Guided Practice: VP1.7.1

If a 4th vector, $\vec{D}$ is added to $\vec{A}+\vec{B}+\vec{C}$,
which results in $\vec{A}+\vec{B}+\vec{C}+\vec{D}=0$, find:

1) magnitude of $\vec{D}$
2) Direction of $\vec{D}$ wrt angle measured counterclockwise from +x axis
3) state in which quadrant this angle lies

Given that $\vec{A}+\vec{B}+\vec{C}$ displacement is 12.7m,

$$12.7m + \vec{D} = 0$$

$$\vec{D} = -12.7m$$

$$= 12.7m \text{ (displacement)}$$

In this case, magnitude is coincidentally 12.7m, because $\vec{D}$ results in return to point of origin.

Direction of $\vec{D}$ wrt +x-axis = $180° - 51°$

$= 129°$ from +x axis.

Quadrant: within the -x axis and +y axis.

# VP.1.7.2

1) Calculate magnitude and direction of $\vec{S}$.
where $\vec{S} = \vec{A} - \vec{B} + \vec{C}$

2) State direction of $\vec{S}$ wrt angle counter-clockwise from +x axis and quadrant.

Assuming $-\vec{B} = -(\vec{B})$ wrt components:


X-component = 38.37m + 46.36m + 0m
($S_x$) = 84.73m

Y-component = 61.40m + 33.68m − 17.80m
($S_y$) = 77.28m.

$S_R$ = $\sqrt{(84.73m)^2 + (77.28m)^2}$ = 114.68m.

$\theta = \tan^{-1}\left(\frac{77.28m}{84.73m}\right)$

= 42.37° (counter-clockwise from +x axis)

Quadrant: +y and +x

# VP1.7.3

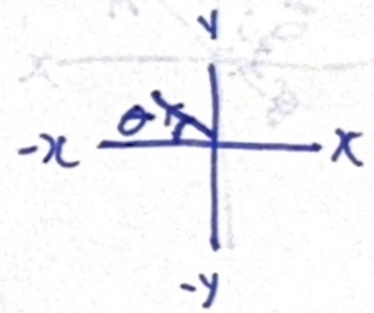
$\vec{T} = \vec{A} + \vec{B} + 2\vec{C}$

$T_x$ = 38.37m − 46.36m + 0m = −7.99m

$T_y$ = 61.40m − 33.68m − 35.60m = −7.88m

$T_R = \sqrt{(-7.99m)^2 + (-7.88m)^2}$

= 11.22m.



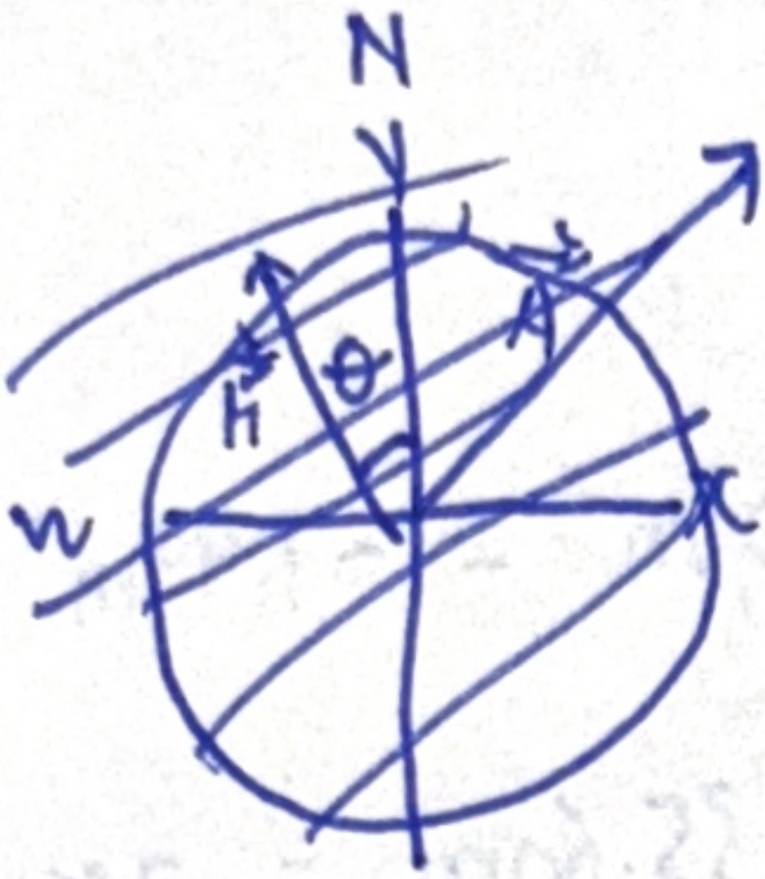

$\theta = \tan^{-1}\left(\frac{-7.88m}{-7.99m}\right)$

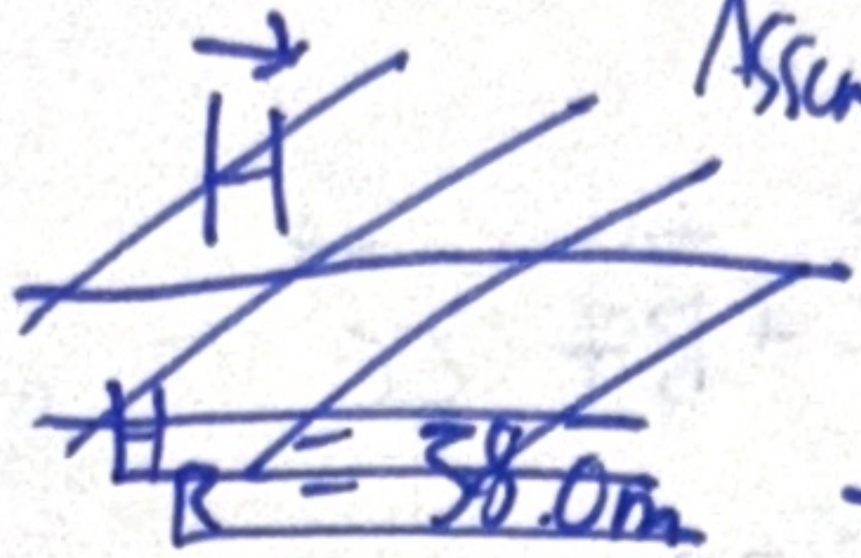
= 44.60°

$\theta$ wrt +x axis = 180° − 44.60°
= 135.40°

Quadrant: +y and −x axis.

VP 1.7.4



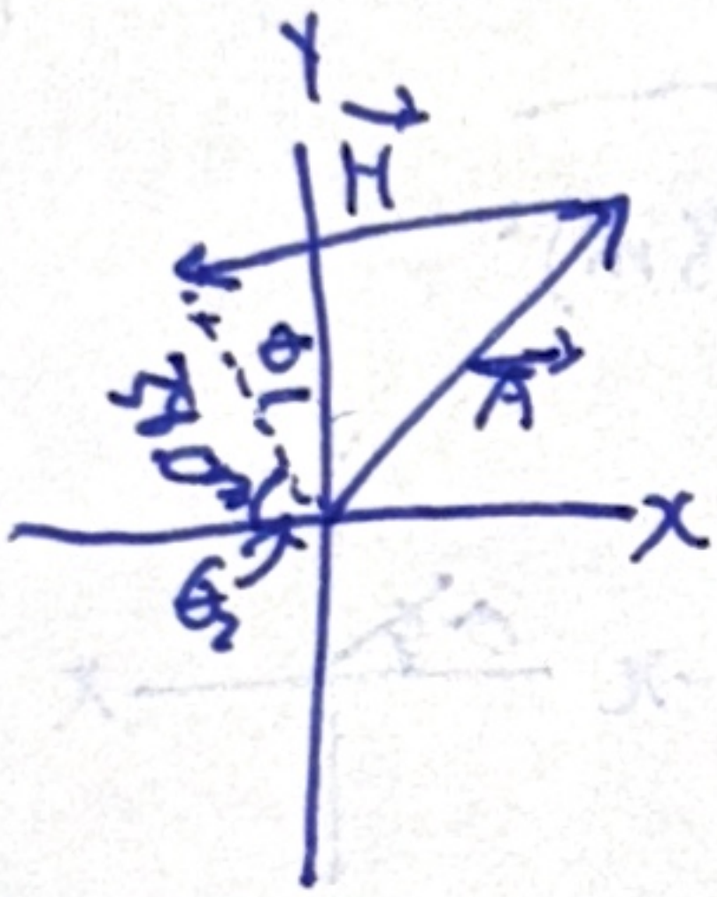

Assume 2nd displacement is $\vec{H}$.

$\theta_1 = 37.0°$

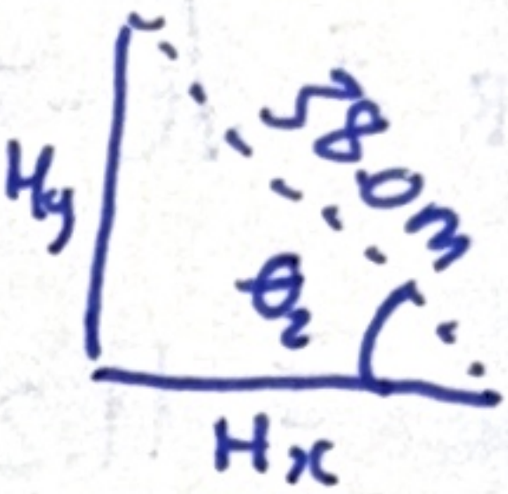
$H_\theta = 37.0°$

$\theta_2 = 90° - 37°$

$= 53°$




1. Find $H_y$.
2. Find $H_x$.




$H_y = \cos^{-1}(H_x)$

$53° = \cos^{-1}\left(\frac{H_x}{38.0m}\right) = \sin^{-1}\left(\frac{H_y}{38.0m}\right)$

$H_x = 38.0m \cos(53°) = 22.87m.$

$H_y = 38.0m \sin(53°) = 30.35m$

$H_R = 38.0m.$ Direction of $\vec{H}$ is $= 180° - 53°$

$= 127°$

(ccw +x axis).

Quadrant: +y axis → −x axis