TH-GP General Physics 1/13

Sum of two vectors

$A = \langle 2.0\hat{i} + 3.0\hat{j} \rangle$ (x, y)

$B = \langle 4.0\hat{i} - 5.0\hat{j} \rangle$ (x, y)

$\xrightarrow{2}$ $\uparrow 3$ $\xrightarrow{4}$ $\downarrow 5$

$A + B$

$(2.0 + 4.0)\hat{i} + (3.0 + (-5.0))\hat{j}$ ← vector

sum of vectors $\{ \langle 6\hat{i} - 2\hat{j} \rangle$

Resultant

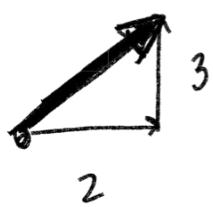
$r = \sqrt{(6)^2 + (-2)^2}$

$\sqrt{36 + 4} = \sqrt{40}$

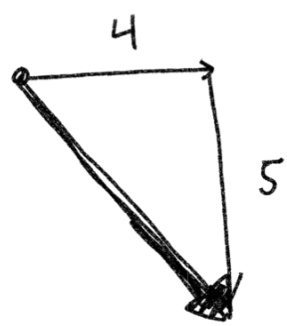
$\sqrt{4}\sqrt{10}$

$2\sqrt{10}$

A



B

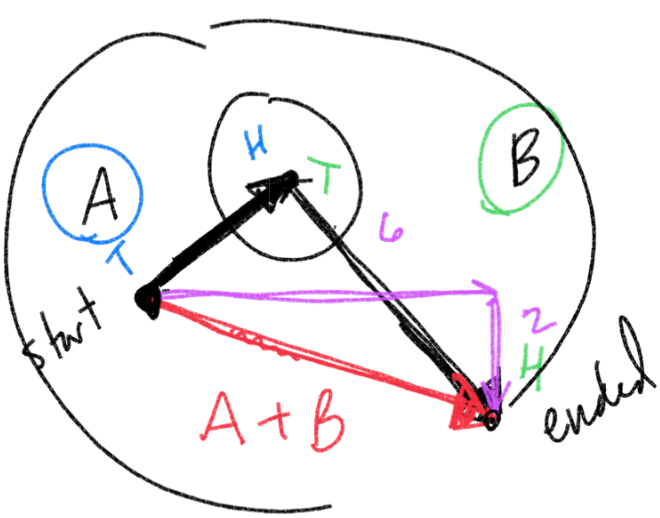


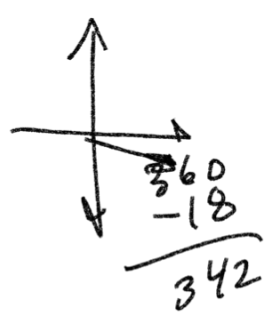
$\theta = \tan^{-1} \frac{y}{x}$

$6\hat{i} - 2\hat{j}$

$\tan^{-1}\left(\frac{-2}{6}\right)$

$\theta = -18°$





$(2\sqrt{10}, 342°)$

A: $\langle 10\hat{i} - 8\hat{j} \rangle$ B: $\langle 2\hat{i} + 3\hat{j} \rangle$

$\langle \hat{i} + \hat{j} \rangle$

Resultant

resultant displacement

$\langle 10+2 \rangle \hat{i}$ $\langle -8+3 \rangle \hat{j}$

$\langle 12\hat{i} - 5\hat{j} \rangle$

$\langle 12\hat{i} - 5\hat{j} \rangle$

Magnitude: $\sqrt{(12)^2 + (-5)^2} = \sqrt{144+25}$

$\sqrt{169} = 13$

$\theta = \tan^{-1}\left(\frac{-5}{12}\right) = -22.6°$

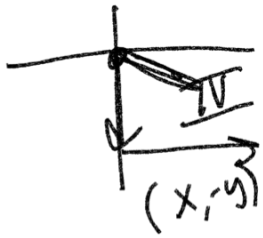
360

Direction

337.4°

$y = -5$

$x = 12$



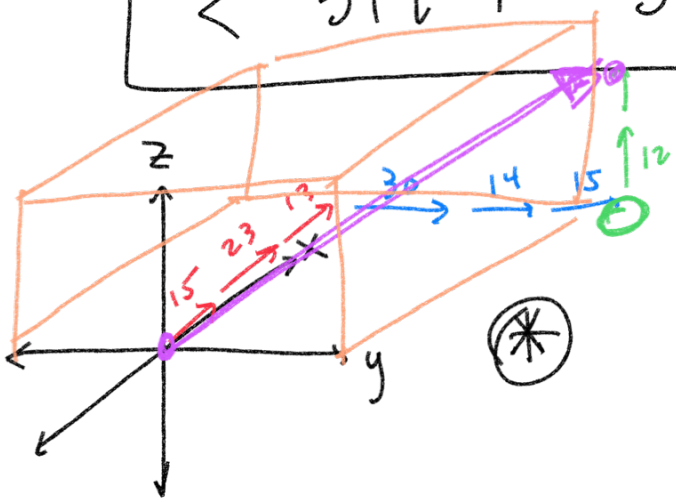
$d_1 = \langle 15\hat{i} + 30\hat{j} + 12\hat{k} \rangle$

$d_2 = \langle 23\hat{i} + 14\hat{j} + 5.0\hat{k} \rangle$ resultant displacement

$d_3 = \langle 13\hat{i} + 15\hat{j} \rangle$

$$(15 + 23 + 13)\hat{i} + (30 + 14 + 15)\hat{j} + (12 + 5.0)k$$

$$\boxed{\langle 51\hat{i} + 59\hat{j} + 17k \rangle}$$



magnitude $\sqrt{i^2 + j^2 + k^2}$

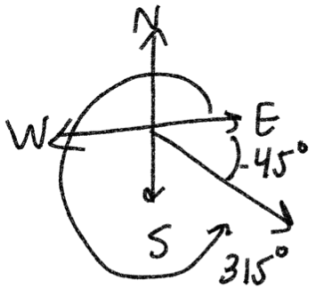
$$\sqrt{(51)^2 + (59)^2 + (17)^2}$$

$$= \sqrt{6371} = \boxed{79.8}$$

Hiker 25.0 km southeast

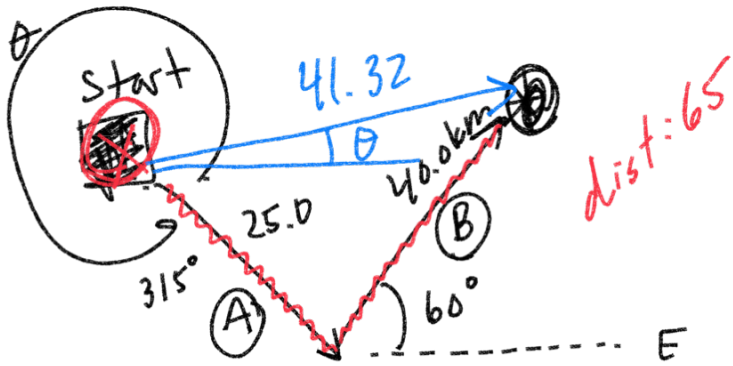
25.0 at 315°

40.0 km 60° north of East



$x = r\cos\theta$

$y = r\sin\theta$



dist: 65

Component

x y

A

$x = 25\cos 315°$

$y = 25\sin 315°$

B

$x = 40\cos 60°$

$y = 40\sin 60°$

A + B

x

$25\cos 315° + 40\cos 60°$

$\underbrace{17.68 \quad 20}_{37.68}$

y

$25\sin 315 + 40\sin 60°$

$\underbrace{-17.68 + 34.64}_{16.96}$

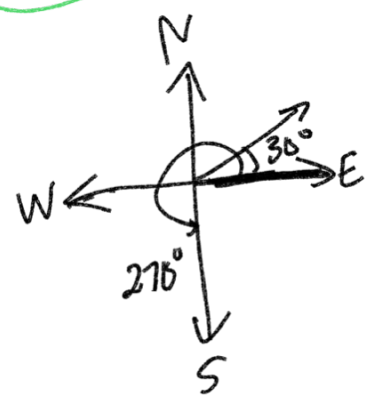
$(37.68, 16.96)$

$r = \sqrt{(37.68)^2 + (16.96)^2} = 41.32$

$\theta = \tan^{-1}\frac{16.96}{37.68}$

$\theta = 24.23°$

Caitlin is looking to deposit Nate's dead body. From her car she traveled 5.2 miles in a direction 30° north of east (A) and then headed south for 3.5 miles (B). Finally she traveled 6.8 miles in a direction 40° west of south (C). How did Caitlin kill Nate?



A

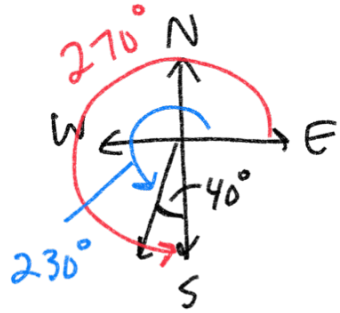
$x = 5.2 \cos 30° = 4.5$

$y = 5.2 \sin 30° = 2.6$

B

$3.5 \cos 270°$ 0

-3.5 $3.5 \sin 270°$



C

$x = 6.8 \cos 230°$ $y = 6.8 \sin 230°$