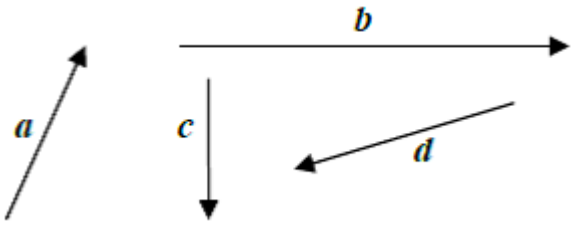
3.3 More Vector Operations

Practice Tasks

I. Concepts and Procedures

1. Let a, b, c, and d be the vectors shown below. Sketch each of the following:



a. $b + c$

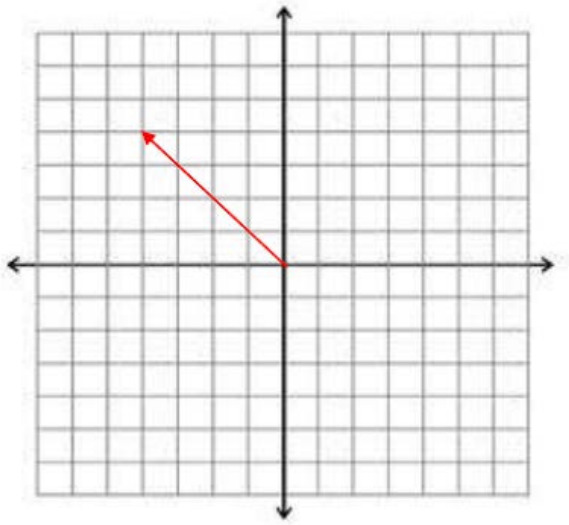
b. $-\frac{1}{4}a$

c. $2d - b$

d. Find e so $c + e =$

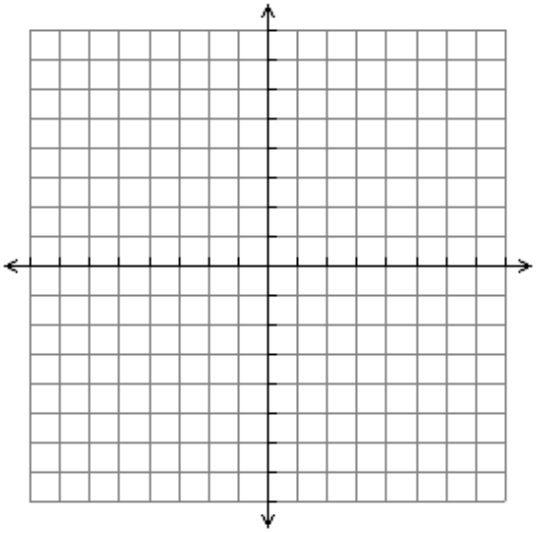
e. Find f so that $2f + a = 0$.

2. Using either the triangle method or the parallelogram law, graph the resultant of vector $\mathbf{u} + \mathbf{v}$: Given $\mathbf{u} = \langle -5,3 \rangle$ (already graphed) and $\mathbf{v} = \langle 1,1 \rangle$

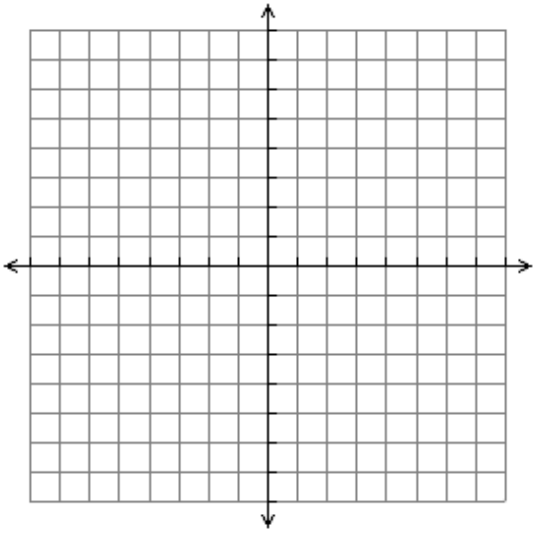


3. Given $\mathbf{u} = \langle -2,1 \rangle$ and $\mathbf{v} = \langle 3,1 \rangle$, find (a) $\mathbf{u} - \mathbf{v}$, and (b) $3\mathbf{u} - 2\mathbf{v}$. Then sketch your resultant vector.

a.



b.



4. Find the component form of vector $\mathbf{v}$ with the given magnitude and direction angles:

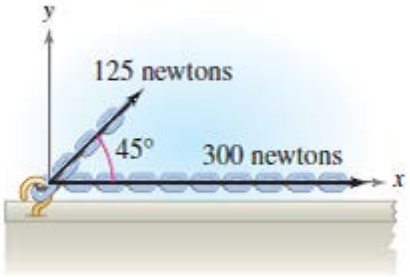
	Magnitude	*Angle*
a.	$\|\|v\|\| = 3$	$\theta = 0°$
b.	$\|\|v\|\| = 1$	$\theta = 45°$
c.	$\|\|v\|\| = \frac{7}{2}$	$\theta = 150°$
d.	$\|\|v\|\| = 2\sqrt{3}$	$\theta = 45°$
e.	$\|\|v\|\| = 5.23$	$\theta = 63°$
f.	$\|\|v\|\| = 13.7$	$\theta = 123°$

5. Find the magnitude and the direction of the sum of $\mathbf{u}$ and $\mathbf{v}$ with the given magnitude and direction angles θ_u and θ_v:

	Magnitude	*Angle*
a.	$\|\|u\|\| = 5$	$\theta_u = 0°$
	$\|\|v\|\| = 5$	$\theta_v = 90°$
b.	$\|\|u\|\| = 4$	$\theta_u = 60°$
	$\|\|v\|\| = 4$	$\theta_v = 90°$
c.	$\|\|u\|\| = 20$	$\theta_u = 45°$
	$\|\|v\|\| = 50$	$\theta_v = 180°$
d.	$\|\|u\|\| = 50$	$\theta_u = 30°$
	$\|\|v\|\| = 30$	$\theta_v = 110°$
e.	$\|\|u\|\| = 13$	$\theta_u = 28°$
	$\|\|v\|\| = 7$	$\theta_v = 61°$

II. Problem Solving

1. Forces with magnitudes of 125 newtons and 300 newtons act on a hook (see figure below). The angle between the two forces is 45°. Find the direction and magnitude of the resultant of these forces.



III. Reasoning

1. Sasha says that a vector has a direction component in it; therefore, we cannot add two vectors or subtract one from the other. His argument is that we cannot add "east" to "north" nor subtract "east" from "north," for instance. Therefore, he claims, we cannot add or subtract vectors.

   a. Is he correct? Explain your reasons.

   b. What would you do if you need to add two vectors, **u** and **v**, or subtract vector **v** from vector **u** arithmetically?

2. Tyiesha says that if the magnitude of a vector **u** is zero, then **u** has to be a zero vector. Is she correct? Explain how you know.