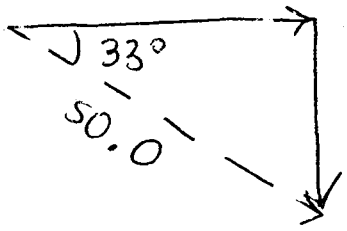
Gen Physics

WS 3 Name KEY Date 9/11/12 Period 6 Corralejo #

Basic trig and Vector Components

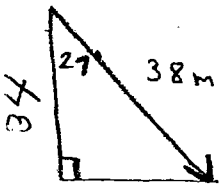
1. Find the x and y components of a vector with magnitude 50.0 at an angle of 33 degrees South of East.



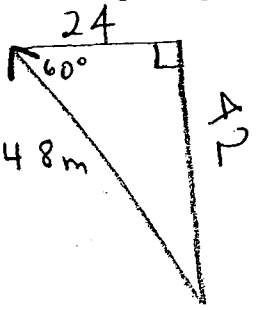
$x = 50.0 \cos 33° = \boxed{41.9}$

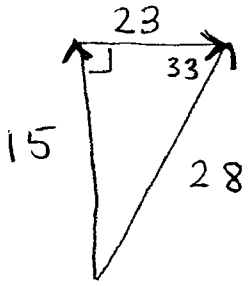
$y = 50.0 \sin 33° = \boxed{27.2}$

2. Calculate the x and y components for the following triangles.



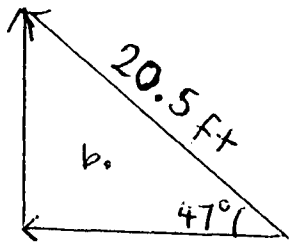
17 m





3. Calculate the resultant vector using the following instructions. What is there final position relative to their initial position?

a. **Walk 13 ft North.**
b. **Walk 20.5 ft 47 degrees North of West.**
c. **Walk 10. ft East.**



	ΣX	ΣY
a.	0	+13
b.	−14	+15
c.	10	0

$\vec{R}_x = -4$ ft

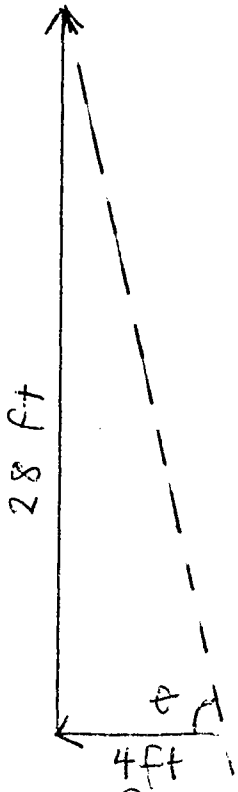
$\vec{R}_y = +28$ ft

$\sqrt{28^2 + 4^2} = 28.28$

$\theta = \tan^{-1}\left(\frac{28}{4}\right)$

$= 81.87°$

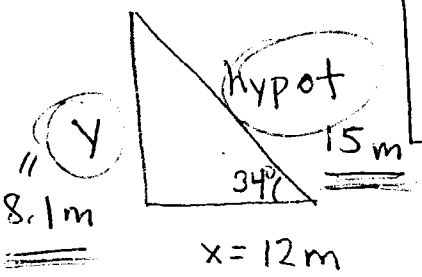
28ft @ 82° N of W



WS 3

$\cos 34^\circ = \frac{12}{hyp}$ $\tan 34^\circ = \frac{y}{12m}$

$hyp = \frac{12\,m}{\cos 34^\circ} = 14.47$ $y = 12m \tan 34^\circ = 8.09$

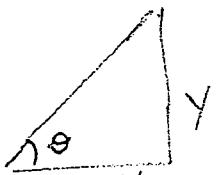


find y, hypot

$\sin\theta = \frac{opp}{hyp}$

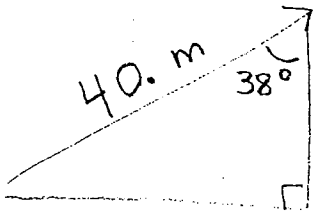
$\cos\theta = \frac{adj}{hyp}$

$\tan\theta = \frac{opp}{adj}$



$a^2 + b^2 = c^2$ Pathagorean Thm for Right Triangles

Find x and y



$y = 32m$

$\sin 38^\circ = \frac{x}{40}$

$x = 40m \sin 38^\circ$

$= 24.6265$

$y = 40.m \cos 38^\circ$

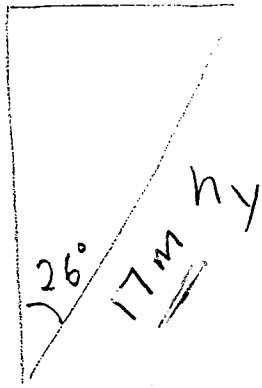
$= 31.52043$

$\cos 26^\circ = \frac{15}{hyp}$

$hyp = \frac{15\,m}{\cos 26^\circ} = 16.689$

7.3m x Find x, hypot

15 m



$\tan 26^\circ = \frac{x}{15m}$

$x = 15m \tan 26^\circ$

$= 7.316$

WS

Name Key Date Period #

Vector Practice

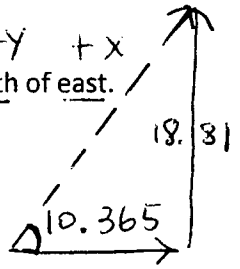
Calculate the resultant vectors showing the component vectors and final magnitude and direction.
Draw a picture. Show all work!

Ex. Sarah walked 12 miles north, 3.0 miles west, then 15 miles at 27° north of east.

ΣX: $-3 + 13.365 = 10.365$ $\quad$ ΣY: $+12 + 6.81 = 18.81$

$15\cos 27^\circ = 13.365$

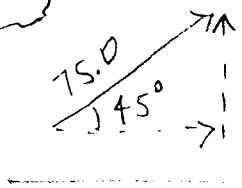
$15 \sin 27^\circ = 6.81$



$\sqrt{(18.81)^2 + (10.365)^2} = 21.47672$

$\theta = \tan^{-1}\left(\frac{18.81}{10.365}\right)$

1. A team of ducks flew 100.0 miles north, then 75.0 miles at 45° north of east.



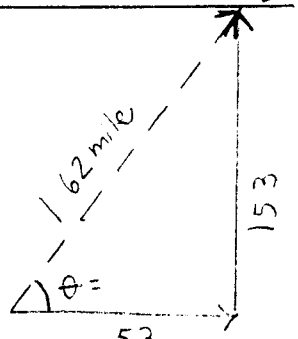
ΣX: $1\ 0$ $\quad$ ΣY: $+100$

$2\ 53 + 53 = 106$ $\quad$ $53 + 153 = 206$

$\sqrt{(53)^2 + (153)^2} = 162 \text{ mile}$

$\theta = \tan^{-1}\left(\frac{153}{53}\right) = 71^\circ \text{ N of E}$

21 miles @ 61° N of E

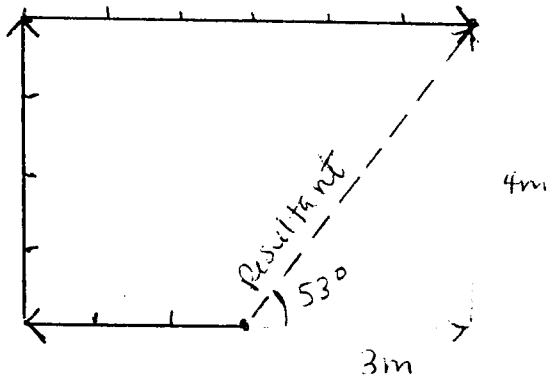


2. A girl delivering newspapers covers her route by traveling three blocks west, four blocks north, then six blocks east.

a. What is the resultant displacement?

5m @ 53° N of E

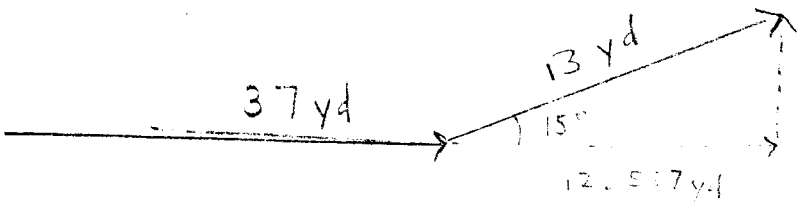
$\theta = \tan^{-1}\left(\frac{4}{3}\right) = 53^\circ$



b. What is the total distance she travels?

$3 + 4 + 6 =$ 13 blocks

3. Jeremy threw the football 37 yards to Henry who ran 13 yards at 15° from the end zone to score a touchdown. How far was Jeremy from the end zone?



$37 + 12.557 = 49.557$

50. yards

4. How would you add two vectors that are not parallel or perpendicular?

head to tail find components ΣX, ΣY

5. Can a vector have a component greater than its magnitude?

NO

6. Is it possible to add a vector quantity to a scalar quantity? Explain.

NO apples and oranges

20. kg + 12 m/s North = crazy

7. A pelican flying along a horizontal path drops a fish from a height of 5.4 m while traveling at 5.0 m/s.

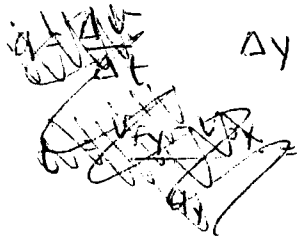
a. How far does the fish travel horizontally before hitting the water?

$v_x = 5.0\ m/s$

$\Delta y = -5.4\ m$

$a_y = -9.8\ m/s^2$

$v_{0y} = 0$



$\Delta y = v_{0y} t + \frac{1}{2} a_y t^2$

$\Delta y = \frac{1}{2} a_y t^2$

$t = \sqrt{2\Delta y / a} = \sqrt{\frac{2(-5.4\ m)}{-9.8\ m/s^2}} = 1.05\ s$

$\Delta x = v_x t = \left(5.0 \frac{m}{s}\right)(1.05\ s)$

$= \boxed{5.2\ m}$

b. What are the fish's horizontal and vertical velocities just before hitting the water?

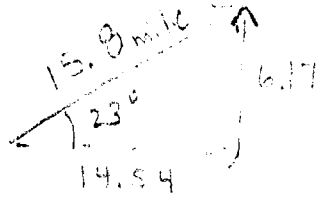
$v_x = \boxed{5.0\ m/s}$

$v_{fy} = v_{0y} + a_y t$

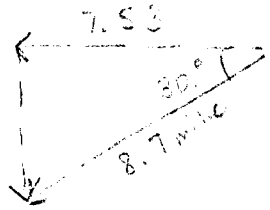
$= 0 + (-9.8 \frac{m}{s})(1.05\ s) = -10.2878$

$\rightarrow \boxed{-10.\ m/s}$

8. Lost in the wilderness, Erik wandered 15.8 miles at 23° north of east, then 8.7 miles at 30.0 ° south of west. Relative to his initial position, where does Erik end up?



	ΣX	ΣY
1.	+14.54	+ 6.17
2.	-7.53	-4.35
	+ 7 mile	+ 1.82 mile



$\theta = \tan^{-1}\left(\frac{1.82}{7}\right) = 14.57°$

7.5 mile @ 15 ° N of E