Solve triangle ΔBHO if $B = 64^\circ$, $b = 7.9$ and $h = 8.3$. **Sketch and label triangles with your final answers.** **SCORE: _____ / 15 PTS**
If no such triangle exists, write "DNE". If more than one triangle is possible, solve for all possible triangles.

$h \sin B = 8.3 \sin 64^\circ \approx 7.46$

$7.46 < 7.9 < 8.3 \longrightarrow 2\ \Delta$'s

$\frac{\sin H}{8.3} = \frac{\sin 64^\circ}{7.9}$

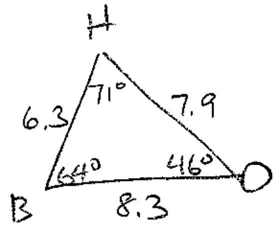
$H = \sin^{-1} \frac{8.3 \sin 64^\circ}{7.9} \approx 71^\circ$

OR $H = 180^\circ - 71^\circ = 109^\circ$

$O = 180^\circ - (64^\circ + 71^\circ) = 46^\circ$

$\frac{o}{\sin 46^\circ} = \frac{7.9}{\sin 64^\circ}$

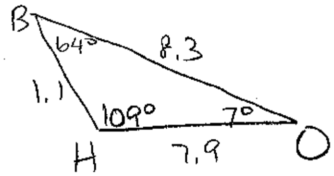
$o = \frac{7.9 \sin 46^\circ}{\sin 64^\circ} = 6.3$



$O = 180^\circ - (64^\circ + 109^\circ) = 7^\circ$

$\frac{o}{\sin 7^\circ} = \frac{7.9}{\sin 64^\circ}$

$o = \frac{7.9 \sin 7^\circ}{\sin 64^\circ} = 1.1$



Find the area of triangle ΔCPR if $r = 16.7$, $c = 9.3$, $C = 32^\circ$, $P = 41^\circ$ and $R = 107^\circ$. **SCORE: _____ / 5 PTS**

$\frac{1}{2} rc \sin P = \frac{1}{2}(16.7)(9.3) \sin 41^\circ = 50.95$

Suppose that $M = 29^\circ$ and $x = 8.5$. Find all values of m so that there is exactly one possible triangle ΔMAX. **SCORE: _____ / 5 PTS**

$m = x \sin M$ OR $m \geq x$

$m = 8.5 \sin 29^\circ$ OR $m \geq 8.5$

$m = 4.12$ OR $m \geq 8.5$

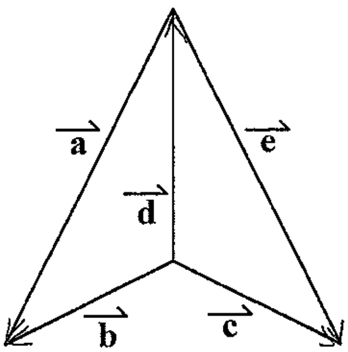
MULTIPLE CHOICE: **Circle the letter corresponding to the correct answer.** **SCORE: _____ / 5 PTS**

If $e = 5.4$ and $n = 2.9$, there is a possible triangle ΔLEN if $l =$

$2.4 + 2.9 \not> 5.4$ | $2.5 + 2.9 \not> 5.4$ | $5.4 + 2.9 \not> 8.3$ | $5.4 + 2.9 \not> 8.4$

[A] 2.4 **[B]** 2.5 **[C]** 8.3 **[D]** 8.4 **[E]** none of the above

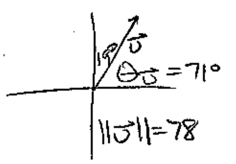
Write vectors $\vec{d}$ and $\vec{e}$ in terms of vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ in the diagram below. **SCORE: _____ / 5 PTS**

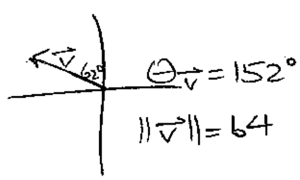


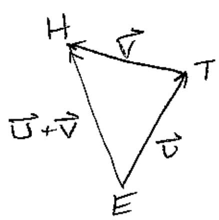
$$\vec{d} + \vec{a} = \vec{b}$$
$$\vec{d} = \vec{b} - \vec{a}$$
$$\vec{d} + \vec{e} = \vec{c}$$
$$\vec{e} = \vec{c} - \vec{d}$$
$$= \vec{c} - (\vec{b} - \vec{a})$$
$$= \vec{c} - \vec{b} + \vec{a}$$

The tourist information center is located 78 yards from the entrance of the parking lot on a bearing of N 19° E. **SCORE: _____ / 20 PTS**
The trailhead is located 64 yards from the tourist information center on a bearing of N 62° W.

[a] Find the vector which represents the position of the trailhead from the entrance of the parking lot.
Write your answer as a linear combination of $\vec{i}$ and $\vec{j}$.
<u>You must use vectors throughout your solution.</u>





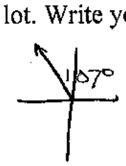


$$\vec{u} + \vec{v} = \langle 78\cos 71°, 78\sin 71° \rangle + \langle 64\cos 152°, 64\sin 152° \rangle$$
$$= \langle -31, 104 \rangle = -31\vec{i} + 104\vec{j}$$

[b] Find the bearing of the trailhead from the entrance of the parking lot. Write your answer in the same format used in the question.

$$\theta_{\vec{u}+\vec{v}} = 180° + \tan^{-1}\frac{104}{-31} = 107°$$

N 17° W



Let $\vec{m}$ be the vector $< -6, 4 >$. **SCORE: _____ / 45 PTS**

Let $\vec{y}$ be the vector $\vec{i} - 2\vec{j}$.

[a] Find a vector of magnitude 4 in the opposite direction as $\vec{m}$. Write your final answer as a linear combination of $\vec{i}$ and $\vec{j}$.

$$-4\left(\frac{1}{\|\vec{m}\|}\right)\vec{m} = -4\left(\frac{1}{\sqrt{(-6)^2+4^2}}\right)\langle -6,4\rangle$$
$$= -\overset{2}{\cancel{4}}\left(\frac{1}{\cancel{2}\sqrt{13}}\right)\langle -6,4\rangle$$
$$= -\frac{2\sqrt{13}}{13}\langle -6,4\rangle$$
$$= \frac{12\sqrt{13}}{13}\vec{i} - \frac{8\sqrt{13}}{13}\vec{j}$$

[b] If the terminal point of $\vec{y}$ is $(-4, -7)$, find the initial point of $\vec{y}$.

$$\langle -4-a, -7-b\rangle = \langle 1,-2\rangle$$
$$-4-a=1 \longrightarrow a=-5$$
$$-7-b=-2 \qquad b=-5 \qquad (-5,-5)$$

[c] Write $-21\vec{i} + \vec{j}$ as the sum of 2 vectors, one parallel to $\vec{m}$ and one perpendicular to $\vec{m}$.

$$\text{PROJ}_{\langle -6,4\rangle}\langle -21,1\rangle = \frac{\langle -21,1\rangle\cdot\langle -6,4\rangle}{\langle -6,4\rangle\cdot\langle -6,4\rangle}\langle -6,4\rangle = \frac{\cancel{130}^{5}}{\cancel{52}_{2}}\langle -6,4\rangle = \langle -15,10\rangle$$

$$\langle -21,1\rangle - \langle -15,10\rangle = \langle -6,-9\rangle$$
$$\langle -21,1\rangle = \langle -15,10\rangle + \langle -6,-9\rangle$$

[d] Find the angle (rounded to the nearest integer degrees) between $\vec{y}$ and $-3\vec{j}$.

$$\cos^{-1}\frac{\langle 1,-2\rangle\cdot\langle 0,-3\rangle}{(\sqrt{5})(3)} = \cos^{-1}\frac{2}{\sqrt{5}} = 27^\circ$$

[e] Find $3\vec{y} - 2\vec{m}$. Write your final answer in component form.

$$3\langle 1,-2\rangle - 2\langle -6,4\rangle = \langle 3,-6\rangle - \langle -12,8\rangle = \langle 15,-14\rangle$$