



Math Objectives

- Students will evaluate an expression.
- Students will recognize the effect of changing a variable on the value of an expression.
- Students will relate the change in the value of an expression to the symbolic representation.
- Students will make sense of problems and persevere in solving them (CCSS Mathematical Practice).

Vocabulary

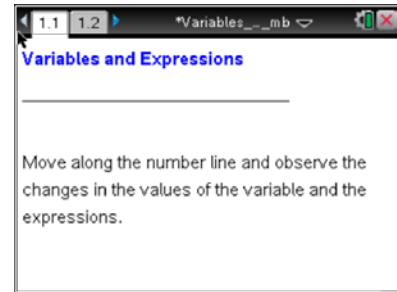
- expression
- variable
- coefficient

About the Lesson

- This lesson introduces the concept of variable and the role of variables in simple mathematical expressions.
- As a result, students will move a point along a number line and observe changes in the values of an expression. They will be asked to connect the changes in the values to the coefficient of the variable term in the expression.

TI-Nspire™ Navigator™ System



- Screen Capture
- Live Presenter
- Quick Poll



TI-Nspire™ Technology Skills:

- Download a TI-Nspire document
- Open a document
- Move between pages
- Grab and drag a point

Tech Tips:

- Make sure the font size on your TI-Nspire handhelds is set to Medium.
- You can hide the function entry line by pressing  .

Lesson Materials:

Student Activity

Variables_and_Expressions.pdf

Variables_and_Expressions.doc

TI-Nspire document

Variables_and_Expressions.tns

Visit www.mathnspired.com for lesson updates and tech tip videos.



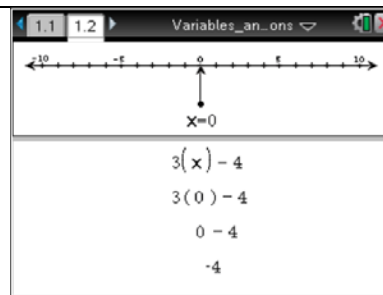
Discussion Points and Possible Answers

Tech Tip: If students experience difficulty dragging a point, check to make sure that they have moved the cursor (arrow) until it becomes a hand (☞) getting ready to grab the point. Also, be sure that the word *point* appears. Press **ctrl** to grab the point and close the hand . When finished moving the point, press **esc** to release the point.

Move to page 1.2.

- As you grab the point and move the arrow beneath the number line, what changes? What stays the same?

Answer: The value of x , the product in the line below the box, the result of the product, and the final value all change when you move the arrow.



Teacher Tip: This might be an opportunity to review the notion of coefficients—the number in the product that contains a variable. In this case, the coefficient of x is 3, which does not change in the expression, nor does the constant term -4 .

- Wade says that when x is negative, the value of $3(x) + -4$ is always negative. Explain why he is right or wrong.

Answer: He is right because the product of 3 and any negative will be negative and then adding a -4 will always result in a negative.

- Find a value of the variable x that causes the expression $3(x) + -4$ to equal 17.

Answer: $x = 7$

- Estimate a value of the variable x that causes the expression $3(x) + -4$ to equal 15. Explain your reasoning.

Answer: The value for the expression is 17 when $x = 7$ and 14 when $x = 6$ so the value of x must be between 6 and 7.



Teacher Tip: In the expression $3(x) + -4$, the -4 is called the **constant** term.

4. Find a value for x that will make the value of the expression $3(x) + -4$ equal to -4 .

Answer: The expression will be equal to -4 or when $3x + -4 = -4$. This will happen when $x = 0$.

Teacher Tip: Students might need to be reminded what is meant by the constant term. A good question might be “Why is constant a good name for the term?” Note that in evaluating the expression, the constant term never varies while the values for the variable change the values of any term that contains the variable.

TI-Nspire Navigator Opportunity: *Screen Capture and Live Presenter*
See Note 1 at the end of this lesson.

5. a. If the value of x is increased by 1, how does the value of the expression change?

Answer: The value of the expression will change by 3.

- b. How is this change related to the expression?

Answer: The value of the expression will change by 3, which is the coefficient of x in the expression.

Teacher Tip: Ask students to consider why the coefficient is related to the change when the value of x is increased by 1. When x in the expression $3x + -4$ is increased by 1, the result actually adds another 3: $3(x + 1) + -4$ is the same as $3x + 3 + -4$.

6. a. Write an expression you think will increase by 5 when the value of x is increased by 1.

Answer: Student answers will vary. One possible answer is $5x + -2$.

- b. Give some examples to support your reasoning.

Answer: Any expression in which the coefficient of x is 5 will increase by 5 if the value of x is increased by 1. This is because $5(x + 1) = 5x + 5$, which is an increase of 5 in the value of the expression.



Teacher Tip: Ask students whether the constant term will affect the change in value as x changes by 1 and why or why not.

7. Write an expression that will not vary (change in value) when the value of x is increased by 1. Explain your reasoning.

Answer: Student answers may vary. One possible answer is $0x + 6$. The coefficient of x has to be 0 because if it is something other than 0, increasing x by 1 will change the value of the expression.

TI-Nspire Navigator Opportunity: *Quick Poll*
See Note 2 at the end of this lesson.

Wrap Up

Upon completion of the discussion, the teacher should ensure that students are able to:

- Understand that a variable is a symbol that represents a set of numbers and can be used in an expression.
- Evaluate an expression.
- Understand that as the values for a variable change in a systematic way, the values of the expression also change in a systematic way that can be related to the numbers in the expression.



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Note 1

Questions 1–4, Screen Capture and Live Presenter: Use Screen Capture to monitor how students are investigating the answers to questions 1–4. Then pick different students and use Live Presenter to have each student show how he or she answered questions 2, 3, and 4.

Note 2

Quick Poll: Use the Open Response feature and send the student the following Poll Prompts. Then ask the question that appears in quotes.

1. Poll Prompt: $6x + 7$ Ask: "What is the constant term?"

Answer: 7

2. Poll Prompt: $-3x + 5$ Ask: "What is the coefficient of x ?"

Answer: -3

3. Poll Prompt: $4x$ Ask: "What is the constant term?"

Answer: 0

4. Poll Prompt: $-x + 5$ Ask: "What is the coefficient of x ?"

Answer: -1

5. Poll Prompt: $x - 4$ Ask: "What is the constant term?"

Answer: -4