**Activity 8.2.5 Multiplying Vectors by Scalars**

Looking at the previous activity we see that $\vec{-u}=\left(-u\_{1},-u\_{2}\right)=\left(\left(-1\right)u\_{1},\left(-1\right)u\_{2}\right)$. We find $\vec{-u} by finding the vector with the same magnitude, but with a reversed direction or alternatively $ by multiplying the components of the vector by $-1$.

The same idea can be used to find a vector $\vec{v}+\vec{v}$, see below.

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$$\vec{v}+\vec{v}=\left(v\_{1}+v\_{1},v\_{2}+v\_{2}\right)=\left[\begin{matrix}v\_{1}+v\_{1}\\v\_{2}+v\_{2}\end{matrix}\right]=\left(2v\_{1},2v\_{2}\right)=\left[\begin{matrix}2v\_{1}\\2v\_{2}\end{matrix}\right]$$

It is natural to create scalar multiples of vectors in this manner and to define $\vec{v}+\vec{v}=2\vec{v}$

and $\vec{–u}=\left(-1\right)\vec{u}$. Similarly, for any scalar *k*, $k\vec{v}$ = $\left(kv\_{1},kv\_{2}\right)=\left[\begin{matrix}kv\_{1}\\kv\_{2}\end{matrix}\right]$

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1. Label the coordinate system above with a scale and determine the ordered pair notation for $\vec{v}$.
2. Determine the ordered pair notation for $-\frac{1}{2}\vec{v}$ and draw and label the vector on the coordinate system.
3. Using both arrows and ordered pairs, find $\vec{v}+\left(-\frac{1}{2}\vec{v}\right)$ and verify that this is the same vector as $\vec{v}-\left(\frac{1}{2}\vec{v}\right)$ and $\vec{v}+\frac{1}{2}\left(-\vec{v}\right)$.
4. If $\vec{a}$ = (0, 3) and $\vec{c}$ = (5,0) then find $2\vec{a}$ + $\vec{c}$ .
5. If $\vec{a}$ = (1, -2) and $\vec{c}$ = (4, -5) then find $\vec{3a}$ + 4 $\vec{c}$ .

1. $\vec{r}=\left[\begin{matrix}7\\-9\end{matrix}\right], \vec{c}=\left[\begin{matrix}-4\\12\end{matrix}\right],\vec{v}= 2\vec{r}-3\vec{c}=\left[\begin{matrix}\\\end{matrix}\right].$
2. $\vec{r}=\left[\begin{matrix}7\\-9\end{matrix}\right] and a=-3$ show that $\left‖a\vec{r}\right‖=\left⌊a\right⌋\left‖\vec{r}\right‖$