

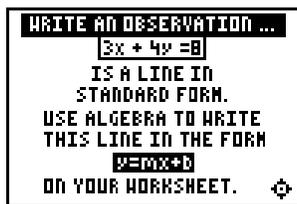
Linear Functions: Slope-Intercept Form Student Worksheet

Overview

The **Overview** introduces the topics covered in **Observations** and **Activities**. Scroll through the **Overview** using \rightarrow (\leftarrow to review, if necessary). Read each screen carefully. Look for new terms, definitions, and concepts.

Observations

The **Observations** illustrate mathematical concepts relating to writing slope in slope-intercept form. Scroll through the **Observations** using \rightarrow (\leftarrow to review, if necessary). Read each screen carefully. When you come to a **Write an Observation** screen, stop and write the answers to the questions on your worksheet.



Observation

Use your algebraic knowledge to change $3x + 4y = 8$ to the form $y = mx + b$. Show your work.

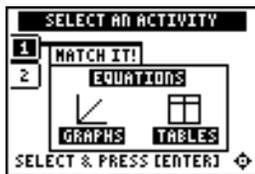
Remember: $3x + 4y = 8$ is Standard Form.

Activities

The **Activities** section helps you practice using the slope-intercept form of lines. You can select from two activities — **Match It!** or **Line Soccer**. Follow these steps to play the activity and complete your worksheet.

1. Make sure you are in the **Activities** for this section.
2. Highlight an activity using \uparrow or \downarrow , and press **ENTER**.

Activities (continued)



Scoring: You get two attempts to answer the problem. You earn 2 points for a correct answer, 1 point for a correct answer on the second try.

You can earn up to 12 points.



Scoring: You get two attempts to answer the problem. You earn 2 points for a correct answer on the first try, 1 point for a correct answer on the second try.

You score a goal when you answer a question correctly against Alex, the goalkeeper. You also get to keep any points you earned while passing the ball.

Match It!

- Select the correct answer to the question. Questions include:
 - Selecting the graph that correctly illustrates an equation.
 - Selecting the equation that correctly describes a graph.
 - Selecting the equation that goes with the table.
- What was your score? _____

Line Soccer

- Pass the ball by answering a question correctly. Possible slope-intercept questions include:
 - Selecting the (x,y) coordinate that solves an equation.
 - Using an (x,y) coordinate and b to solve for m in an equation.
 - Using an (x,y) coordinate and m to solve for b .
 - Using two (x,y) coordinates to calculate m and b .
- To enter your answer:
 - As a negative number, press $(-)$.
 - As a mixed number, enter the whole number and press $\langle \text{UNIT} \rangle$, and then enter the fraction.
 - As a fraction, press $\langle n/d \rangle$ and enter the numerator. Press $\langle n/d \rangle$ again and enter the denominator.
- Show your work for each problem:

- What was your score? _____

Activities (continued)

Additional Problems

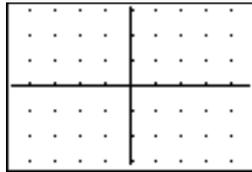
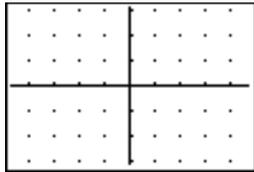
1. Make a table and draw the graph for the following linear functions.

a. $Y = -X + 2$

b. $Y = 2X - 1$

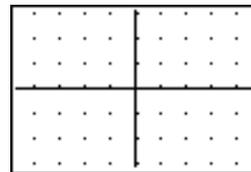
X	Y

X	Y



2. Think of the graph below as a map. You start to walk from the point $(-1,1)$. You can walk only along a path that is the line with the slope: $m = -2$

- Label two points, A and B, that you can walk to on the graph if the slope of your path $= -2$. Each tick mark is 1 unit.
- Find the equation of the line that describes your walking path. Show your work below.



- Record the coordinate points of A and B below. Use the equation of your path to check to see if your points A and B are on really on your line! Show your work below.

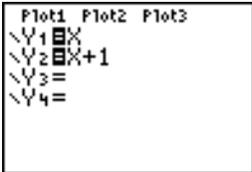
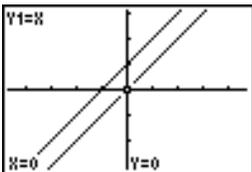
Point	Check It
A=	
B=	

 **Try-It!™ on Your TI-83 Plus or TI-73**

Parent and Family of Functions

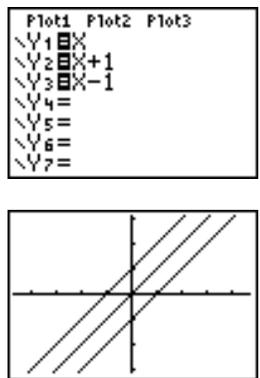
Compare graphs of $Y_1=X$ and $Y_2=X+1$. If you know the graph of $Y_1=X$, can you draw the graph of any line in slope-intercept form? Investigate using your graphing calculator!

Note: See  Tip™ 3: *Graphing a Function* and  Tip™ 5: *Adjusting the Viewing Window* for instructions if you need help. Set up your graphing calculator so that **GridOn** on the window format (2nd [FORMAT]) screen and **ZDecimal** on the zoom menu (ZOOM) are selected.

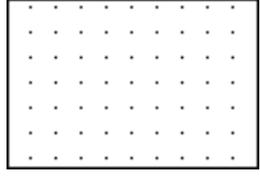
To Do This	Press	Display (TI-83 Plus shown)
1. Exit the Topics in Algebra 1 application and clear the Home screen.	2nd [QUIT] <EXIT> [CLEAR]	
2. Define $Y_1=X$ and $Y_2=X+1$. Note: On the TI-73, use x rather than X,T,θ,n .	Y= [CLEAR] X,T,θ,n [CLEAR] X,T,θ,n + 1	
3. Set the viewing window.	TI-83 Plus: ZOOM 4:ZDecimal TI-73: ZOOM 8:ZDecimal	
4. Trace both Y_1 and Y_2 .	[TRACE] [←] or [→] to trace a function [↑] and [↓] to move between functions	

5. Write a description of what you see. How does the graph of $Y=X$ compare to the graph of $Y=X+1$?

 **Try-It!™ on Your TI-83 Plus or TI-73 (continued)**

To Do This	Press	Display (TI-83 Plus shown)
<p>6. Enter and trace $Y_3=X-1$.</p> <p>Note: On the TI-73, use \boxed{x} rather than $\boxed{X.T.O.n}$.</p>	<p>$\boxed{Y=}$ $\boxed{\downarrow} \boxed{\downarrow} \boxed{\text{CLEAR}}$ $\boxed{X.T.O.n} \boxed{-} \boxed{1}$ $\boxed{\text{TRACE}}$ $\boxed{\leftarrow}$ or $\boxed{\rightarrow}$ to trace a function $\boxed{\uparrow}$ and $\boxed{\downarrow}$ to move between functions</p>	

7. Write a description of what you see. How does the graph of $Y=X$ compare to the graph of $Y=X-1$?

<p>8. Where will the line, $Y=X+2$ be located? Draw in your prediction and then use the graphing calculator to check your work. Was your graph correct? If not, why not?</p>	
<p>9. Now predict and draw the following lines on the graph to your right. Draw your own axes. Do not use the graphing calculator.</p> <p>$Y=X+3$ $Y=X-3$ $Y=X+8$ $Y=X-8$</p>	

10. Check your work! Graph each line on the graphing calculator. Could you see all of the lines? Record your observations.

Note: On the TI-73, you need to clear a line in the Y= editor to make room for your new lines.

11. You cannot see $Y=X+8$ or $Y=X-8$ on your graphing calculator. Why do you think that the line is not showing? Change your **WINDOW** (WINDOW) settings so that you are able to see these lines. Record the changes you made.

12. Compare the lines: $Y=X$, $Y=2X$, and $Y=3X$. What do you notice? Try other lines in the form $Y = AX$. Next, try to graph $Y=2X+3$ without the graphing calculator. Explain your strategy.

Linear Functions: Slope-Intercept Form**Teacher Notes****Objectives**

- To review the form of the equation $y = mx + b$, where m is slope and b is the y -intercept.
- To view graphing lines and developing equations from data.
- To view tables of values and graphing lines from an equation of the form $y = mx + b$.
- To emphasize three ways of looking at lines, tables, graphs and equations.
- To develop the equation of a line from information given, such as slope and y -intercept, point and slope, and two points.
- To review the slope of parallel and perpendicular lines.

Math Highlights

This section highlights a review of the slope-intercept form of a line, $y = mx + b$. Students will review graphing a line using one point and the slope of the line. They will also see the equation of a line developed inductively from data by simulating the amount of volts produced by lining up batteries in series. Students will also review how to find a table and graph a line using the equation $y = mx + b$.

A review of calculations follow, which show the step-by-step procedures needed to find the equation of a line given, the slope and y -intercept, the slope and a point on the line, and finally two points.

Common Student Errors

- When students perform the calculations to find the equation of a line given the slope and y -intercept, the slope and a point on the line, or two points, they often have problems following the steps. For example, given two points, the student needs to perform three steps. First, the student needs to calculate the slope of the line. Students may forget the formula for slope, and then be careless about substituting the correct values in the formula. Also, they may make errors in sign. In the second step, they need to find b using the calculated slope and one of the points. Students need to understand that they could pick either point for this calculation. If the slope is incorrect from the first step, the error cascades into the rest of the solution. In the third step, they need to place all of the information into the final answer as $y = mx + b$.
- Students become comfortable using the variables x and y . They should be exposed to the use of other letters for the independent and dependent variables. Students should be able to recognize, for example, $D = 2T + 4$ as a linear relationship with independent variable T , dependent variable D , a slope of 2 and the D -intercept as 4. They need to learn that they will need to change the variables so the function reads $y = 2x + 4$ in order to graph it on the graphing calculator.

Student Worksheet Notes with Answers

Overview

Tell students:

1. How to find the **Overview**, or tell them to review the instructions on the worksheet.
2. How to navigate the application, if they are not yet familiar with the application.
3. To scroll through the **Overview** on the graphing calculator. Point out new terms, definitions, and concepts, and tell students to look for them as they go through the **Overview**.

Observations

The **Observations** help students understand using algebra to change a linear equation in standard form to slope-intercept form.

If necessary, tell students how to find the **Observations** for this section.



Observation

Students use algebra to write $3x+4y=8$ in $y=mx+b$ form.

Answers may vary, especially the step order. One possible answer:

Step 1: Subtract $3x$ from both sides of the equation.

$$3x - 3x + 4y = 8 - 3x$$

Step 2: Simplify the equation.

$$4y = -3x + 8$$

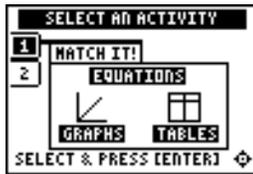
Step 3: Divide both sides of the equation by 4.

$$\frac{4y}{4} = \frac{-3}{4}x + \frac{8}{4}$$

Step 4: Simplify to get the answer.

$$y = \frac{-3}{4}x + 2$$

Activities



Scoring: Students get two attempts to answer the problem. They earn 2 points for a correct answer, 1 point for a correct answer on the second try.

Students can earn up to 12 points.



Scoring: Students get two attempts to answer the problem. They earn 2 points for a correct answer, 1 point for a correct answer on the second try.

Students score a goal when they answer a question correctly against Alex, the goalkeeper. They also get to keep any points they earned while passing the ball.

Note: Unsimplified fractions are counted as correct.

Match It!

Tell students to:

1. Select the correct answer to the question. Questions include:
 - Selecting the graph that correctly illustrates an equation.
 - Selecting the equation that correctly describes a graph.
 - Selecting the equation that goes with the table.
2. Record their scores.

Line Soccer

Tell students to:

1. Pass the ball by answering a question correctly. Possible slope-intercept questions include:
 - Selecting the (x,y) coordinate that solves an equation.
 - Using an (x,y) coordinate and b to solve for m in an equation.
 - Using an (x,y) coordinate and m to solve for b .
 - Using two (x,y) coordinates to calculate m and b .
2. Enter their answers in the following ways, as necessary:
 - as a negative number, press $\boxed{-}$.
 - as a mixed number, enter the whole number and press $\langle \text{UNIT} \rangle$, and then enter the fraction.
 - as a fraction, press $\langle n/d \rangle$ and enter the numerator. Press $\langle n/d \rangle$ again and enter the denominator.
3. Show their work for each problem.
4. Record their scores.

Activities (continued)**Additional Problems**

1. Students make a table and draw the graph for $Y=-X+2$ and $Y=2X-1$.

Answers may vary. Make sure that students correctly label the axes and all points from the corresponding table.

2. Students label two points, A and B, where the line segment between the two has a slope that is -2 .
- Possible points students can walk to on the screen shown are $(-2,3)$, $(0,-1)$, and $(1,-3)$.*
 - Students should use $m=-2$ and the point; for example, $(-1,1)$ to find the y -intercept, b . The answer is $y=-2x-1$.*
 - Students should substitute their point in the line to see if the equation is satisfied.*

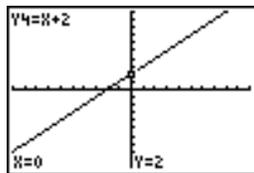
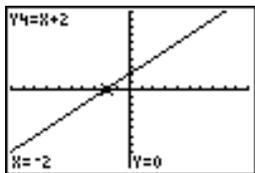
Try-It!™ on Your TI-83 Plus or TI-73

Students need to know the features of the graphing calculator covered in  Tip™ 3: *Graphing a Function* and  Tip™ 5: *Adjusting the Viewing Window*. They work through an investigation of parent and family of functions of $Y=X$. See Student Worksheet for details.

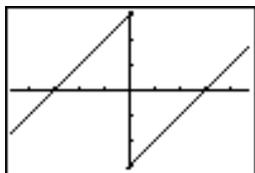
Tell students to follow the steps exactly on the graphing calculators. Example screens are displayed on the worksheets for students to compare with the graphing calculator screens.

This keystroke exercise lets students discover the connection between the parent and family of functions so they can quickly graph functions of the form $y=mx+b$.

5. Possible answers for comparing the graph of $Y=X$ to $Y=X+1$: *parallel, equivalent slope, offset by 1, $Y=X$ crosses the origin $(0,0)$, etc.*
7. Possible answers for comparing the graph of $Y=X$ to $Y=X-1$: *same as above.*
8. Students should draw the function on the worksheet first before graphing it on the graphing calculator. $Y=X+2$ intersects the X -axis at $(-2,0)$ and the Y -axis at $(0,2)$.



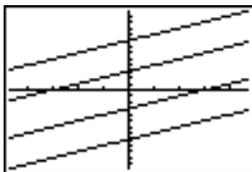
10. Students should draw the function on the worksheet first before graphing it on the graphing calculator. If they graph it without changing the window values, the screen looks like this:



 **Try-It!™ on Your TI-83 Plus or TI-73 (continued)**

Parent and Family of Functions

11. Students cannot see all functions when they don't change their window values, which are: $X_{min}=-4.7$, $X_{max}=4.7$, $Y_{min}=-3.1$, $Y_{max}=3.1$. To fit all functions on the screen, $X_{min}>8$ and $Y_{max}>8$. Functions in order from top to bottom: $Y=X+8$, $Y=X+3$, $Y=X-3$, $Y=X-8$.



12. In order from top to bottom: $Y=3X$, $Y=2X$, $Y=X$ (**ZFit** window values). Graph of $Y=2X+3$ (**ZStandard** window values). To graph the function $Y=2X+3$, students should think that the graph is parallel to $Y=2X$, and then shift $Y=2X$ up 3 units on the Y-axis.

