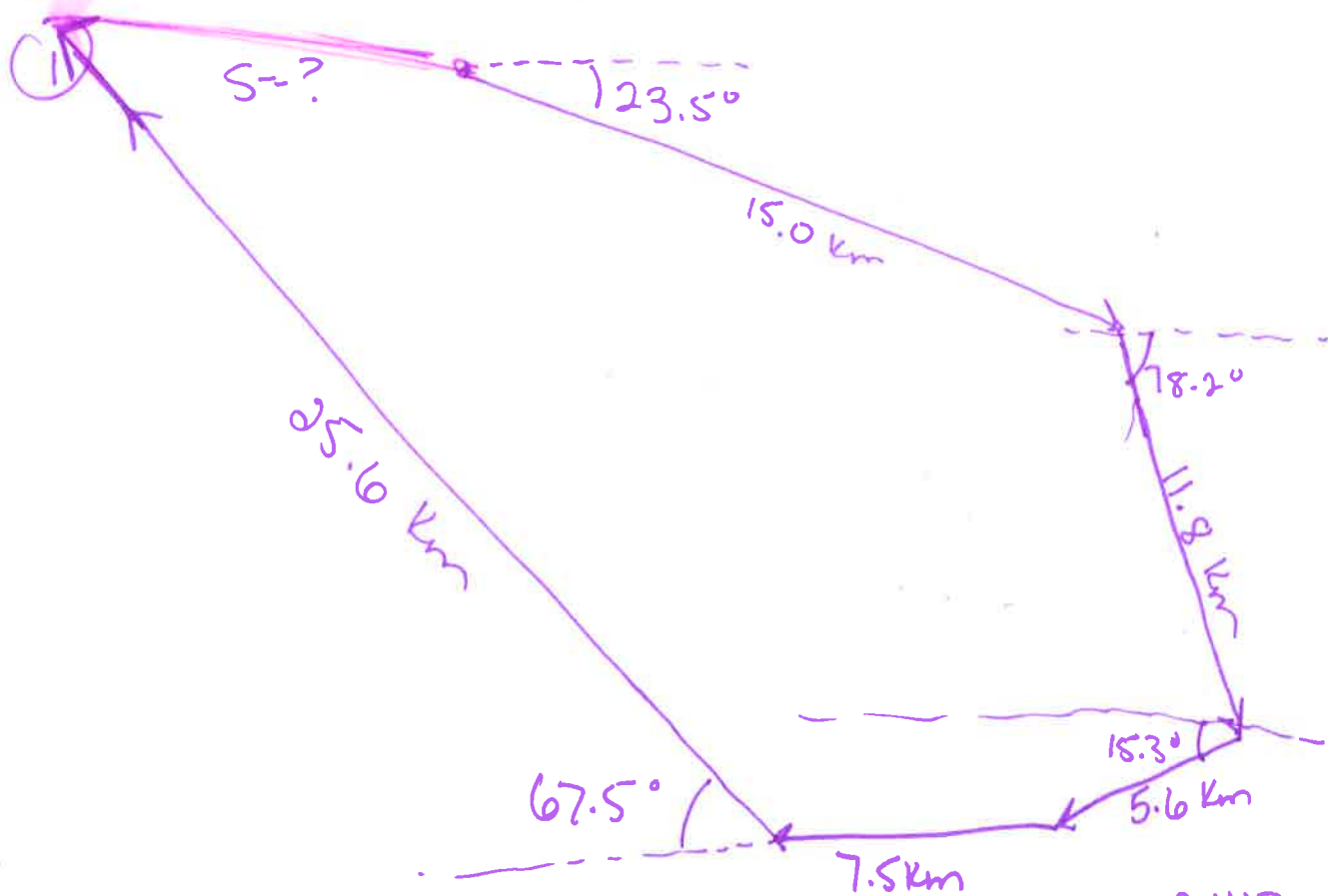


# Vector Practice - Answer Key



$$X_1 = 15 \cos 23.5^\circ$$

$$Y_1 = -15 \sin 23.5^\circ$$

$$X_2 = 11.8 \cos 78.2^\circ$$

$$Y_2 = -11.8 \sin 78.2^\circ$$

$$X_3 = -5.6 \cos 15.3^\circ$$

$$Y_3 = -5.6 \sin 15.3^\circ$$

$$X_4 = -7.5 \text{ km}$$

$$Y_4 = \emptyset$$

$$X_5 = -25.6 \cos 67.5^\circ$$

$$Y_5 = 25.6 \sin 67.5^\circ$$

$$X = 13.756 + 2.413 - 5.402 - 7.5 - 9.797 = -6.53 \approx -6.5 \text{ km}$$

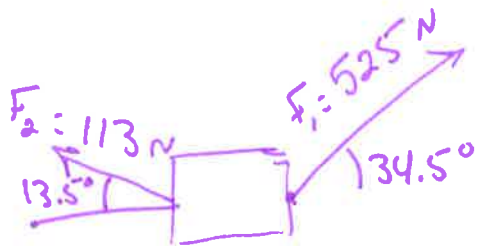
$$Y = -5.981 - 11.551 - 1.478 + 23.651 = 4.641 \text{ km} \approx 4.6 \text{ km}$$

$$S = \sqrt{(-6.53)^2 + (4.64)^2} = 8.01 \text{ km}$$

$$\theta = \tan^{-1}\left(\frac{4.64}{6.53}\right) = 35.4^\circ \text{ NW}$$

8.0 km, 35.4° NW

2



$$X_1 = 525 \cos 34.5^\circ = 432.67$$

$$Y_1 = 525 \sin 34.5^\circ = 297.36$$

$$X_2 = -113 \cos 13.5^\circ = -109.88$$

$$Y_2 = 113 \sin 13.5^\circ = 26.38$$

$$X = 432.67 - 109.88 = 322.79$$

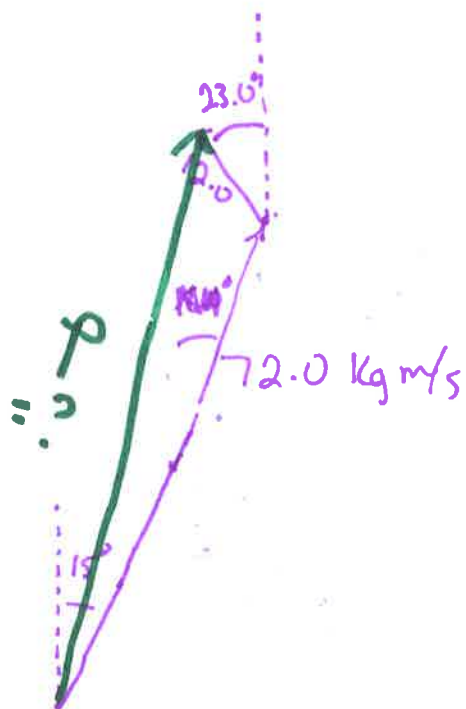
$$Y = 297.36 + 26.38 = 323.74$$

$$F = \sqrt{X^2 + Y^2} = \sqrt{(322.79)^2 + (323.74)^2}$$

$$F = \underline{\underline{457 \text{ N}}}$$

$$\theta = \tan^{-1}\left(\frac{323.74}{322.79}\right) = \underline{\underline{45.1^\circ \text{ up } \& \text{ to the right}}}$$

3



$$X_1 = 72 \sin 15^\circ = 18.6 \text{ kg m/s}$$

$$Y_1 = 72 \cos 15^\circ = 69.5 \text{ kg m/s}$$

$$X_2 = -12 \sin 23^\circ = -4.69 \text{ kg m/s}$$

$$Y_2 = 12 \cos 23^\circ = 11.0 \text{ kg m/s}$$

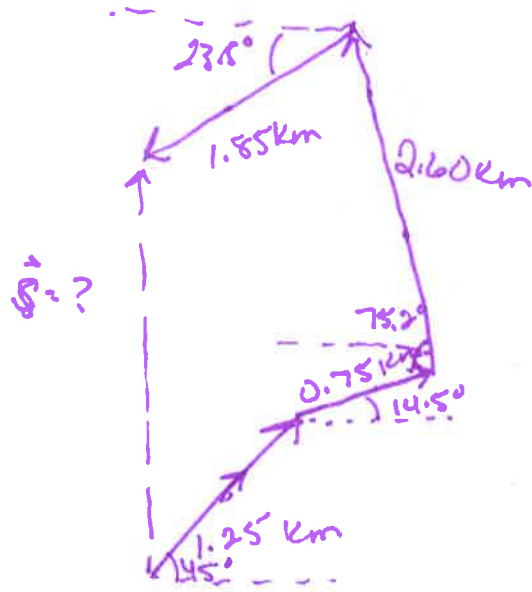
$$X = 13.9 \text{ kg m/s}$$

$$Y = 80.8 \text{ kg m/s}$$

$$P_{\text{total}} = \sqrt{X^2 + Y^2} = \sqrt{13.9^2 + 80.8^2} = 82.0 \text{ kg m/s}$$

$$\theta = \tan^{-1} \left( \frac{80.8}{13.9} \right) = 80.2^\circ$$

4



$$X_1 = 1.25 \cos 45^\circ = 0.884$$

$$Y_1 = 1.25 \sin 45^\circ = 0.884$$

$$X_2 = 0.75 \cos 14.5^\circ = 0.726$$

$$Y_2 = 0.75 \sin 14.5^\circ = 0.188$$

$$X_3 = -2.60 \cos 75.2^\circ = -0.673$$

$$Y_3 = 2.60 \sin 75^\circ = 2.511$$

$$X_4 = -1.85 \cos 23.5^\circ = -1.697$$

$$Y_4 = -1.85 \sin 23.5^\circ = -0.738$$

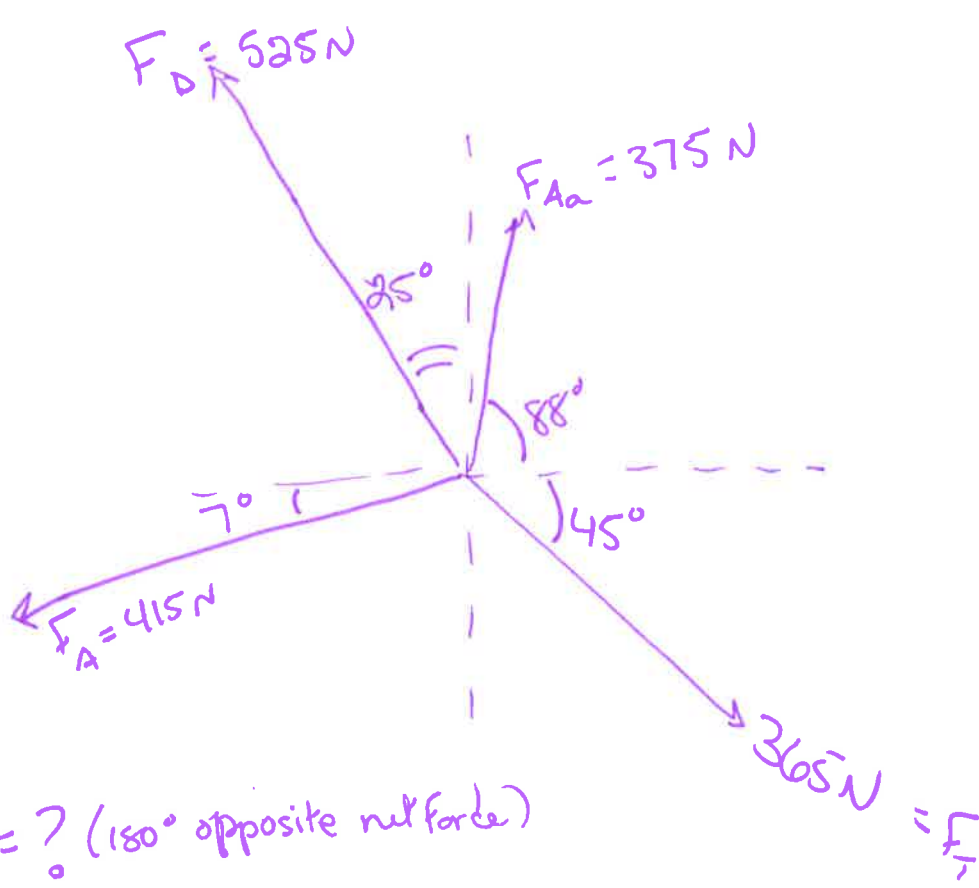
$$X = 0.884 + 0.726 - 0.673 - 1.697 \\ = -0.76$$

$$Y = 0.884 + 0.188 + 2.511 - 0.738 \\ = 2.85$$

$$S = \sqrt{x^2 + y^2} = \sqrt{.76^2 + 2.85^2} = 2.94 \text{ km}$$

$$\theta = \tan^{-1}\left(\frac{y}{x}\right) = \tan^{-1}\left(\frac{2.85}{-.76}\right) = 75.1^\circ \text{ NW}$$

(5)



$F_5 = ?$  (180° opposite net force)

$$F_{x1} + F_{x2} + F_{x3} + F_{x4} + F_{x5} = 0$$

$$(375 \cos 88^\circ) - (525 \sin 25^\circ) - (415 \cos 7^\circ) + (365 \cos 45^\circ) = -F_{5x}$$

$$13.1 - 221.9 - 411.9 + 258.1 = -F_{5x}$$

$$-362.6 = -F_{5x}$$

$$F_{5x} = 362.6 \text{ N}$$

$$F_{y1} + F_{y2} + F_{y3} + F_{y4} + F_{y5} = 0$$

$$(375 \sin 88^\circ) + 525 \cos 25^\circ - 415 \sin 7^\circ - 365 \sin 45^\circ + F_{5y} = 0$$

$$374.8 + 475.8 - 50.6 - 258.1 = -F_{5y}$$

$$541.9 = -F_{5y}$$

$$F_{5y} = -541.9 \text{ N}$$

$$F_5 = \sqrt{(362.6)^2 + (-541.9)^2} = \underline{\underline{652 \text{ N}}}$$

$$\theta = \tan^{-1}\left(\frac{541.9}{362.6}\right) = 56.2^\circ$$

$$\rightarrow \underline{\underline{304^\circ}}$$

Counter-clockwise  
from +X axis