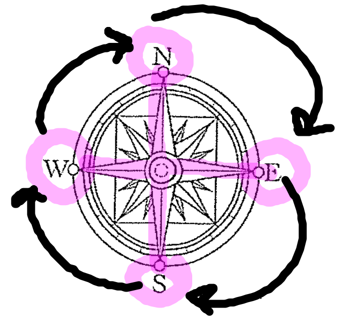
Never Eat Soggy Weiners
Never Enter Stinky Washrooms

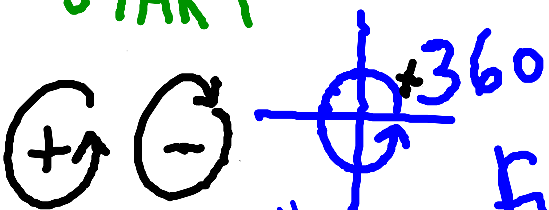


U2:L4 Vector Components

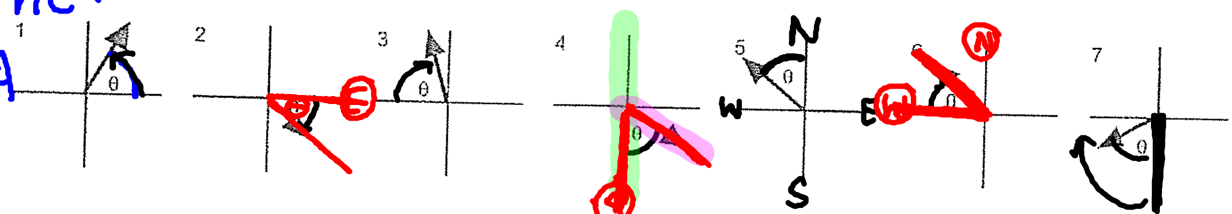
For each angle drawn, label the correct compass headings.

where you START → [N 40° W] ← where to go from the start

angle from start (0-90°)

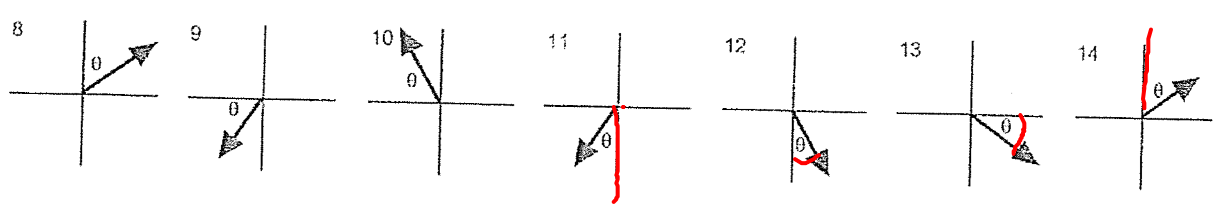


θ = "Theta"
θ = <A



50° 35° 52° 56° 50° 45° 58°

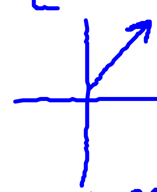
[E 50° N]	[E 35° S]	[W 52° N]	[S 56° E]	[N 50° W]	[W 45° N]	[S 58° W]



50° 40° 53° 28° 19° 23° 38°

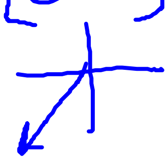
[N 50 E]	[W 40 S]	[W 53 N]	[S 28° W]	[S 19° E]	[E 23° S]	[N 38° E]

[NE]

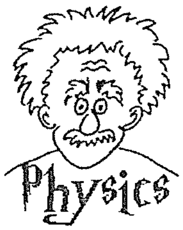


[N 45° E]

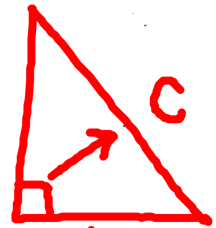
[SW]



[S 45° W]



Vector Worksheet



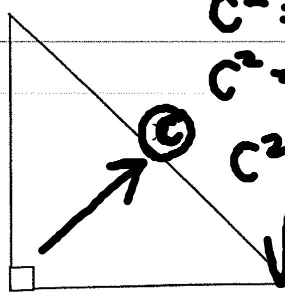
$c^2 = a^2 + b^2$

$a^2 = c^2 - b^2$

$b^2 = c^2 - a^2$

Directions: Use the Pythagorean Theorem to solve for x.

1.



$a = 5$, $b = 5$, c

$c^2 = a^2 + b^2$

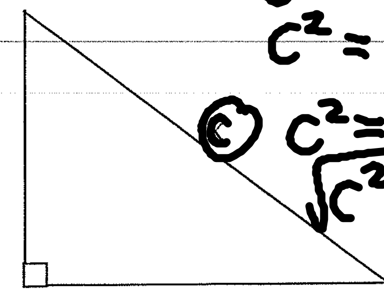
$c^2 = 5^2 + 5^2$

$c^2 = 25 + 25$

$\sqrt{c^2} = \sqrt{50}$

$\boxed{c = 7.07}$

2.



$b = 8$, $a = 12$, c

$c^2 = a^2 + b^2$

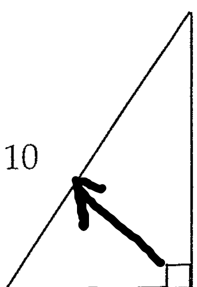
$c^2 = 12^2 + 8^2$

$c^2 = 144 + 64$

$\sqrt{c^2} = 208$

$\boxed{c = 14.42}$

3.



$C = 10$, $8 = a$, b

$b^2 = c^2 - a^2$

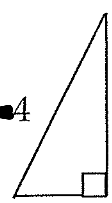
$b^2 = 10^2 - 8^2$

$b^2 = 100 - 64$

$\sqrt{b^2} = 36$

$\boxed{b = 6}$

4.



$c = 4$, $b = 2$, a

$a^2 = c^2 - b^2$

$a^2 = 4^2 - 2^2$

$a^2 = 16 - 4$

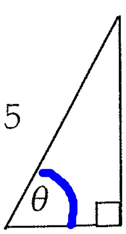
$a^2 = 12$

$\boxed{a = 3.46}$

Directions: Find the sin, cos, and tan of the angle θ.

$S = \frac{O}{H}$ $C = \frac{A}{H}$ $T = \frac{O}{A}$

5.



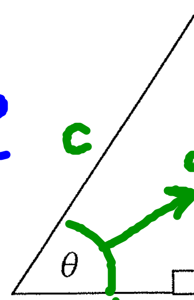
5, 4, 3, θ

$\sin\theta = \frac{O}{H} = \frac{4}{5} = 0.8$

$\cos\theta = \frac{A}{H} = \frac{3}{5} = 0.6$

$\tan\theta = \frac{O}{A} = \frac{4}{3} = 1.\overline{3}$

6.



c, a 8, 7 b, θ

$c^2 = a^2 + b^2$

$c^2 = 8^2 + 7^2$

$c^2 = 64 + 49$

$\sqrt{c^2} = 113$

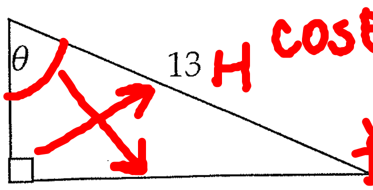
$c = 10.63$

$\sin\theta = \frac{8}{10.63} = 0.75$

$\cos\theta = \frac{7}{10.63} = 0.66$

$\tan\theta = \frac{8}{7} = 1.14$

7.



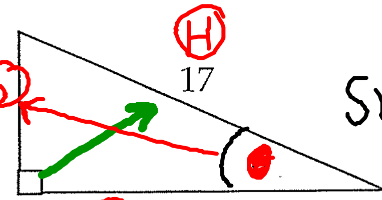
θ, 5, 13 H, 12

$\sin\theta = \frac{12}{13} = 0.92$

$\cos\theta = \frac{5}{13} = 0.38$

$\tan\theta = \frac{12}{5} = 2.4$

8.



O 8, H 17, A 15, θ

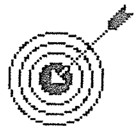
$\sin\theta = \frac{8}{17} = 0.47$

$\cos\theta = \frac{15}{17} = 0.88$

$\tan\theta = \frac{8}{15} = 0.5\overline{3}$

Vectors

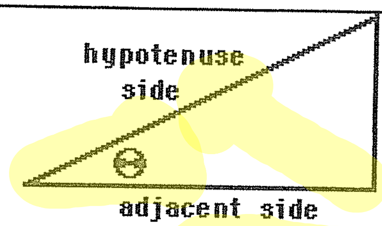
The magnitude of a vector component can be determined using trigonometric functions.



Trigonometry Review

Trigonometric functions are mathematical functions that relate the length of the sides of a right triangle to the angles of the triangle. The meaning of the functions can be easily remembered by the mnemonic

SOH CAH TOA



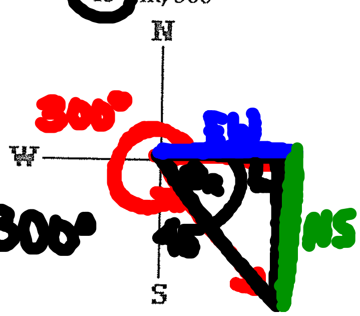
SOH --> Sin Θ = $\frac{\text{Opposite}}{\text{Hypoteneuse}}$ CAH --> Cos Θ = $\frac{\text{Adjacent}}{\text{Hypoteneuse}}$ TOA --> Tan Θ = $\frac{\text{Opposite}}{\text{Adjacent}}$

3. Sketch the given vectors; project the vector onto the coordinate axes and sketch the components. Then determine the magnitude of the components using SOH CAH TOA.

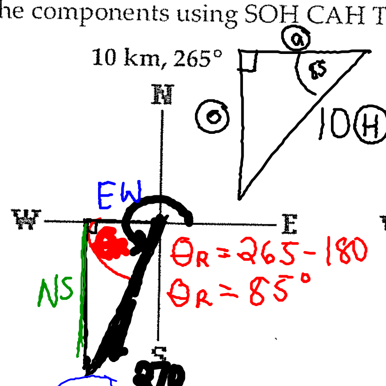
Start @ E (+)

$\Theta_R = 360° - 300°$
$\Theta_R = 60°$

45 m, 300°

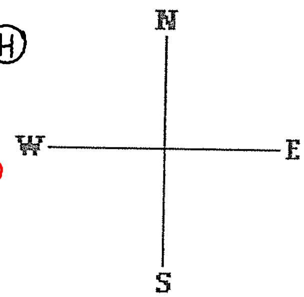


10 km, 265°



$\Theta_R = 265 - 180$
$\Theta_R = 85°$

200 mi, 150°



E-W Component:
cos 60° = EW/45
cos 60° (45) = EW = 22.5 km

N-S Component:
Sin 60° = NS/45
Sin 60 (45) = NS = 38.97 km

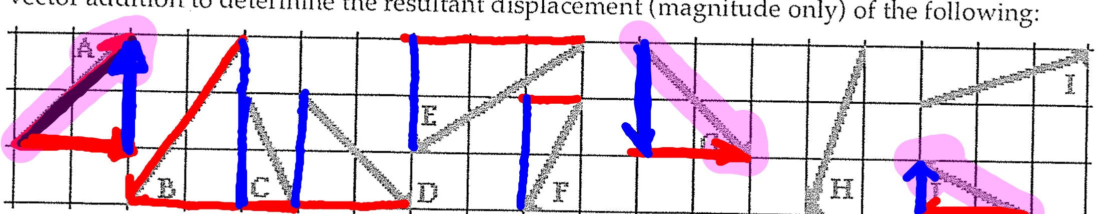
E-W Component:
cos 85° = EW/10
cos 85° (10) = EW = 0.87 km

N-S Component:
Sin 85° = NS/10
Sin 85° (10) = NS
9.96 km

E-W Component:
173.2 mi

N-S Component:
100 mi

4. Consider the diagram below (again); each square is 10 km along its edge. Use components and vector addition to determine the resultant displacement (magnitude only) of the following:



A + B + C ==> Σ E-W: 20-20+10 Σ N-S: 20-30-20 Overall Displacement: 10E 30S

D + E + F ==> Σ E-W: 20-30-10 Σ N-S: -20-20-20 Overall Displacement: 20W 60S

G + H + I ==> Σ E-W: 20-10+30 Σ N-S: -20-30 Overall Displacement: 40E 40S

A + J + G ==> Σ E-W: 20-20+20 Σ N-S: +20+10-20 Overall Displacement: 20E 10N

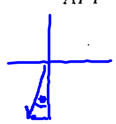
Directions and Components

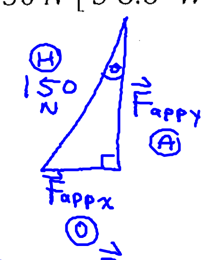
For the following situations, draw an FBD and determine the magnitude and direction of the x and y components of the applied forces:

$F_{APP} = 70\ N\ [\ N\ 20°W]$

$F_{APP} = 22.5\ N\ [\ N\ 38.7°E]$

$F_{APP} = 150\ N\ [\ S\ 8.6°\ W]$





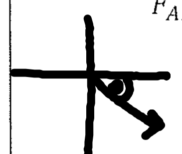
$\sin(8.6°)150N = \vec{F}_{appx}$

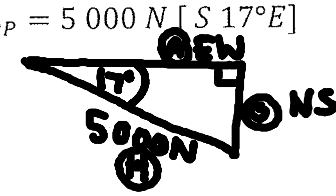
$\boxed{22.4N = \vec{F}_{appx}}$

$\cos(8.6°)150N = \vec{F}_{appy}$

$\boxed{148.3\ N = \vec{F}_{appy}}$

$F_{APP} = 5\ 000\ N\ [\ S\ 17°E]$





$\sin\theta = \frac{O}{H}$

$\sin 17° = \frac{NS}{5000N}$

$\sin 17°(5000N) = NS$

$\boxed{1461.9\ N = NS}$

$\cos\theta = \frac{A}{H}$

$\cos 17° = \frac{EW}{5000}$

$\cos 17°(5000) = EW$

$\boxed{4781\ 5\ N = EW}$

$F_{APP} = 15\ N\ [\ S\ 33.2°\ W]$

$F_{APP} = 2\ N\ [\ N\ 12.5°\ E]$