

1) a)



b)



$$2. a) \vec{F}_1 = 45 \text{ N} @ 135^\circ$$

$$F_2 = 20 \text{ N} @ 200^\circ$$

$$F_{1x} = 45 \text{ N} \cos 135^\circ$$

$$F_{1x} = -31.82 \text{ N}$$

$$F_{2x} = 20 \text{ N} \cos 200^\circ$$

$$F_{2x} = -18.79 \text{ N}$$

$$F_{1y} = 45 \text{ N} \sin 135^\circ =$$

$$F_{1y} = 31.82 \text{ N}$$

$$F_{2y} = 20 \text{ N} \sin 200^\circ$$

$$F_{2y} = -6.84 \text{ N}$$

$$\vec{F} = \vec{F}_1 + \vec{F}_2$$

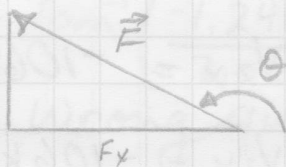
$$F_x = F_{1x} + F_{2x} = -31.82 \text{ N} - 18.79 \text{ N} = -50.61 \text{ N}$$

$$F_y = F_{1y} + F_{2y} = 31.82 \text{ N} - 6.84 \text{ N} = 24.98 \text{ N}$$

$$F = \sqrt{F_x^2 + F_y^2} = \sqrt{(50.61 \text{ N})^2 + (24.98 \text{ N})^2}$$

$$F = 56.5 \text{ N}$$

$$\theta = \tan^{-1} \left(\frac{F_y}{F_x} \right) = \tan^{-1} \left(\frac{24.98 \text{ N}}{-50.61 \text{ N}} \right)$$



$$\theta = -26.27^\circ$$

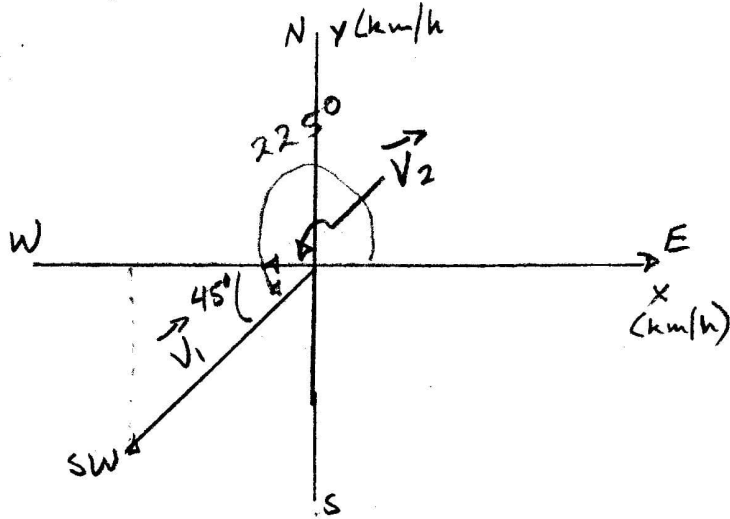
Wrong quadrant.

$$\theta = 180^\circ + -26.27^\circ$$

$$\theta = 154^\circ$$

$$\vec{F} = 56.5 \text{ N} @ 154^\circ$$

2. b) $\vec{V}_1 = 150 \text{ km/h SW}$ $\vec{V}_2 = 20 \text{ km/h W}$



$$V_{1x} = (-150 \text{ km/h}) \cos 45^\circ = -106 \text{ km/h}$$

$$V_{1y} = (-150 \text{ km/h}) \sin 45^\circ = -106 \text{ km/h}$$

OR you could use the trig. angle,

$$V_{1x} = (150 \text{ km/h}) \cos 225^\circ = -106 \text{ km/h}$$

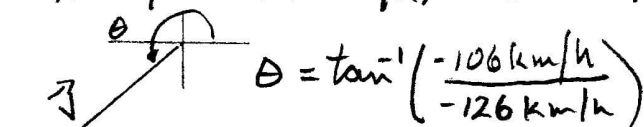
$$V_{1y} = (150 \text{ km/h}) \sin 225^\circ = -106 \text{ km/h}$$

$V_{2x} = -20 \text{ km/h}$	$\vec{V} = 165 \text{ km/h @ } 220^\circ$
$V_{2y} = 0 \text{ km/h}$	
$\vec{V} = \vec{V}_1 + \vec{V}_2$	

$$V_x = V_{1x} + V_{2x} = -106 \text{ km/h} - 20 \text{ km/h} = -126 \text{ km/h}$$

$$V_y = V_{1y} + V_{2y} = -106 \text{ km/h} - 0 \text{ km/h} = -106 \text{ km/h}$$

$$V = \sqrt{V_x^2 + V_y^2} = \sqrt{(-126 \text{ km/h})^2 + (-106 \text{ km/h})^2} = 165 \text{ km/h}$$



$$\theta = \tan^{-1} \left(\frac{-106 \text{ km/h}}{-126 \text{ km/h}} \right)$$

$$\theta = 40^\circ$$

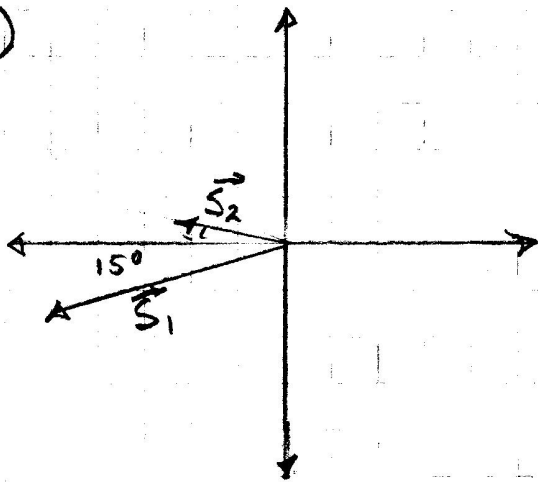
wrong quadrant \Rightarrow

$$\theta = 40^\circ + 180^\circ = 220^\circ$$

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$$\vec{S}_1 = 5.4 \text{ m } [15^\circ \text{ S of W}] \quad \vec{S}_2 = 1.82 \text{ m } [5^\circ \text{ N of W}]$$

2) c)



$$S_{1x} = (-5.4 \text{ m}) \cos 15^\circ = -5.21 \text{ m}$$

$$S_{1y} = (-5.4 \text{ m}) \sin 15^\circ = -1.40 \text{ m}$$

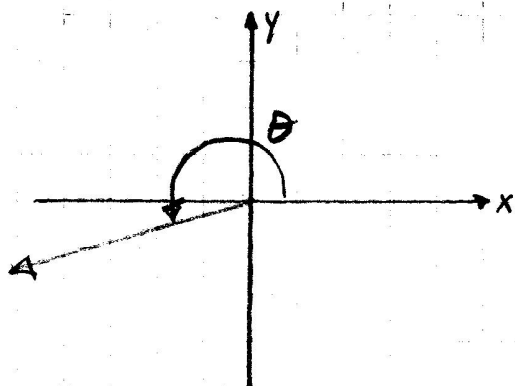
$$S_{2x} = (-1.82 \text{ m}) \cos 5^\circ = -1.81 \text{ m}$$

$$S_{2y} = (1.82 \text{ m}) \sin 5^\circ = 0.16 \text{ m}$$

$$S_x = -5.21 \text{ m} - 1.81 \text{ m} = -7.02 \text{ m}$$

$$S_y = -1.40 \text{ m} + 0.16 \text{ m} = -1.24 \text{ m}$$

$$S = \sqrt{S_x^2 + S_y^2} = \sqrt{(-7.02 \text{ m})^2 + (-1.24 \text{ m})^2} = 7.13 \text{ m}$$



$$\theta = \tan^{-1}\left(\frac{-1.24 \text{ m}}{-7.02 \text{ m}}\right) = 10.0^\circ$$

Wrong quadrant

$$\theta = 10^\circ + 180^\circ = 190^\circ$$

$$\vec{S} = 7.13 \text{ m } @ 190^\circ$$

$$\vec{S} = 7.13 \text{ m } [10^\circ \text{ S of W}]$$

3. The resultant force is the force obtained when adding up all the forces acting on an object - in this case, a point.

Reading from the graph

$$F_{1x} = 5\text{ N}$$

$$F_{1y} = -3\text{ N}$$

$$F_{2x} = 6\text{ N}$$

$$F_{2y} = 4\text{ N}$$

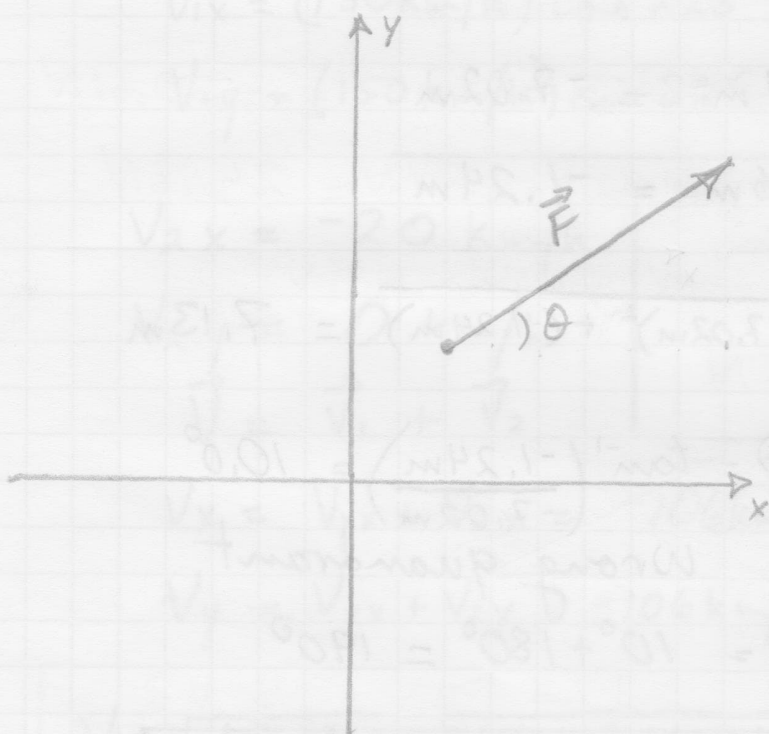
$$\underline{F_{3x} = -5\text{ N}}$$

$$\underline{F_{3y} = 2\text{ N}}$$

$$\Sigma F_x = 6\text{ N}$$

$$\Sigma F_y = 3\text{ N}$$

$$F = \sqrt{(6\text{ N})^2 + (3\text{ N})^2} = \sqrt{45}\text{ N}$$



$$\theta = \tan^{-1}\left(\frac{3\text{ N}}{6\text{ N}}\right)$$

$$\theta = 26.6^\circ$$

$$\vec{F} = \sqrt{45}\text{ N} @ 26.6^\circ$$