \dfrac{1}{3}\mathbf{x} - \dfrac{5}{3}$

Standard form

x – 3y = 5

10. **Example** – Find the slope and y-intercept of a line with equation in standard form.

Recall that the standard form of the equation of a line is Ax + By = C. If B ≠ 0, the slope and y-intercept can be found by changing the equation to slope-intercept form.

Ax + By = C

By = –Ax + C

$\mathbf{y} = -\dfrac{A}{B}\mathbf{x} + \dfrac{C}{B}$

The slope is $-\dfrac{A}{B}$ and the y-intercept is $\dfrac{C}{B}$, for B $\neq$ 0

11. **Example** – Using the calculations from # 10 above, find the slope and y-intercept in the equation y = –2x + 4.

The standard form of this equation is

2x + y = 4

slope = $-\dfrac{A}{B}$ **y-intercept** = $\dfrac{C}{B}$

slope = $-\dfrac{2}{1} = -2$ **y-intercept** = $\dfrac{4}{1} = 4$

If B = 0 in the standard form of the equation, the slope is undefined, the line has no y-intercept, and C ≠ 0.

Name:_____
Date:_____
Class:_____

Slope-Intercept Form of a Linear Equation Worksheet

Find the slope-intercept form of the equation of the line for each slope, m, and each y-intercept, b.

1. m = 5, b = –3
2. m = –1, b = 4
3. m = $\frac{2}{3}$, b = –7
4. m = 2.5, b = 0
5. m = 0, b = 0

State the slope and y-intercept of the graph of each equation

6. y = –2x + 5
7. y = x – 8
8. y = $-\frac{3}{4}x - 3$
9. y = $\frac{1}{3}x$
10. $\frac{1}{2}y = 7x - 1$
11. –y = 0.2x + 6
12. –y = x

State the slope-intercept form of each equation.

13. 2x + 5y = 10
14. 3x – y = 6
15. 4x + 8y = 11
16. 2x = 11
17. 0.4x – 0.4y = 0.4
18. $\frac{1}{5}x - \frac{1}{3}y = \frac{1}{7}$

Find the slope-intercept form and the standard form of the equation of the line that satisfies the given conditions.

19. Slope = $\frac{1}{2}$, passes through (6,4)
20. Slope = 4, passes through (2, –3)
21. Slope = 5, passes through the origin
22. Passes through (6, 1) and (8, –4)
23. x-intercept = –3, y-intercept = 6
24. x-intercept = 0, y-intercept = 2

Slope-Intercept Form of a Linear Equation Worksheet Key

Find the slope-intercept form of the equation of the line for each slope, m, and each y-intercept, b.

1. m = 5, b = –3 ➔ **y = 5x – 3**
2. m = –1, b = 4 ➔ **y = –x + 4**
3. m = $\frac{2}{3}$, b = –7 ➔ **y = $\frac{2}{3}$x – 7**
4. m = 2.5, b = 0 ➔ y = 2.5x
5. m = 0, b = 0 ➔ **y = 0**

State the slope and y-intercept of the graph of each equation

6. y = –2x + 5 ➔ **slope = –2, y-intercept (0, 5)**
7. y = x – 8 ➔ **slope = 1, y-intercept (0, –8)**
8. y = $-\frac{3}{4}$x – 3 ➔ **slope = $-\frac{3}{4}$, y-intercept (0, –3)**
9. y = $\frac{1}{3}$x ➔ **slope = $\frac{1}{3}$, y-intercept (0, 0)**
10. $\frac{1}{2}$y = 7x – 1 ➔ **y = 14x – 2 ➔ slope = 14, y-intercept (0, –2)**
11. –y = 0.2x + 6 ➔ **y = –0.2x – 6 ➔ slope = –0.2, y-intercept (0, –6)**
12. –y = x ➔ **y = –x ➔ slope = –1, y-intercept (0, 0)**

State the slope-intercept form of each equation.

13. 2x + 5y = 10 ➔ $-\frac{2}{5}$**x + 2**

14. 3x – y = 6 ➔ **y = 3x – 6**

15. $4x + 8y = 11$ ➔ **y =** $-\frac{1}{2}$**x +** $\frac{11}{8}$

16. $2x = 11$ ➔ **no slope-intercept form**

17. $0.4x - 0.4y = 0.4$ ➔ **y = x – 1**

18. $\frac{1}{5}x - \frac{1}{3}y = \frac{1}{7}$ ➔ **y =** $\frac{3}{5}$**x –** $\frac{3}{7}$

Find the slope-intercept form and the standard form of the equation of the line that satisfies the given conditions.

19. Slope = $\frac{1}{2}$, passes through (6,4)

4 = $\frac{1}{2}$**(6) + b**
1 = b

Slope-intercept form
y = $\frac{1}{2}$**x + 1**

Standard form
x – 2y = –2

20. Slope = 4, passes through (2, –3)

–3 = 4(2) + b
–11 = b

Slope-intercept form
y = 4x – 11

Standard form
4x – y = 11

21. Slope = 5, passes through the origin

0 = 5(0) + b
0 = b

Slope-intercept form
y = 5x

Standard form
5x – y = 0

22. Passes through (6, 1) and (8, –4)

m = $\frac{1-(-4)}{(6-8)}$
m = $-\frac{5}{2}$

1 = $-\frac{5}{2}$**(6) + b**
16 = b

Slope-intercept form
y = $-\frac{5}{2}$**x + 16**

Standard form
5x + 2y = 32

23. x-intercept = –3, y-intercept = 6

m = $\frac{0-6}{-3-0}$

m = 2

0 = 2(–3) + b
6 = b

Slope-intercept form
y = 2x + 6

Standard form
2x – y = –6

24. x-intercept = 0, y-intercept = 2

m = $\frac{0-2}{0-0}$

slope undefined

No slope-intercept form

Standard form
x = 0

Student Name: _____

Date: _____

Slope-Intercept Form of a Linear Equation Checklist

1. On questions 1 thru 5, did the student find the slope-intercept form of each equation?

    a. Yes (25 points)
    b. 4 out of 5 (20 points)
    c. 3 out of 5 (15 points)
    d. 2 out of 5 (10 points)
    e. 1 out of 5 (5 points)

2. On questions 6 thru 12, did the student state the slope correctly?

    a. Yes (35 points)
    b. 6 our of 7 (30 points)
    c. 5 out of 7 (25 points)
    d. 4 out of 7 (20 points)
    e. 3 out of 7 (15 points)
    f. 2 out of 7 (10 points)
    g. 1 out of 7 (5 points)

3. On questions 6 thru 12, did the student state the y-intercept correctly?

    a. Yes (35 points)
    b. 6 our of 7 (30 points)
    c. 5 out of 7 (25 points)
    d. 4 out of 7 (20 points)
    e. 3 out of 7 (15 points)
    f. 2 out of 7 (10 points)
    g. 1 out of 7 (5 points)

4. On questions 13 thru 18, did the student state the slope-intercept form of each equation?

    a. Yes (35 points)
    b. 6 our of 7 (30 points)
    c. 5 out of 7 (25 points)
    d. 4 out of 7 (20 points)
    e. 3 out of 7 (15 points)
    f. 2 out of 7 (10 points)
    g. 1 out of 7 (5 points)

5. On questions 19 thru 24, did the student find the slope-intercept form correctly?

    a. Yes (30 points)
    b. 5 out of 6 (25 points)
    c. 4 out of 6 (20 points)
    d. 3 out of 6 (15 points)
    e. 2 out of 6 (10 points)
    f. 1 out of 6 (5 points)

6. On questions 19 thru 24, did the student find the standard form correctly?

    a. Yes (30 points)
    b. 5 out of 6 (25 points)
    c. 4 out of 6 (20 points)
    d. 3 out of 6 (15 points)
    e. 2 out of 6 (10 points)
    f. 1 out of 6 (5 points)

Total Number of Points _____

Name: _____
Date:_____
Class:_____

NOTE: The sole purpose of this checklist is to aide the teacher in identifying students that need remediation. It is suggested that teacher's devise their own point range for determining grades. In addition, some students need remediation in specific areas. The following checklist provides a means for the teacher to assess which areas need addressing.

1. Does the student need remediation in content (finding the slope-intercept form of an equation given the slope and y-intercept) for questions 1 thru 5?
   Yes_____ No_____

2. Does the student need remediation in content (identifying the slope and y-intercept in a linear equation) for questions 6 thru 12?
   Yes_____ No_____

3. Does the student need remediation in content (rewriting linear equations into slope-intercept form) for questions 13 thru 18? Yes_____ No_____

4. Does the student need remediation in content (writing a linear equation in slope-intercept form given a point and the slope) for questions 19 thru 24?
   Yes_____ No_____

Sample point range

A 180 points and above

B 171 points and above

C 152 points and above

D 133 points and above

F 132 points and below

A 178 points and above

B 161 points and above

C 133 points and above

D 114 points and above

F 113 points and below