Vector Basics

1. Resolve	B	~~A~~ The portion of the vector on the x or y axis.
2. Magnitude	C	~~B~~ To find the x– or y-component of a vector.
3. Resultant	E	~~C~~ The size of a vector ("35" of "35 m").
4. Component	A	~~D~~ Tells where a vector is pointing or the angle of the vector.
5. Direction	D	~~E~~ What you find by adding two vectors together.
6. Vector	F	~~F~~ Something that has magnitude and direction.

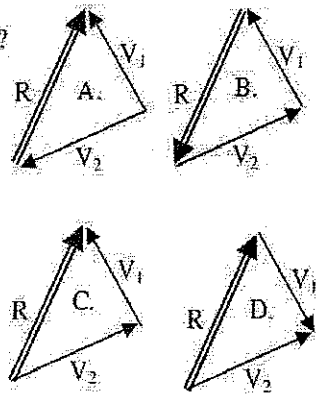
7. In figures A—D, which vectors are added correctly? If wrong, why?

A. no, tip to tail

B. yes

C. No, resultant does not end at origin

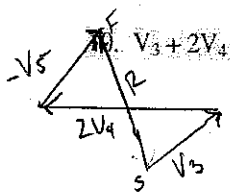
D. no, tip to tail



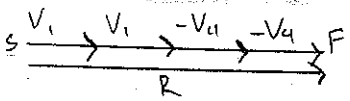
Using the vectors at the right, draw the resultants for the following operations.

8. $V_2 - V_5 =$

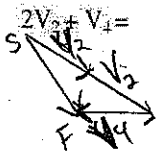
10. $V_3 + 2V_4 - V_5 =$



11. $2V_1 - 2V_4 =$



9. $2V_3 + V_4 =$



$V_1 + V_4 = 0$

12. Add $2V_1 + V_4$ mathematically.

V_1

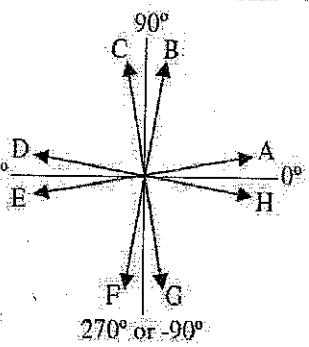
13. If each of the vectors is 10° from the closest axis, determine the directions of each of the vectors.

$\theta_A = 10°$ $\theta_E = 190°\ (-170°)$

$\theta_B = 80°$ $\theta_F = 260°\ (-100°)$

$\theta_C = 100°$ $\theta_G = 280°\ (-80°)$

$\theta_D = 170°$ $\theta_H = 350°\ (-10°)$

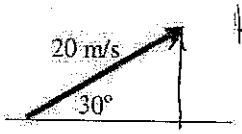


15. A person walks 12 m across a room.

A. What is their horizontal component? 12m

B. What is their vertical component? 0m

16. Resolve this vector into its components.



$H \sin\theta = 20 \sin 30°$

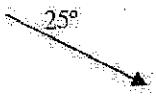
$= 10 m/s$

$20 \cos 30° = 17.32 m/s$

14. Find calculator directions for the following vectors.

A. $\theta = 90°$

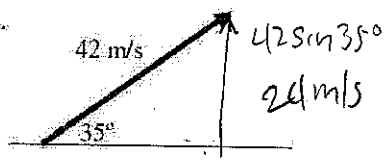
B. $\theta = 335°$ or $-25°$



C. $\theta = 135°$

17. Resolve these vectors into their components.

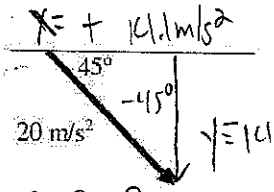
A.



$42 \sin 35° = 24 m/s$

$42 \cos 35° = 34.4 m/s$

B.

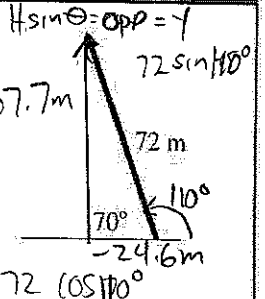


$\sin\theta = \frac{O}{Hy}$

$H \sin\theta = OPP = Y$

$20 \sin 45° = 141.1 m/s^2$

C.

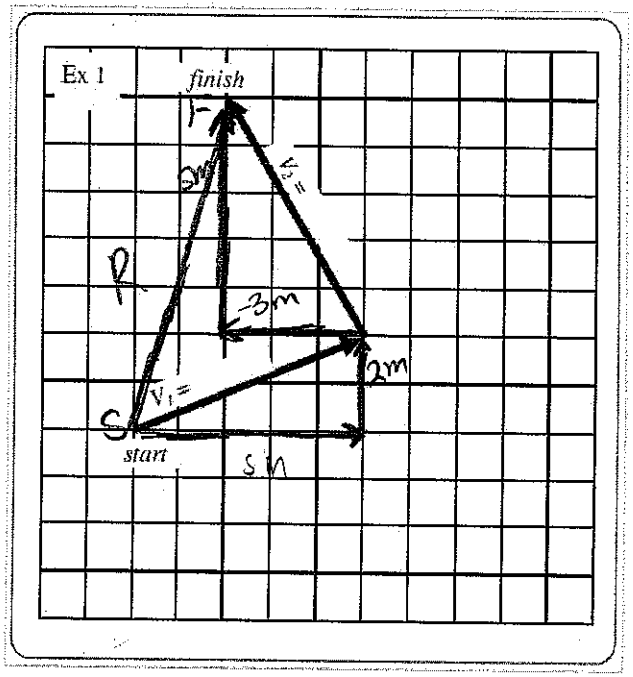


$H \sin\theta = OPP = Y$

$72 \sin 110°$

$72 \cos 110°$

Each grid square represents 1 m. In this example, you may count squares.



1. Find the following information for vector 1.
   A. How far does vector 1 move horizontally? (*This is the X-component.*) X_1 = 5m
   B. What is the Y-component of vector 1? Y_2 = 2m
   C. How long is vector 1? (*Find the magnitude of vector 1.*) $a^2+b^2=c^2$

$V_1^2=(5m)^2+(2m)^2$ =

$V=\sqrt{25+4}$ $V=5.4m$

2. Resolve vector 2 into its x and y components. (*Do the same as in #1*)
   A. X_2 = -3m
   B. Y_2 = 5m
   C. Magnitude of vector 2 = $a^2+b^2=c^2$

$V_2^2=(-3m)^2+(5m)^2$

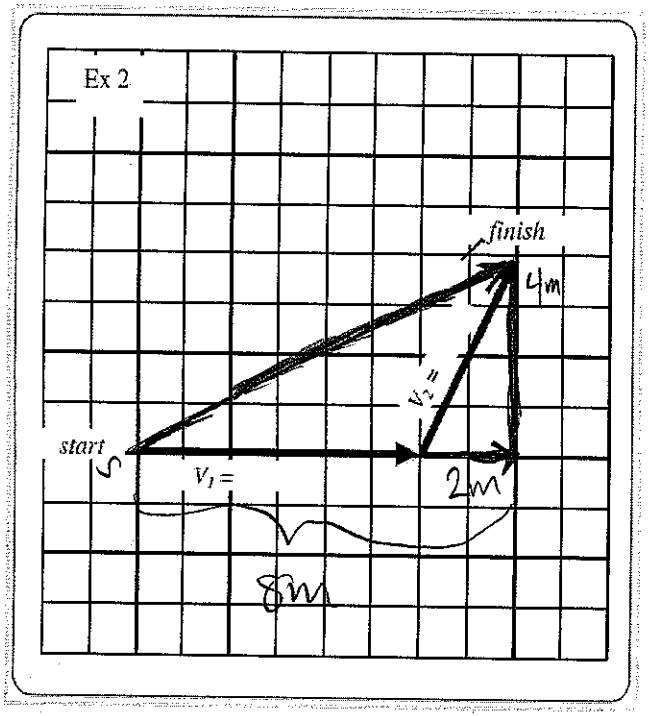
$V_2=\sqrt{9+25}$ $V_2=5.8m$

3. Draw the resultant from the start to the finish (Label it "R").
4. Add together X_1 and X_2 = 5m + -3m = 2m (this is X_{total})
5. Y_{total} = 2m + 5m = 7m
6. Using X_{total} and Y_{total}, calculate the length of R (*with X_{total} and Y_{total} you have two sides of a right triangle*). $\tan\theta=\frac{7m}{2m}=3.5_{rm}$

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

$\theta=\tan^{-1}(3.5)=74^\circ$

$R=\sqrt{(2m)^2+(7m)^2}=\sqrt{4+49}=7.3m$ 74°



1. A. X_1 = 6m B. Y_2 = 0m

   C. Magnitude of V_1 =

   6m

2. A. X_2 = 2m B. Y_2 = 4m

   C. Magnitude of vector 2 = $a^2+b^2=c^2$

   $V_2^2 = (2m)^2+(4m)^2$

   $V_2 = 4.47m$

3. Draw the resultant from the start to the finish.
4. A. X_{total} = 8m B. Y_{total} = 4m
5. Calculate the magnitude of R. $a^2+b^2=c^2$

   $R^2 = (8m)^2+(4m)^2 = \sqrt{64+16} = 8.9m$

6. Using X total and Y total, calculate the direction of R. *(see "Adding Vector" notes.)*

   $\tan\theta = \frac{Yt}{Xt} = \frac{4m}{8m} = .5$

   $\theta = \tan^{-1}(.5)$ $\theta = 26.6^\circ$