

2- parallelograms law:-

$$R = \sqrt{A^2 + B^2 + 2AB \cos \theta}$$

$\theta$  it is the angle between A & B or it can say the angle opposite  $R$

3- Triangle Law:-

$$\frac{A}{\sin \theta} = \frac{B}{\sin \beta} = \frac{R}{\sin \gamma} \quad \text{أي كل قوة مع sin مقابل}$$

ex 2:- A hiker begins a trip by first walking 25 km southeast from her car. she stops and sets up her tent for the night. On the second day, she walks 40 km in a direction  $60^\circ$  north of east, at which point she discovers a forest ranger's tower.

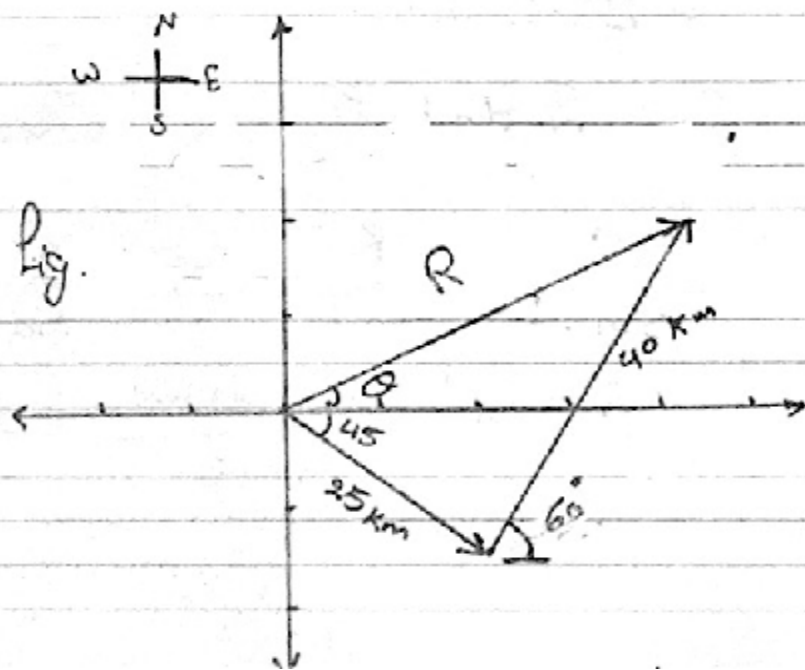
Determine the components of the hiker's displacement for each day.

solution:-

Graphically as shown in fig.

$$\theta = 25^\circ$$

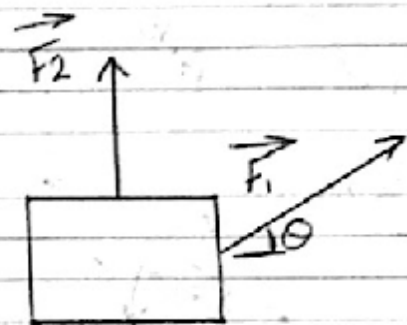
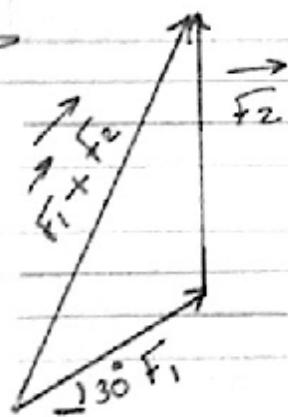
$$R = 46 \text{ km}$$



ex:- A Force  $\vec{F}_1$  of magnitude 6 units acts on an object at the origin in a direction  $\theta = 30^\circ$  above the positive x-axis as shown in figure. A second force  $\vec{F}_2$  of magnitude 5 units acts on the object in the direction of the positive y-axis. Find graphically the magnitude and direction of the resultant force  $\vec{F}_1 + \vec{F}_2$ .

Solution:-

graphically:-



$$\vec{F}_1 + \vec{F}_2 = 9.2$$

$$\theta = 62^\circ$$

ex: The displacement vectors  $\vec{A}$  and  $\vec{B}$  shown in figure both have magnitudes of 3 m. The direction of vector  $\vec{A}$  is  $\theta = 30^\circ$ . Find graphically

a.  $\vec{A} + \vec{B}$ , b.  $\vec{A} - \vec{B}$ , c.  $\vec{B} - \vec{A}$  and d.  $\vec{A} - 2\vec{B}$

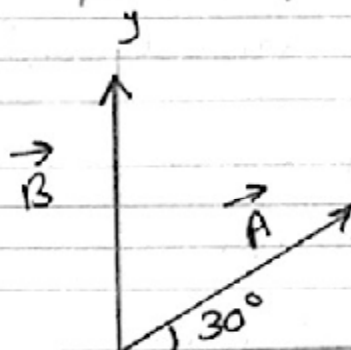
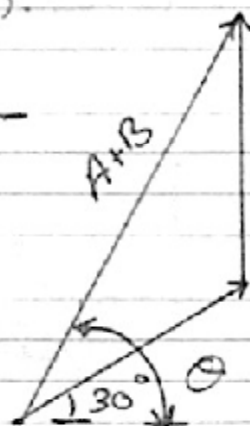
(Report all angles counterclockwise from the positive x-axis).

Solution:-

a.  $\vec{A} + \vec{B}$

= 5.2 m

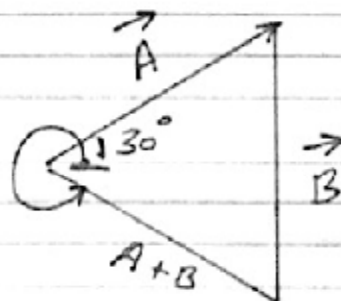
$\theta = 60^\circ$



b.  $\vec{A} - \vec{B} = 3\text{ m}$

$\theta = 90 + 180 + 58$

=  $328^\circ$

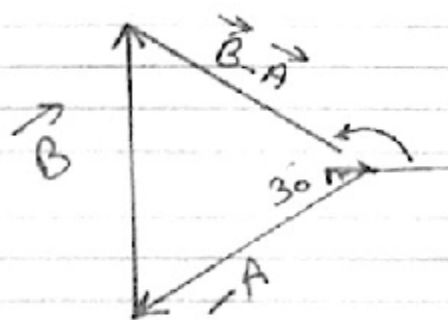


c.  $\vec{B} - \vec{A}$

=  $-\vec{A} + \vec{B}$

= 3 m

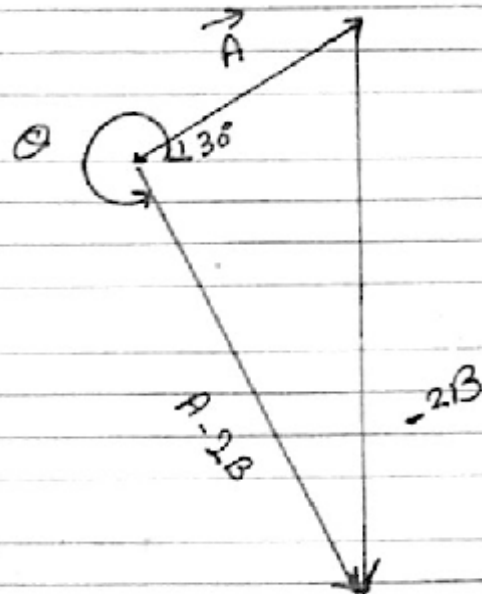
$\theta = 150^\circ$



$$d - \vec{A} - 2\vec{B}$$

$$= 5.2 \text{ m}$$

$$\theta = 270 + 30 = 300^\circ$$

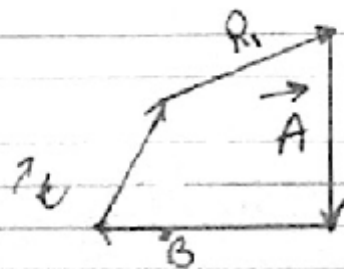
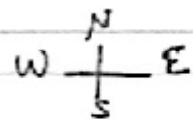


12 ex: Three displacements are  $\vec{A} = 200 \text{ m}$  due south,  $\vec{B} = 250 \text{ m}$  due west, and  $\vec{C} = 150 \text{ m}$  at  $30^\circ$  east of north. a - Construct a separate diagram for each of the following possible ways of adding these

vectors.  $\vec{R}_1 = \vec{A} + \vec{B} + \vec{C}$ ,  $\vec{R}_2 = \vec{B} + \vec{C} + \vec{A}$ ,  $\vec{R}_3 = \vec{C} + \vec{B} + \vec{A}$

Solution:-

$$\vec{R}_1 = \vec{A} + \vec{B} + \vec{C}$$



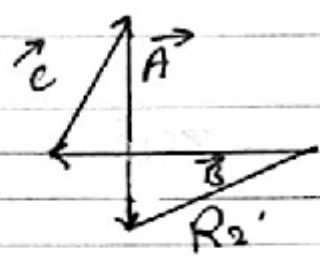
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$$\vec{R}_2 = \vec{B} + \vec{C} + \vec{A}$$



$$\vec{R}_3 = \vec{C} + \vec{B} + \vec{A}$$

