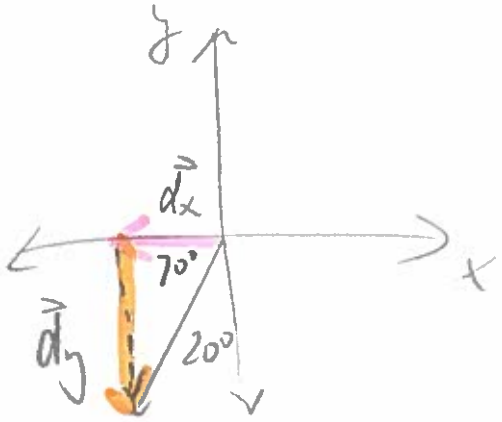
PHYSICS 12 **Vector Quiz** Name: KEY

[4] 1. Resolve a displacement vector $\vec{d} = 120\text{km}\ [\text{S } 20° \text{ W}]$ into its vector components.



$\vec{d}_x = -120 \cos 70°$

$\vec{d}_x \doteq -41$ km

$\vec{d}_y = -120 \sin 70°$

$\doteq -113$ km

$\vec{d}_x = [-41, 0]$ km and $\vec{d}_y = [0, -113]$ km

[4] 2. Find the magnitude and direction of $\vec{a} = [40, -10]\ \text{m/s}^2$.

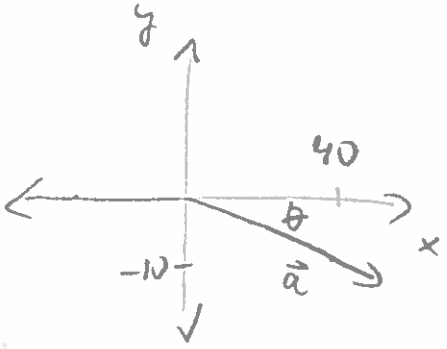
$\|\vec{a}\| = \sqrt{40^2 + (-10)^2}$

$= \sqrt{1700}$

$\doteq 41\ \text{m/s}^2$

$\theta = \tan^{-1}\left(\frac{10}{40}\right)$

$\doteq 14°$

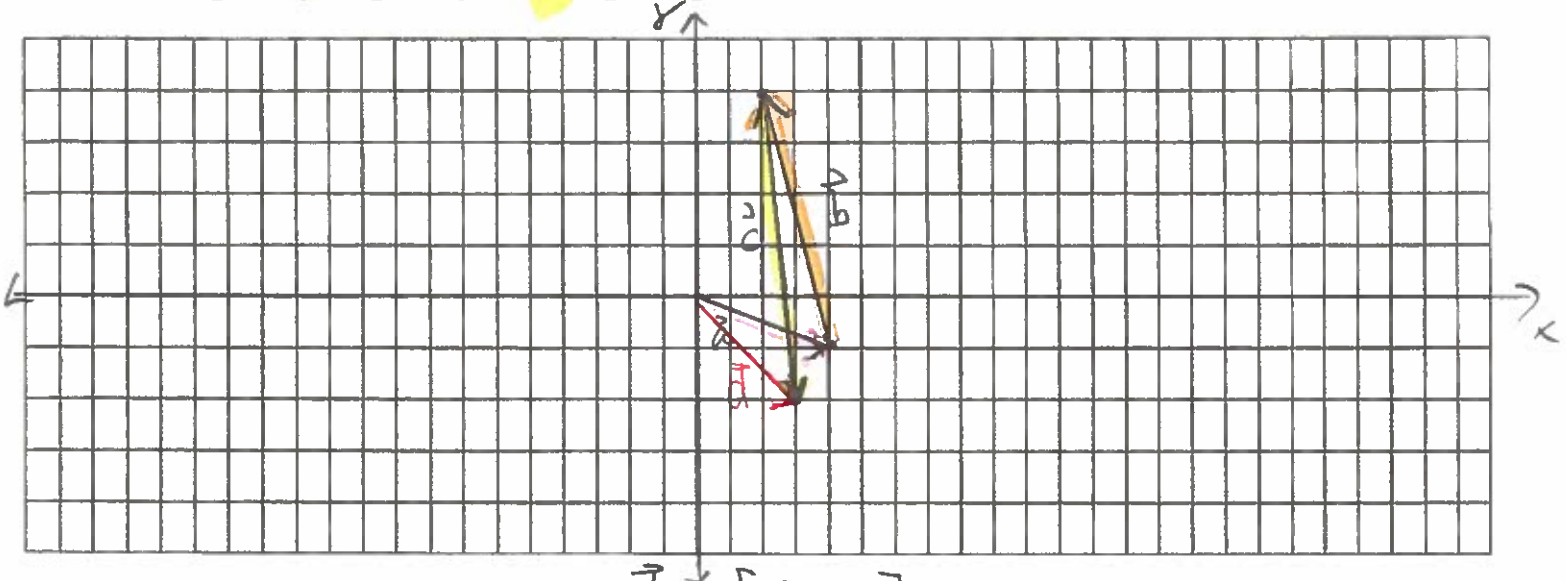


Magnitude of $\vec{a}$ is $41\ \text{m/s}^2$ and its direction is E 14° S.

[4] 3. Sketch a labeled diagram of $\vec{a} + \vec{b} + \vec{c}$. **Clearly identify the resultant vector.**

$\vec{a}$ = [4,-1]m , $\vec{b}$ = [-2,5] m, $\vec{c}$ =[1,-6] m

let $\vec{d} = \vec{a} + \vec{b} + \vec{c}$



Resultant vector in vector notation: $\vec{d} = [3, -2]$ m

[4] 4. Consider a truck that moves with velocity 65 km/h [N] and a car that moves with velocity 109 km/h [S]. What is the velocity of the car relative to the truck?
Remember, your full solution must include a coordinate system and your final answer has to include units and direction.

N+
S-

$\vec{v}_{cg} = 109$ km/h [S]
$= -109$ km/h [N]

$\vec{v}_{tg} = 65$ km/h [N]

$\hookrightarrow \vec{v}_{gt} = -\vec{v}_{tg}$
$= -65$ km/h [N]

$\vec{v}_{ct} = \vec{v}_{cg} + \vec{v}_{gt}$
$= -109 + (-65)$
$= -174$ km/h [N]

∴ The velocity of the car relative to the truck is 174 km/h [N] or −174 km/h [N].