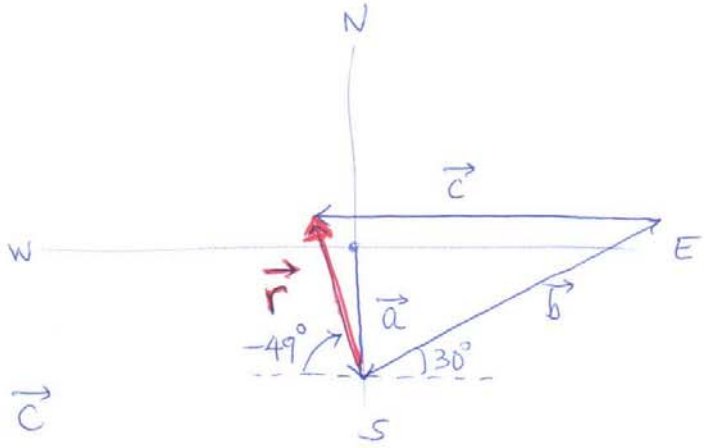
QUIZ#3- CHAPTER3
DATE: 24/09/18

Name: Key Id#: Sect.#:

Starting from the origin, a boy walks 3.5 m South, then 10 m at 30^0 North of East, and finally 10 m West. Find the magnitude and direction of the resultant displacement vector.



$$\vec{r} = \vec{a} + \vec{b} + \vec{c}$$

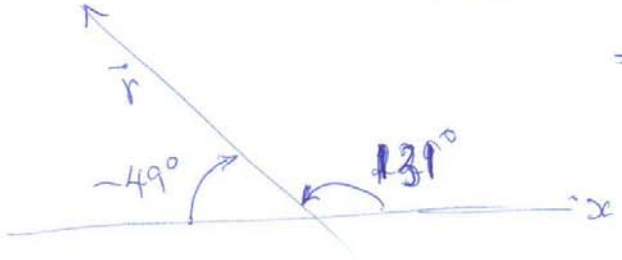
$$= (0\,\hat{i} - 3.5\,\hat{j}) + (10\cos 30^\circ\,\hat{i} + 10\sin 30^\circ\,\hat{j})$$

$$+ (-10\,\hat{i} + 0\,\hat{j})$$

$$\vec{r} = -1.3\,\hat{i} + 1.5\,\hat{j}$$

magnitude $r = 2.0$ m

direction $\theta = \tan^{-1}\left(\frac{1.5}{-1.3}\right) = -49^\circ$



⇒ From + x axis

$\theta = 131^\circ$

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Consider vector **A** = 6 i – 7 j + 2k and vector **B** = –12 i + 10 j.

(a) What is the magnitude of vector **C** = 2**A** x **B**.

$$\vec{C} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 12 & -14 & 4 \\ -12 & 10 & 0 \end{vmatrix}$$

$$= \hat{i}(-40) - \hat{j}(+48) + \hat{k}(120 - 168)$$

$$= -40\,\hat{i} - 48\,\hat{j} - 48\,\hat{k}$$

(6) $$|\vec{C}| = \sqrt{(-40)^2 + (-48)^2 + (-48)^2} = \boxed{78.8}$$

(b) Find the component of **B** along the direction of **A.**

(4) $$\vec{B} \cdot \vec{A} = BA\cos\theta$$

$B\cos\theta$ is the component of $\vec{B}$ along the direction of $\vec{A}$.

$$B\cos\theta = \frac{\vec{B} \cdot \vec{A}}{A} = -\frac{72 - 70}{9.4} = -15.4$$

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Vectors **A** = 3.0i + 4.0j and **B** = 5.0i – 2.0j lie in the x-y plane.
(a) Find the angle between the two vectors.

$\vec{A} \cdot \vec{B} = AB\cos\theta$

$\vec{A} \cdot \vec{B} = 15 - 8 = 7$

$|\vec{A}| = A = \sqrt{3^2 + 4^2} = 5$

$|\vec{B}| = B = \sqrt{5^2 + 2^2} = 5.4$

$7 = 5 \times 5.4 \cos\theta \Rightarrow \theta = \cos^{-1}(0.259)$

$\boxed{\theta = 75^\circ}$

(b) Find the component of **A** along the direction of **B**.

$A\cos\theta = \dfrac{\vec{A} \cdot \vec{B}}{B}$

$= \dfrac{7}{5.4} = \boxed{1.3}$