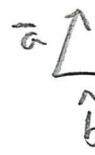
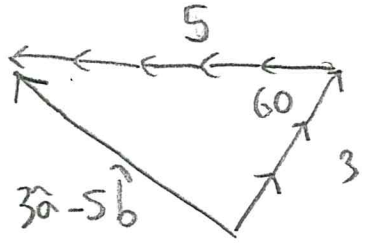
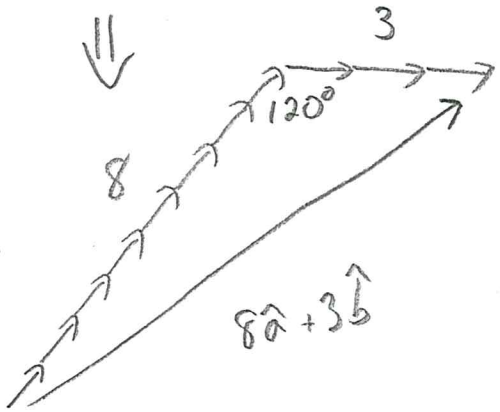
Challenge Set #1

1a) 

$\Rightarrow$ 

$|3\hat{a}-5\hat{b}| = \sqrt{19}$

b) $\Downarrow$



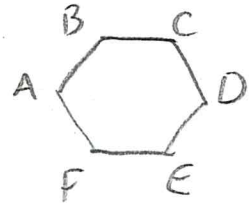
$|8\hat{a}+3\hat{b}| = \sqrt{97}$

2. a) $|\vec{u}+\vec{v}| = |\vec{u}-\vec{v}|$ if $\vec{u} \perp \vec{v}$

b) $|\vec{u}+\vec{v}| = |\vec{u}|+|\vec{v}|$ if $\vec{u}$ and $\vec{v}$ are in same direction

c) $|\vec{u}+\vec{v}| = |\vec{u}|-|\vec{v}|$ if $\vec{u}$ and $\vec{v}$ are opposite direction

d) $|\vec{u}-\vec{v}| = |\vec{u}|+|\vec{v}|$ if $\vec{u}$ and $\vec{v}$ are opposite direction

3 

$\vec{AB} + \vec{AC} + \vec{AP} + \vec{AE} + \vec{AF}$

$= \vec{AB} + [\vec{AB}+\vec{BC}] + [\vec{AB}+\vec{BC}+\vec{CD}] + [\vec{AF}+\vec{FE}] + \vec{AF}$

$= 3\vec{AB} + 3\vec{BC} + 3\vec{AF}$

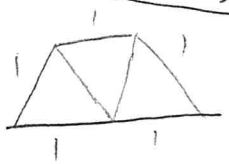
$= 3(\vec{AB}+\vec{BC}+\vec{AF})$

$= 3\vec{AD}$

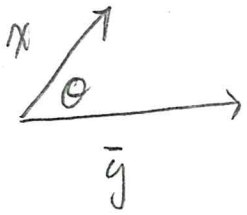
$\Rightarrow 3(2) = 6$

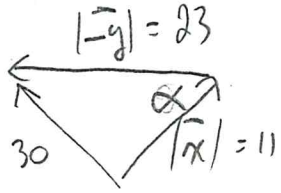
$\vec{BC} = \vec{FE}$

$\Downarrow$



4. $|\bar{x} - \bar{y}| = 30$

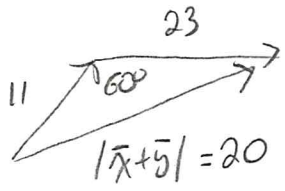




$\alpha = 120°$

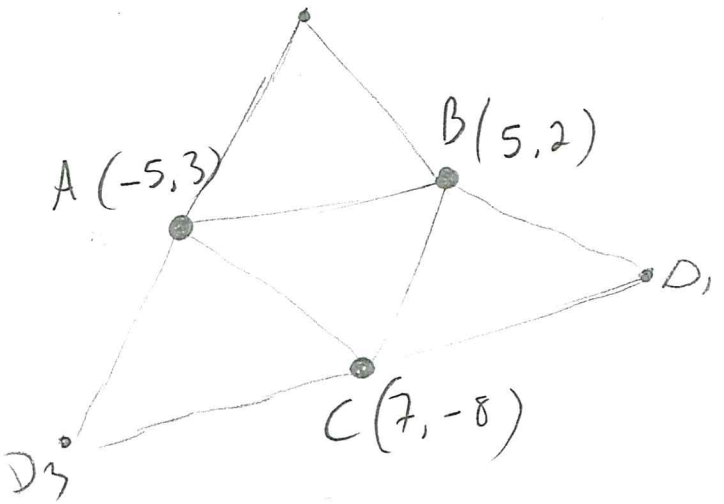
$\therefore \theta = 120°$

$\therefore |\bar{x} + \bar{y}| = 20$



Angles not to scale because we do not know initial configuration

5.



There are 3 pts to find. Call them D_1, D_2, D_3

$\vec{OD_1} = \vec{OC} + \vec{AB} = (17, -9)$

$\vec{OD_2} = \vec{OB} + \vec{CA} = (-7, 13)$

$\vec{OD_3} = \vec{OA} + \vec{BC} = (-3, -7)$

6. Determine two of vectors $\bar{AB}$, $\bar{BC}$ or $\bar{AC}$ and show that one is some multiple of the other

7. Show that $|\bar{AB}|$, $|\bar{AC}|$, $|\bar{BC}|$ satisfy pythagorean thm

8. $\bar{r} = 5[E\ 53^\circ S] = (3,-4)$

$\bar{a} = \sqrt{29}[E\ 21.8^\circ N] = (5, 2)$

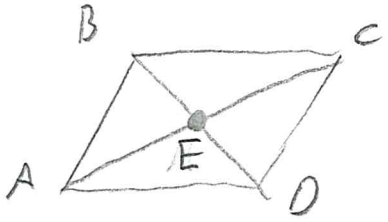
$\therefore \bar{r} = \bar{a} + \bar{b}$

$\bar{r} - \bar{a} = \bar{b}$

$(3,-4) - (5,2) = \bar{b}$

$(-2,-6) = \bar{b} \Rightarrow \sqrt{40}[W\ 71.6^\circ S]$

9.



Because $\bar{AE} = \bar{EC}$

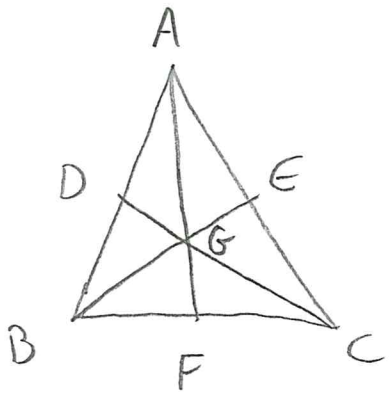
$\bar{BE} = \bar{ED}$

$\bar{EA} + \bar{EB} + \bar{EC} + \bar{ED}$

$= \bar{CE} + \bar{DE} + \bar{EC} + \bar{ED}$ Pairs of opposite vectors

$= \vec{0}$

10.



Note

$\overline{AG} = 2\overline{GF}$

$\overline{BG} = 2\overline{GE}$

$\overline{CG} = 2\overline{GD}$

$\overline{BF} = \overline{FC}$

$\overline{GA} + \overline{GB} + \overline{GC}$

$= 2\overline{FG} + \overline{GF} + \overline{FB} + \overline{GF} + \overline{FC}$

$= 2(\overline{FG} + \overline{GF}) + \overline{FB} + \overline{FC}$

$= \overline{0}$