Adding Vectors

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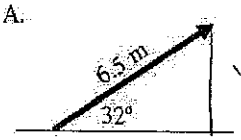
1. A drag racer moves 350 m down a race track. X = 350m, Y = 0m

2. A person walks 150 m north. X = 0m, Y = 150N

3. Resolve the following vectors into their components.

A.



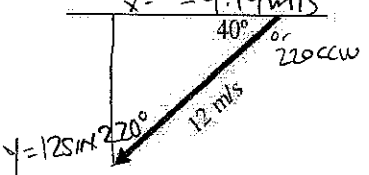
$Y = H\sin\theta = 6.5m \sin 32° = 3.44m$

$X = H\cos\theta = 6.5m \cos 32° = 5.51m$

B.

$X = 12m/s \cos 220°$

$x = -9.19 m/s$



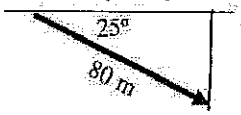
$Y = 12\sin 220°$

$Y = -7.7 m/s$

C.

$X = 80m \cos 335°$

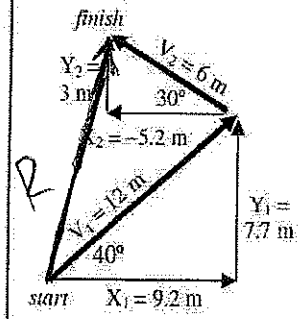
$X = 72.5m$



$Y = 80m \sin 335°$

$Y = -33.8m$

4. Find the resultant of the following two vectors.



A. Draw the resultant from the start of the first vector to the end of the second. Label it "R".

B. $X_{total} = 4m$

C. $Y_{total} = 10.7m$

D. Calculate the magnitude (length) of R.

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

$(4m)^2 + (10.7m)^2 = c^2$

$\sqrt{16 + 114.5} = c$

$c = 11.4m$

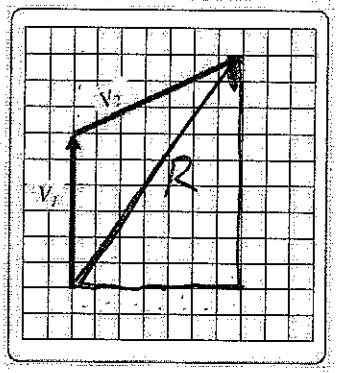
E. Calculate the direction of R.

$\tan\theta = \frac{Y_t}{X_t}$

$\theta = \tan^{-1}\frac{10.7m}{4m}$

$\theta = 69.5°$

5. Add these vectors together. Assume each square = 1 m.



A. $X_1 = 0m$, $Y_1 = 6m$

B. $X_2 = 7m$, $Y_2 = 3m$

C. $X_{total} = 7m$, $Y_{total} = 9m$

D. Draw the resultant (R).

E. Calculate R's magnitude.

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

$(7m)^2 + (9m)^2 = c^2$

$\sqrt{49 + 81}$ $R = 11.4m$

F. Calculate R's direction.

$\tan\theta = \frac{Y_t}{X_t} = \frac{9m}{7m}$

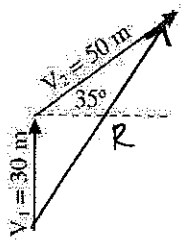
$\theta = \tan^{-1}\frac{9}{7}$

$52.1°$

6. A person walks 30 m north, then 50 m at 35°. Find their total displacement.

A. Below draw R from the start of V_1 to the end of V_2.

B. Resolve v_1 and v_2 into their components (*Step 1 on the front*)



$X_1 = 0$

$Y_1 = 30m$

$X_2 = hyp\cos\theta$

$50m \cos 35°$

$X = 41m$

$Y_2 = hyp\sin\theta$

$50m \sin 35°$

$Y = 28.7m$

$X_{total} = 41m$

$Y_{total} = 58.7m$

$a^2 + b^2 = R^2$

$(41m)^2 + (58.7m)^2 = R^2$ Magnitude = $71.6m$

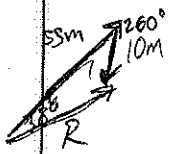
Direction = $\tan\theta = \frac{Y_t}{X_t} = \frac{58.7m}{41m}$

$\theta = \tan^{-1}\frac{58.7}{41} = 55°$

7. Add these vectors: $V_1 = 55$ m at 38° and $V_2 = 10$ m at 260°.

A. Draw V_1, V_2, and R below.

B. Resolve v_1 and v_2 into their components (*Step 1 on the front*)



$X_1 = hyp\cos\theta$

$55m \cos 38°$

$43.3m$

$Y_1 = hyp\sin\theta$

$55m \sin 38°$

$33.9m$

$X_2 = hyp\cos\theta$

$10m \cos 260°$

$-1.7m$

$Y_2 = 10m \sin 260°$

$-9.8m$

$X_{total} = 41.6m$

$Y_{total} = 24.1m$

$(X)^2 + (Y)^2 = (R)^2$

Magnitude = $(41.6)^2 + (24.1m)^2 = R^2$

$48.1m$

Direction = $\theta = \tan^{-1}\frac{24.1m}{41.6m} = 30°$