Name: _____ Date:_____

Introduction to Vectors using Geometry

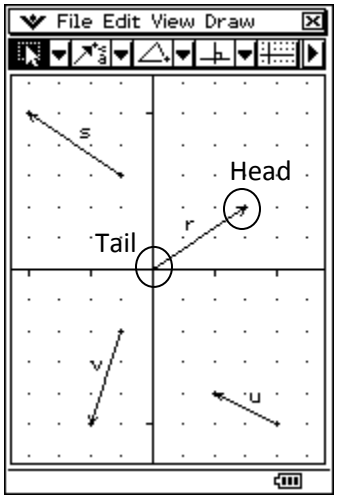
Vectors

A vector is a displacement with magnitude (length) and direction. Each vector has a tail and head (arrow part).

Two vectors are said to be equivalent if they have the same magnitude and direction. Graphically, two equivalent vectors will be parallel.

We can describe vectors with columns or rows. For example:

The vector that starts at the point (0,0) and ends at the point (2,-3) can be described using the ClassPad as either $[2,-3]$ or $\begin{bmatrix} 2 \\ -3 \end{bmatrix}$.

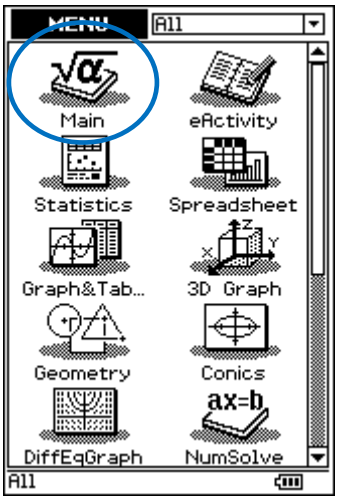


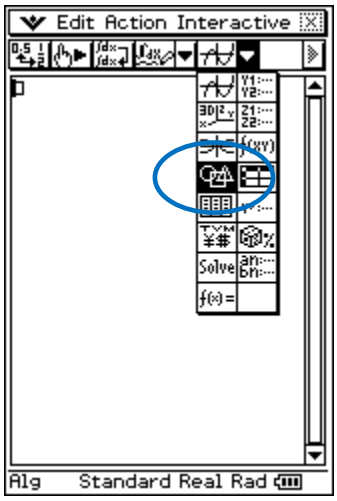
Setting up the ClassPad:

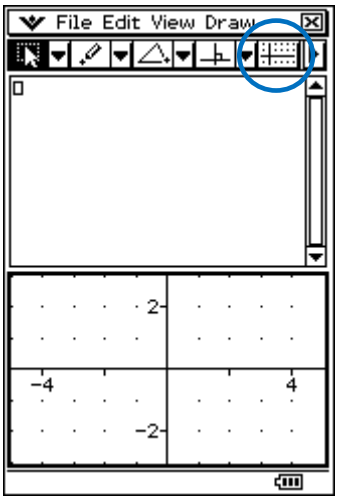
a) Open J and clear the window if needed (Edit/Clear All).

b) Insert a Geometry window.

c) Tap the ɋbutton until you have the grid and axis with numbers showing (usually three times).

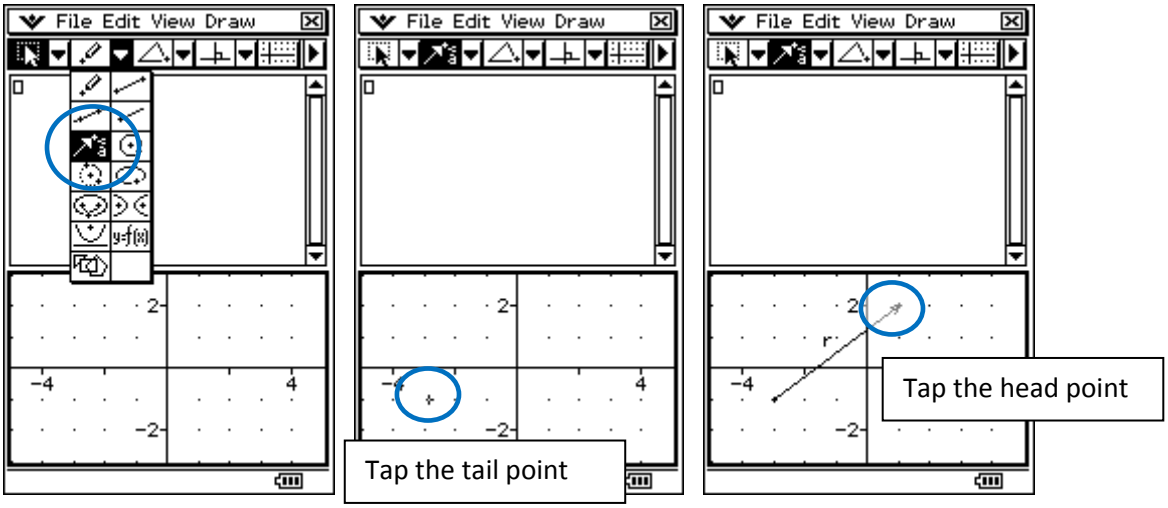






d) Tap the second down arrow (n) on the toolbar and select H (vector drawing tool).

e) Tap one point to be the tail and then tap another point to be the head.



Congratulations, your first vector is drawn!

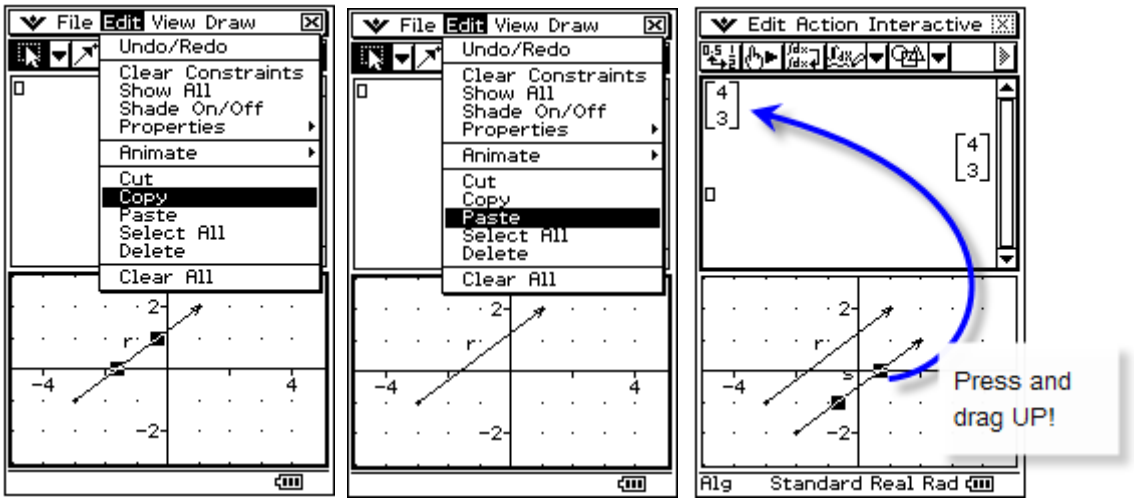
Equivalent Vectors and Scalar Multiples

Before tapping anywhere else, change back to the select mode by tapping the G toolbar button.

a) Tap on your vector to select it and then select Edit/Copy.

b) Next select Edit/Paste.

c) Press on the new vector and drag it UP to the Main window. Press EXE to get output.



d) Tap any white space in the Geometry window to deselect your selected vector.

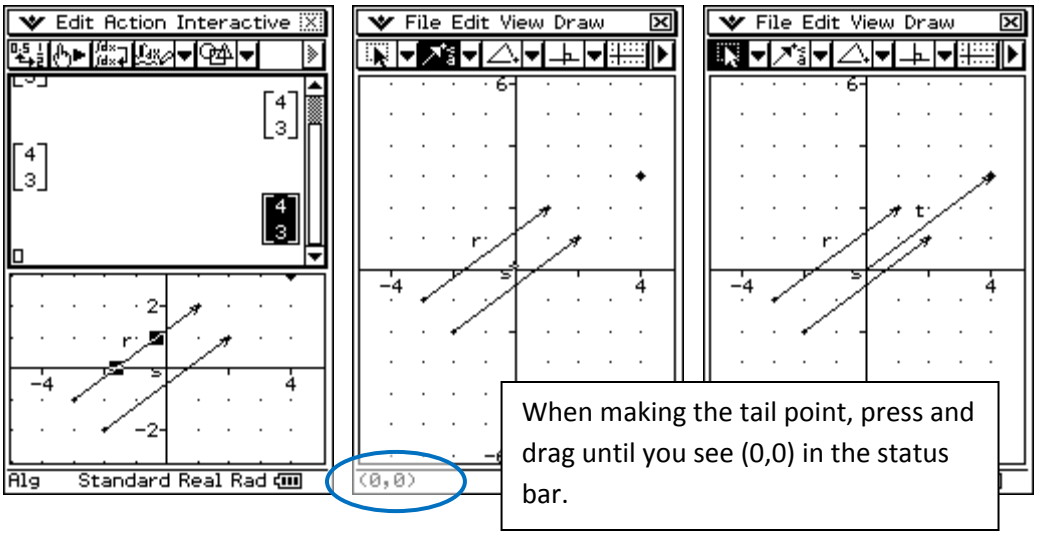
e) Tap on the original vector and drag it UP to Main. Press EXE. Interesting!! They are equivalent.

f) Tap on one of the outputs in Main to select it and let go. Press on the selection and drag to the Geometry window.

g) Tap Resize (⌐) to enlarge the Geometry window. Notice the point.

h) Change to the vector drawing tool (H).

i) Draw a vector from the origin to the point you dropped in from Main.

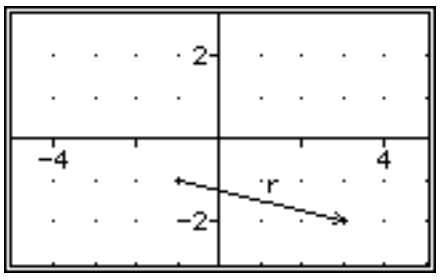


Exercise 1:

Complete: Equivalent vectors are vectors that have the same _____ and same _____.

Exercise 2:

On the same axis, sketch two vectors that are equivalent to the given vector. Check by drawing them in Geometry and dragging up to Main.



Begin by clearing the Main window and then the Geometry window. Next draw a single vector in Geometry.

a) Sketch your vector and label it.

b) Drag your vector up to main and then multiply it by 2. Press EXE and drag it back to Geometry. Using to vector tool, draw a vector from the origin to the point.

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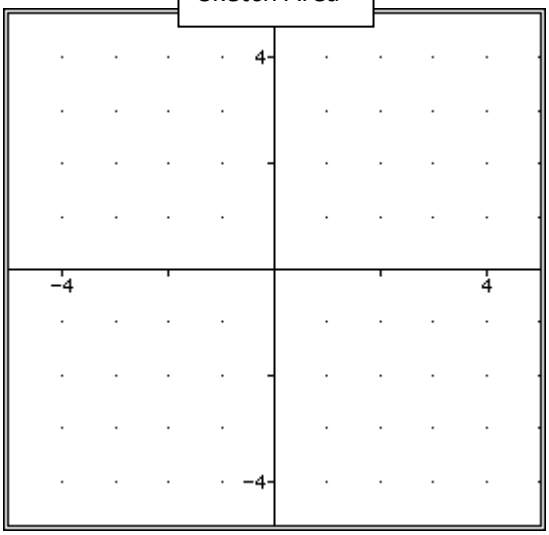
Sketch Area



Note: When we multiply a vector by a constant number, the number is called a **scalar multiple** of the vector.

Exercise 3

In your own words, describe how the original vector is changed when it is multiplied by a negative number.

In your own words, describe how the original vector is changed when it is multiplied by a positive scalar multiple.

Assume the magnitude of vector $\vec{v}$ is known to be 4m. What would be the magnitude of $5\vec{v}$?

Adding Vectors Geometrically

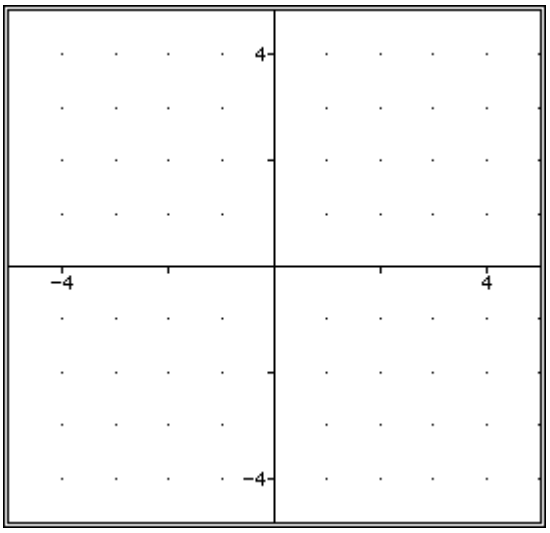
Begin by clearing the Main window and then the Geometry window. Next, draw two vectors, both with tails at the origin.

a) Sketch your vectors and label each.

Sketch Area

b) Drag one vector up to Main, insert a + sign, and then drag the second up. Press EXE.

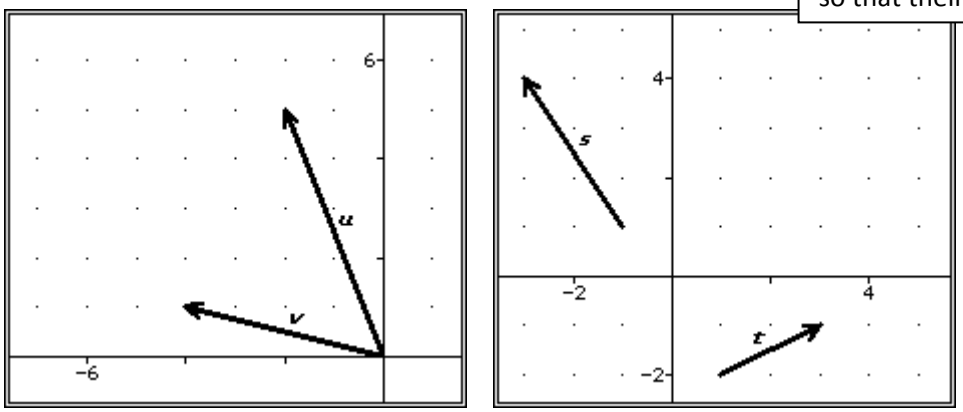
c) Drag the result back to Geometry



Exercise 4:

For sketch and label the sum of the given vectors for each of the following:

Hint: Reposition the vectors so that their tails connect.



Exercise 5:

In your own words, describe how to add two vectors when given only their geometric representation.

Subtracting Vectors Geometrically

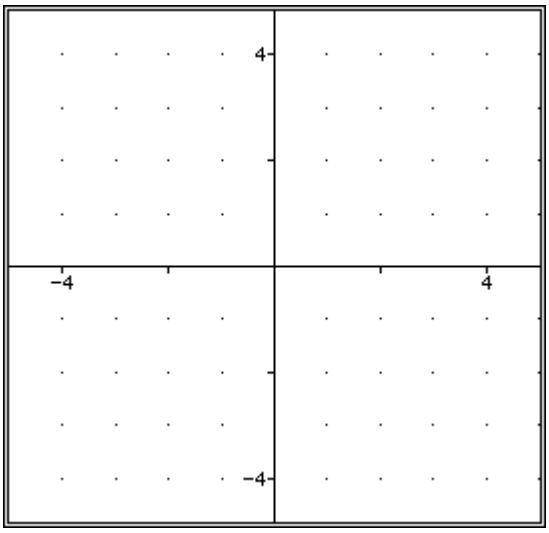
Again, begin by clearing the Main window and then the Geometry window. Next, draw two vectors, both with tails at the origin.

a) Sketch your vectors and label each.

Sketch Area

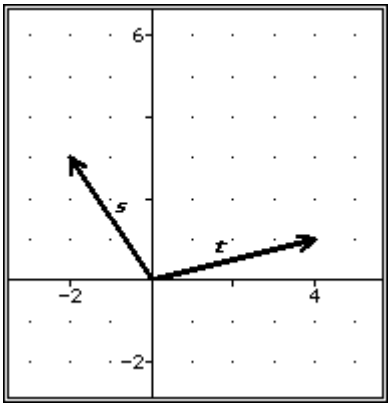
b) Drag one vector up to Main, insert a - sign, and then drag the second up.

Remember which one you dragged up first!

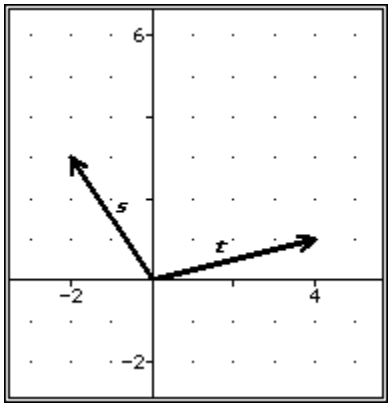


Exercise 6:

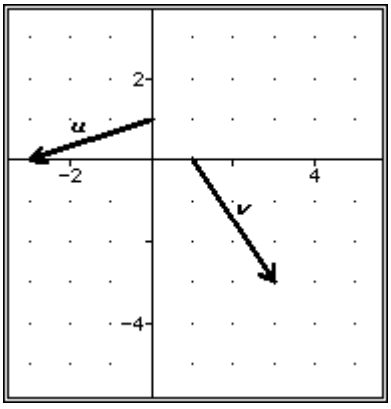
Sketch and label: $\vec{s}-\vec{t}$



Sketch and label: $\vec{t}-\vec{s}$



Sketch and label: $\vec{v}-\vec{u}$



Exercise 7:

In your own words, describe how to find the difference vector when given only their geometric representation and the order in which to subtract. For example, describe $\vec{u}-\vec{v}$.