



### Science Objectives

- Students will interpret vector lines in graphical form.
- Students will construct vectors and perform basic vector functions.

### Vocabulary

- vector
- direction
- magnitude
- angle
- $x$ - $y$  axis

### About the Lesson

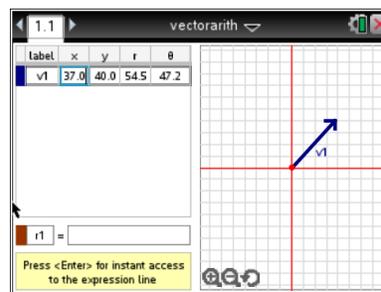
- The student will learn how to construct vectors on a graph.
- As a result, students will:
  - learn to recognize the relationship between magnitude and direction with vector values.
  - learn to perform basic vector functions.

### TI-Nspire™ Navigator™

- Send out the *vectorarith.tns* file.
- Monitor student progress using Class Capture.
- Use Live Presenter to spotlight student answers.

### Activity Materials

- *vectorarith.tns* document
- TI-Nspire™ Technology



### TI-Nspire™ Technology Skills:

- Download a TI-Nspire™ document
- Open a document

### Lesson Materials:

#### Student Activity

- Vector\_Arithmetic\_Student.doc
- Vector\_Arithmetic\_Student.pdf

#### TI-Nspire document

- vectorarith.tns

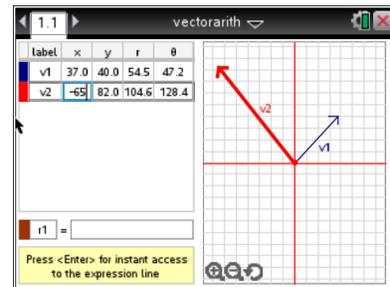


### Discussion Points and Possible Answers

Students should read the background information and directions for creating vectors using the vector tool given on the student activity sheet. In this lesson, students will practice constructing vectors and performing vector functions.

**Teacher Tip:** All students will need to have a full copy of the student activity because it contains the directions for constructing vectors.

- Students are to add a vector v2 to the graph with an x-value of  $-65$  and a y-value of  $82$ . They can use the Menu to insert a new vector, and then enter the x- and y-values in the boxes on the left.



**Teacher Tip:** To move from one text box to another, students can click in the box or press **tab**.

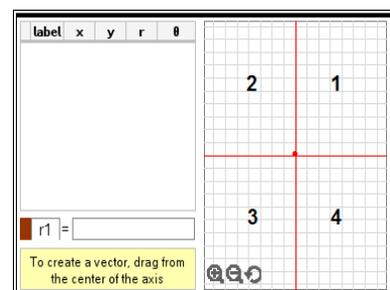
Q1 How does vector v2 compare to vector v1?

**Answer:** Vector v2 is in the opposite direction of vector v1 because the x-value is negative.

Q2 Choose a positive or negative x-value and y-value for each row in the table below and enter them into the vector tool. Then, record the Quadrant the vector points to.

**Sample answers:**

	<b>x-value</b>	<b>y-value</b>	<b>Quadrant</b>
v3	(-) $-20$	(+) $55$	2
v4	(+) $64$	(+) $23$	1
v5	(+) $44$	(-) $-76$	4
v6	(-) $-37$	(-) $-15$	3



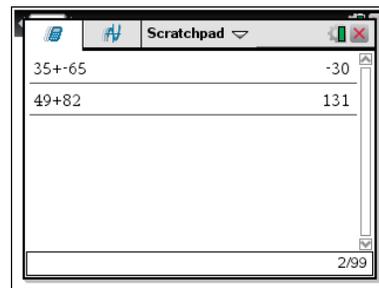
- Students need to delete vectors v3 to v6 that were created in Q2. Then they should answer questions 4-9 using the Vector Arithmetic tool.



Q3. Add  $v_1$  and  $v_2$  by entering  $v_1 + v_2$  into the box next to  $r_1$  at the bottom of the screen. Press  to place the vector on the graph. Record values of  $r_1$  below.

**Sample answers:**  $x = -30$ ,  $y = 131$

Q4 Open the Scratchpad . Add the  $x$ -values of vectors  $v_1$  and  $v_2$ . Then add the  $y$ -values. How do the values compare to the values of vector  $r_1$ ?



**Answer:** They are the same.

3. Add a new vector  $v_3$  with  $x = -8$  and  $y = -23$ . Then add a new vector  $v_4$  with  $x = 34$  and  $y = -34$ .

Q5. In the equation box, add all four vectors  $v_1 + v_2 + v_3 + v_4$ . Press  to place the vector on the graph. Record values of  $r_2$  below.

**Answer:**  $x = 9$ ,  $y = 75$

Q6 On the Scratchpad add the  $x$ -values of vectors  $v_1$ ,  $v_2$ ,  $v_3$ , and  $v_4$ . Then add the  $y$ -values. How do the values compare to the values of vector  $r_2$ ?

**Answer:** They are the same.

Q7 What  $x$ -value and  $y$ -value do you think you will get if you subtract the vectors,  $v_1 - v_2 - v_3 - v_4$ ? Use the Scratchpad to make a prediction.

**Answer:**  $x = 87$ ,  $y = 25$

Q8. In the equation box subtract all four vectors  $v_1 - v_2 - v_3 - v_4$ . Press  to place the vector on the graph. Record values of  $r_3$  below.

**Answer:**  $x = 87$ ,  $y = 25$

Q9. What statements could be made about adding and subtracting vectors?

**Answer:** The  $x$ - and  $y$ -values of the sum or difference of two vectors is the sum or difference of the  $x$ - and  $y$ -values of the original vectors.



**TI-Nspire™ Navigator™ Opportunities**

Use TI-Nspire™ Navigator™ to make screen shots to record and follow student progress. Make a visual check to see which students are successful and which are struggling.

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**Wrap Up**

When students are finished with the activity, retrieve the .tns file using TI-Nspire™ Navigator™. Save grades to Portfolio. Discuss activity questions using Slide Show.

**Assessment**

- Formative assessment will consist of questions embedded in the .tns file. The questions will be graded when the .tns file is retrieved by TI-Nspire™ Navigator™. The TI-Nspire™ Navigator™ Slide Show can be utilized to give students immediate feedback on their assessment.
- Summative assessment will consist of questions/problems on the chapter test, inquiry project, performance assessment, or an application/elaborate activity.