

Linear Equations: Using Algebra

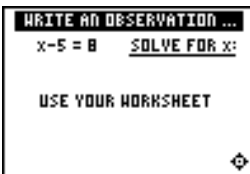
Student Worksheet

Overview

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

Observations

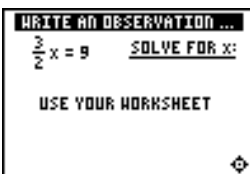
The **Observations** illustrate linear equation concepts relating to algebra. Scroll through the **Observations** using \blacktriangleright (\blacktriangleleft) to review, if necessary). Read each screen carefully. When you come to a **Write an Observation** screen, stop and write the answers to the questions on your worksheet.



Observation 1

$$x - 5 = 8$$

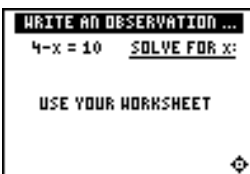
Solve for **x**. Show all of your work below.



Observation 2

$$\frac{3}{2}x = 9$$

Solve for **x**. Show all of your work below.



Observation 3

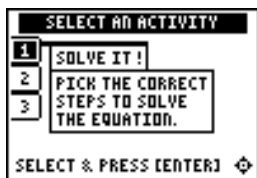
$$4 - x = 10$$

Solve for **x**. Show all of your work below.

Activities

The **Activities** help you practice algebraic concepts. You can select from three activities—**Solve It!**, **Beam Dale Up**, and **Free Fall**. Follow these steps to play an 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**.



Scoring: You get two attempts to pick the correct step or steps. You get 2 points for a correct choice on the first try, and 1 point for a correct choice on the second try. You get an additional 2 points for the correct solution.

The total number of points available varies.

Solve It!

1. Highlight a level (silver = less difficult; gold = more difficult), and press **ENTER** to select it.
2. Look at the algebraic expression at the top of the screen and decide what step to take to solve the equation for x .
3. Press \downarrow or \uparrow to cycle through steps to choose from, and then press **ENTER** to select the correct step (some problems require two steps). If your second choice is incorrect, the correct step is displayed; press any key to continue play. As you play the activity, write the equations, the steps required to solve them, and the solutions to the equations.

4. What level did you play? _____
5. What was your score? _____ out of _____

Activities (continued)



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

You can earn up to 10 points.

Beam Dale Up

1. Highlight a level (silver = less difficult; gold = more difficult), and press **[ENTER]** to select it.
2. Look at the problem on the space ship and determine how to solve the equation for x from the four choices given.
3. Press **[←]** and **[→]** to move Dale the Martian over the correct x value, and then press **[ENTER]**. If the x value you pick is correct, Dale is beamed up to his ship! If the answer is incorrect on the second attempt, the correct answer is displayed; press any key to resume play. As you play the activity, solve each equation in the space below. Show all steps and work.

4. What level did you play? _____
5. What was your score? _____

Activities (continued)



Scoring: Points are based on how quickly you solve each equation.



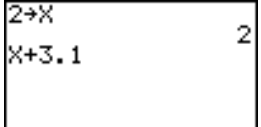

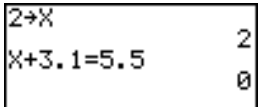
The game automatically ends if four missed equations stack up, or you press **(QUIT)** to stop.

Free Fall

1. Highlight a level (silver = less difficult; gold = more difficult), and press **[ENTER]** to select it.
2. When you are ready to start, press any key.
3. Watch the equation as it falls, and quickly solve for x . Enter the solution (press **[-]** for negative numbers), and press **[ENTER]** before the equation hits bottom. If you give an incorrect answer, the correct answer is displayed; press any key to resume play. The incorrect equation stacks up at the bottom of the screen, giving you less time to solve the next equation.
4. Follow your teacher's instructions for how long to play the activity.
5. What level did you play? _____
6. What was your score? _____

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


Can your graphing calculator check your work? Is $X=2$ the solution to the equation $X+3.1=5.5$?

To Do This	Press	Display (TI-83 Plus shown)
<p>1. Exit the Topics in Algebra 1 application and clear the Home screen.</p> <p>From the Home screen, the graphing calculator can tell you if a sentence is TRUE or FALSE (1=TRUE and 0=FALSE).</p>	<p>$\boxed{2\text{nd}} \boxed{[\text{QUIT}]}$ $\boxed{\langle \text{EXIT} \rangle} \boxed{[\text{CLEAR}]}$</p>	
<p>2. First, check for the value currently stored in X.</p> <p>Note: On the TI-73, use \boxed{x} rather than $\boxed{X,T,\theta,n}$.</p>	<p>$\boxed{X,T,\theta,n}$ $\boxed{\text{ENTER}}$</p>	
<p>3. What is the value of X stored in your graphing calculator? ____ Check around the class. Most likely, there are many different values stored to X.</p>		
<p>4. Next, find out: Is $X+3.1=5.5$ true or false when $X=2$? When you tell the graphing calculator that $X=2$, this is called storing a value in X.</p> <p>Note: On the TI-73, use \boxed{x} rather than $\boxed{X,T,\theta,n}$.</p>	<p>$2 \boxed{\text{STO}\blacktriangleright} \boxed{X,T,\theta,n}$ $\boxed{\text{ENTER}}$</p>	
<p>5. Enter the expression $X+3.1=5.5$. This takes three steps.</p> <p>a. Enter the first part of the expression: $X+3.1$.</p> <p>Note: On the TI-73, use \boxed{x} rather than $\boxed{X,T,\theta,n}$.</p>	<p>$\boxed{X,T,\theta,n} \boxed{+} \boxed{3} \boxed{.} \boxed{1}$</p>	
<p>b. Enter the equal sign (=) for the test.</p>	<p>$\boxed{2\text{nd}} \boxed{[\text{CATALOG}]} \blacktriangleleft$ until = is highlighted $\boxed{\text{ENTER}}$</p>	
<p>c. Now, complete the sentence and see the result. Since the result is 0 (1=TRUE and 0=FALSE), the sentence $X+3.1=5.5$ is false when $X=2$.</p>	<p>$5 \boxed{.} \boxed{5}$ $\boxed{\text{ENTER}}$</p>	
<p>6. Test another point. Try $X=3$. Is the sentence true or false? What value do you think makes the sentence true?</p>		

Hint: You do not have to type in the expressions again.

- On the TI-73, press \blacktriangleleft to highlight previous entries, and press $\boxed{\text{ENTER}}$ to paste an entry on the current line. You can edit the line and use it again.
- On the TI-83 Plus: $\boxed{2\text{nd}} \boxed{[\text{ENTRY}]}$ displays previous entries. When you get to the one you want, you can edit the line and use it again.

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

Additional Problems—Solve the following equations by hand. Show all of your work. Then test your solution using the graphing calculator as shown in the  Try-It! example on the previous page.

1. $x - (-4) = 12$

2. $\frac{3}{4}W - \frac{1}{4} = -\frac{5}{8}$

3. $5.25 + P = -3.5$

Hint: To find = and other relations:

- **TI-83 Plus:** Press $\boxed{2\text{nd}}$ [TEST], and then select the relation you want.
- **TI-73:** Press $\boxed{2\text{nd}}$ [TEXT] to enter the text editor, select the relation you want, press $\boxed{\text{ENTER}}$, select **Done**, and press $\boxed{\text{ENTER}}$.

Linear Equations: Using Algebra

Teacher Notes

Objectives

- To review one-step and two-step linear equations.
- To review the idea of isolating the variable, balancing equations and checking solutions.
- To review the properties of equality.

Math Highlights

This section opens with an explanation of the idea of balancing equations using a pan balance. The properties of equality are displayed. Then, examples of solving linear equations of the forms $x + a = b$, $ax = b$, and $ax + b = c$ are shown. These examples start with word problems and are then modeled with linear equations, solved, and the solution is checked.

Common Student Errors

- Students may have a hard time deciding which steps to follow to solve an equation. In particular, if they are given an equation in the form $x + a = b$, they may choose the wrong step to take if the equation is given as $a + x = b$. Students might make sign errors as they add or subtract from both sides of the equation.
- Students should connect the idea of a zero model from working with integers; for example, they should connect $7 + -7 = 0$ with the concept of an additive inverse. They use the additive inverse to create the zero model. The term zero model is not discussed.
- Students should notice that they are using the multiplicative inverse to isolate the variable when they multiply or divide both sides of equations.
- Although this section deals with the mechanical way of finding the solution set, students should be reminded that they should check to see if the solution is reasonable. They need to keep using number sense.
- Many students are able to see the answer using number sense without the written work. Learning how to write mathematics correctly is part of the communication skill and needs to be encouraged. This can cause frustration for students who find the problems easy to solve “in their heads.”

Student Worksheet Notes with Answers

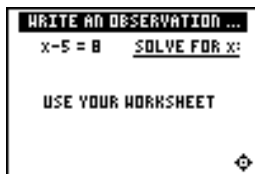
Overview

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 algebraic concepts relating to linear equations. If necessary, tell students how to find the **Observations**.

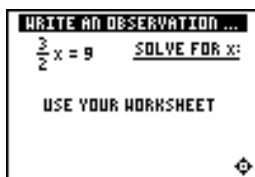
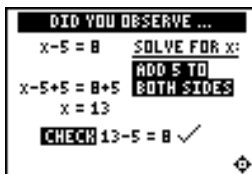


Students solve for x . The answer is displayed on this screen.

Observation 1

$$x - 5 = 8$$

Solve for x . Students show all their work.

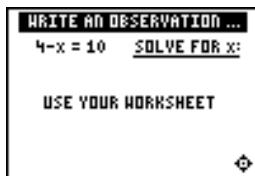
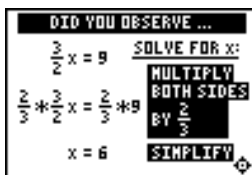


Students solve for x . The answer is displayed on this screen.

Observation 2

$$\frac{3}{2}x = 9$$

Solve for x . Students show all their work.

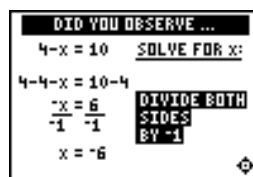
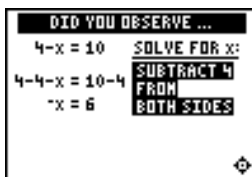


Students solve for x . The answer is displayed on these screens.

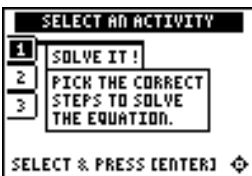
Observation 3

$$4 - x = 10$$

Solve for x . Students show all their work.



Activities



Scoring: Students get two attempts to pick the correct step or steps. They get 2 points for a correct choice on the first try, and 1 point for a correct choice on the second try. They get an additional 2 points for the correct solution.

The total number of points available varies.



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

Students can earn up to 10 points.

Solve It!

Tell students to:

1. Highlight a level (silver = less difficult; gold = more difficult), and press **[ENTER]** to select it.
2. Look at the algebraic expression at the top of the screen and decide what must be done to solve the equation for x . Students must select from the choices offered; this activity presents only one sequence of steps (to first isolate x and then change the coefficient of x to 1), although other sequences may be correct.
3. Press **[↓]** or **[↑]** to cycle through steps to choose from, and then press **[ENTER]** to select the correct step (some problems require two steps). If the second choice is incorrect, the correct step is displayed. They must press a key to continue play. As they play the activity, students should write the equations, the steps required to solve them, and the solutions.
4. Record the level they played.
5. Record their scores.

Beam Dale Up

Tell students to:

1. Highlight a level (silver = less difficult; gold = more difficult), and press **[ENTER]** to select it.
2. Look at the problem on the space ship and determine how to solve the equation for x from the four choices given.
3. Press **[←]** and **[→]** to move Dale the Martian over the correct x value, and then press **[ENTER]**. If the x value they pick is correct, Dale is beamed up to his ship! As they play the activity, students record the solution to each equation, showing all steps and work. If the answer is incorrect on the second attempt, the correct answer is displayed; press any key to resume play.
4. Record the level they played.
5. Record their scores.

Activities (continued)



Scoring: Points are based on how quickly students solve each equation.

Unless you specify point or time limits for this activity, students can play the activity when four missed equations stack up, or they press **QUIT** to stop. There is no time limit.


Free Fall

Tell students to:

1. Highlight a level (silver = less difficult; gold = more difficult), and press **[ENTER]** to select it.
2. When they are ready to start, press any key.
3. Watch the equation as it falls, and quickly solve for x . Enter the solution (press **[(-)]** for negative numbers), and press **[ENTER]** before the equation hits bottom. If students give an incorrect answer, the correct answer is displayed; press any key to resume play. The incorrect equation stacks up at the bottom of the screen, giving them less time to solve the next equation.
4. Follow your instructions. For example, students can play:
 - Until they have answered incorrectly four times (no time limit).
 - Until a certain amount of time has expired (highest score with the fewest misses wins).
 - Until a certain score has been reached (first student to reach the score with the fewest misses wins).
 - Repeatedly over a period of time (days, weeks, etc.) for tracking improvement of high scores.
5. Record the level they played.
6. Record their scores.

Try-It!™ on Your TI-83 Plus or TI-73

Tell students to:

- Solve the following equations by hand and show all of their work.
- Test their solutions using the graphing calculator as shown in the  Try-It! example on the previous page.

1. $x - (-4) = 12$ *when* $x = 8$

2. $\frac{3}{4}W - \frac{1}{4} = -\frac{5}{8}$ *when* $W = -\frac{1}{2}$

3. $5.25 + P = -3.5$ *when* $P = -8.75$