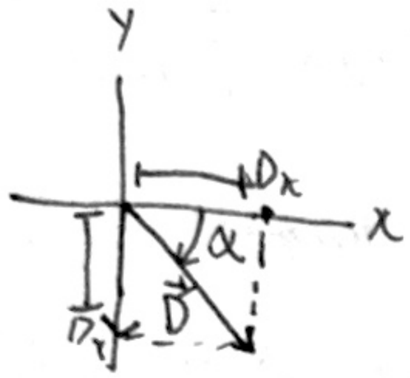
Example 1.6 Finding Components

$|D| = 3.00m$

$\alpha = 45°$



$D_x = D\cos\theta = (3.00m)(\cos(-45°))$

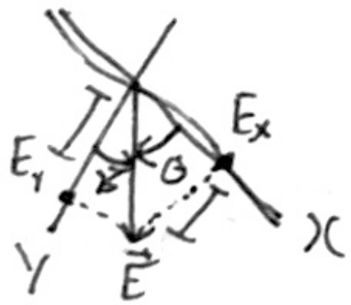
$= +2.1m$

$D_y = D\sin\theta = (\sin(-45°))(3.00m)$

$= -2.1m.$

$|E| = 4.50m$

$\beta = 37.0°$



~~$E_x = E\sin\theta = (\sin(90° - 37°))(4.50m)$~~

$= (\sin(55°))(4.50m)$

$= 3.59m.$

~~$E_y = E$~~

$E_x = E\cos\theta = (\cos(90° - 37°))(4.50m)$

$= (\cos(53°))(4.50m)$

$= 2.708...m$

$\approx +2.71m.$

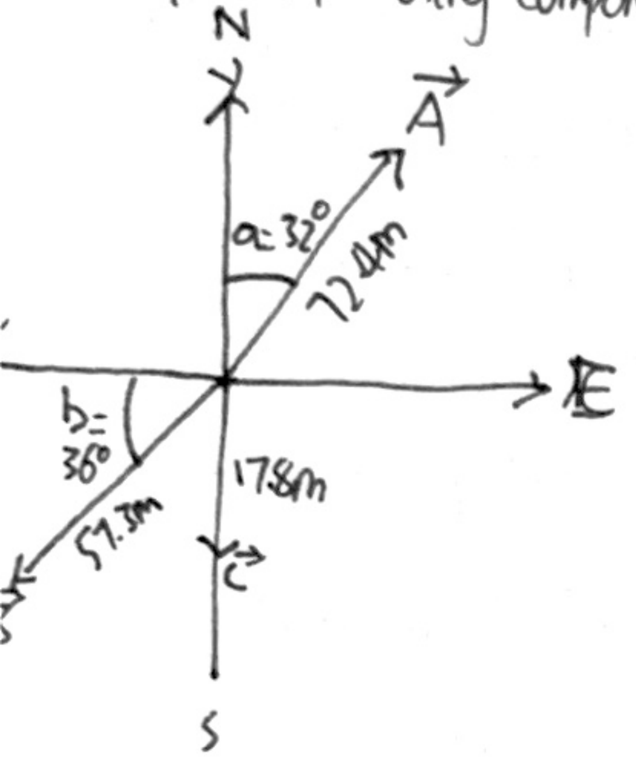
$E_y = E\sin\theta = (\sin(90° - 37°))(4.50m)$

$= (\sin(53°))(4.50m)$

$= 3.593...m$

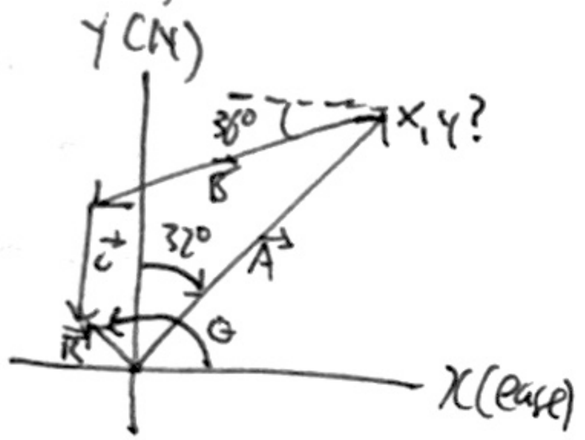
$\approx +3.59m$

Example 1.7 Using components to add vectors



← actually, they are scalar displacements.

e.g.



Difference	Angle	x-component	y-component
$\|\vec{A}\| = 72.4m$	58.0°	$38.37m$	$61.40m$
$\|\vec{B}\| = 57.3m$	216.0°	$-46.36m$	$-33.68m$
$\|\vec{C}\| = 17.8m$	270.0°	$0.00m$	$-17.80m$

$A_x = A\cos\theta_A = (72.4m)(\cos(90^\circ - 32^\circ))$
$= (72.4m)(\cos(58^\circ))$
$\approx 38.37m$

$A_y = A\sin\theta_A = (72.4m)(\sin(58^\circ))$
$\approx 61.40m$

$R_x = A_x + B_x + C_x$
$= 38.37m + (-46.36)m + 0.00m$
$= 38.37m - 46.36m + 0.00m$
$= \cancel{0.00m.}\ -7.99m$

$R_y = A_y + B_y + C_y$
$= 61.40m + (-33.68)m + (-17.80)m$
$= 61.40m - 33.68m - 17.80m$
$= \cancel{+}\ 9.92m$

$R = \sqrt{(-7.99m)^2 + (9.92m)^2}$ ▷ Computing displacement distance from origin
$= 12.7m.$

$\theta = \tan^{-1}\left(\frac{9.92m}{-7.99m}\right)$
$= -51^\circ$

Test your understanding section 1.8

Given: $\vec{A}$ and $\vec{B}$ lying in the xy-plane

a) Can $\vec{A}$ have the same magnitude as $\vec{B}$, but w/ different components?

yes.

b). Can $\vec{A}$ have the same components as $\vec{B}$. but result in a different magnitude!

No. If $\vec{A}$ and $\vec{B}$ same magnitude but differing components, then they point in different directions

If same components, then technically, $\vec{A} = \vec{B}$ (essentially, it means $A_x = B_x$ and $A_y = B_y$, so they share the same coordinates (coordinates). Hence, they must have the same magnitude.