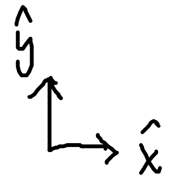
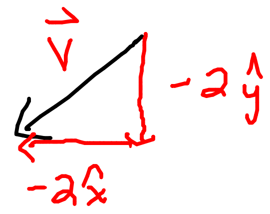




$\vec{v} = -2\hat{x} - 2\hat{y}$

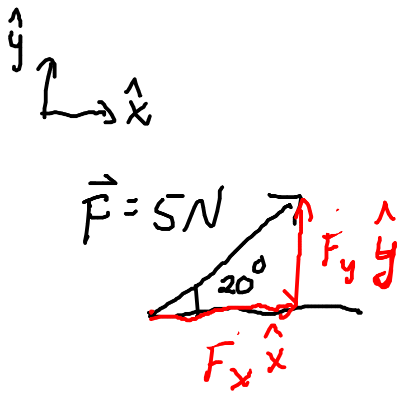
$v_x = -2$

$v_y = -2$

$|\vec{v}| = \sqrt{v_x^2 + v_y^2}$

$= \sqrt{(-2)^2 + (-2)^2} = \sqrt{8} = 2\sqrt{2}$

— — —



$\vec{F} = F_x\hat{x} + F_y\hat{y}$

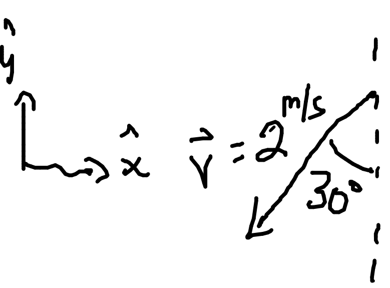
$\sin 20^\circ = \frac{opp}{hyp} = \frac{F_y}{5N} \rightarrow F_y = 5\sin 20^\circ N$

$\cos 20^\circ = \frac{adj}{hyp} = \frac{F_x}{5N} \rightarrow F_x = 5\cos 20^\circ N$

In general, F_x & F_y $= \pm |\vec{F}| \left\{ \begin{matrix} \sin\theta \\ \cos\theta \end{matrix} \right\}$

if θ measured from x-axis
F_x gets cosine
F_y gets sine

" " " " y-axis
F_y : cosine
F_x : sine

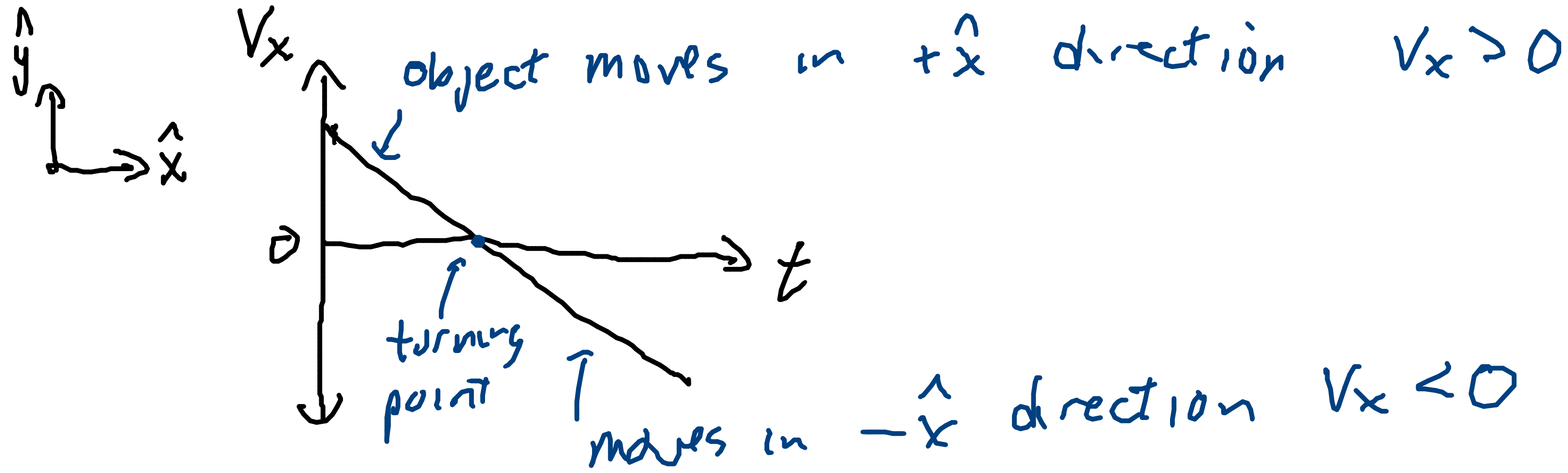


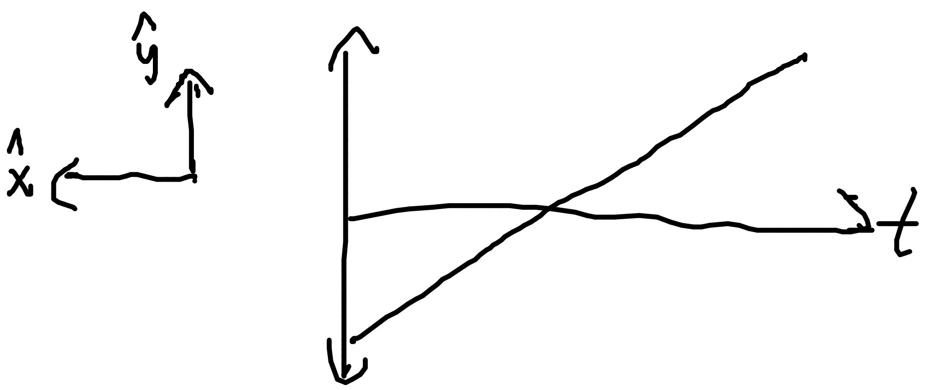
$V_x =$

A) $2\cos 30^\circ$
B) $2\sin 30^\circ$
C) $-2\cos 30^\circ$
D) $\boxed{-2\sin 30^\circ}$
E) $2\tan 30^\circ$
F) $-2\tan 30^\circ$

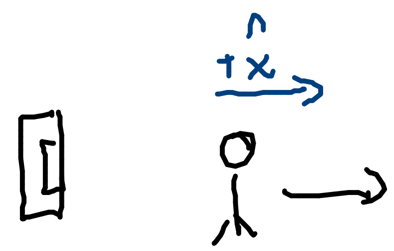
$V_y = -2\cos 30^\circ$

$\vec{V} = -2\sin 30^\circ\,\hat{x} - 2\cos 30^\circ\,\hat{y}$ m/s



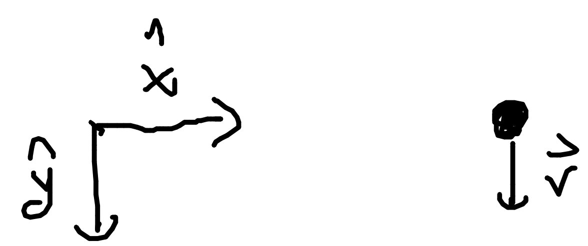


Same motion, different basis



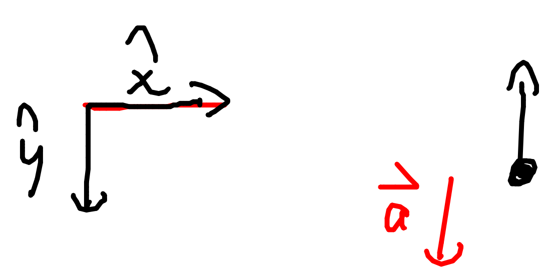
sign of component = direction of vector

e.g.



v_y is $\boxed{A)\ +}$ B) −

a_y is $\boxed{C)\ +}$ D) −



$V_y < 0$

a_y is $\boxed{C)\ +}$ D) −

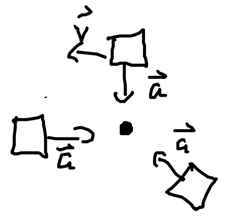
even though it's slowing down!

When v & a have same sign, speed up

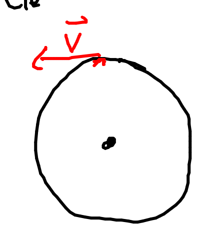
v & a have opposite sign, slow down

Special Types of Acceleration

1) $\underbrace{\text{Centri}}_{\text{center}}\underbrace{\text{petal}}_{\text{seeking}}$ acceleration



→ circular motion
- velocity is tangential to circle
- acceleration is towards center
- if speed is constant $|\vec{v}|$
  then $\vec{a}$ is perpendicular to $\vec{v}$

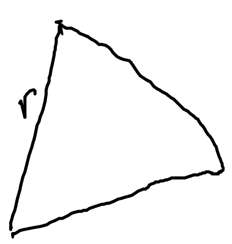


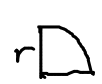
Our bodies detect acceleration
by feeling a "force" in opposite direction.

e.g. stop a car, pushed forward

in circular motion
$\vec{a}$ is towards center,
you feel a "force" away from center
centrifugal "force"

gentle curve
big radius





tight curve

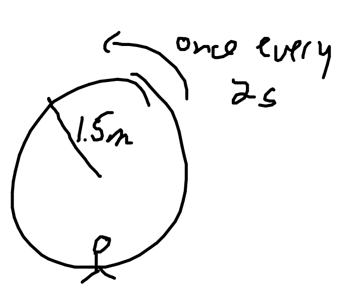
small radius
more centrifugal force –
more acceleration

$$a \propto \frac{1}{r}$$

$a \propto v^2$ faster → more acceleration

centripetal acceleration: $\boxed{a_c = \frac{v^2}{r}}$

e.g. merry-go-round



$$v = \frac{\text{circumference}}{2s} = \frac{2\pi(1.5m)}{2} = 4.7\,m/s$$

$$a = \frac{v^2}{r} = \frac{(4.7)^2}{1.5} = 14.8\,m/s^2 > 9.8\,m/s^2$$
$$= 1.5g$$