

Unit 3: Vector Addition Worksheet #2 - Trigonometric Method

Physics

On fresh paper, add each set of vectors below using trigonometry. For each set, draw a roughly approximate sketch (including a reference frame), calculate the components of each vector using the sine and the cosine functions, then add or subtract like-direction components to find the 'x' and 'y' parts of the resultant and lastly find the magnitude of the resultant using the Pythagorean theorem and the direction using the tangent function.

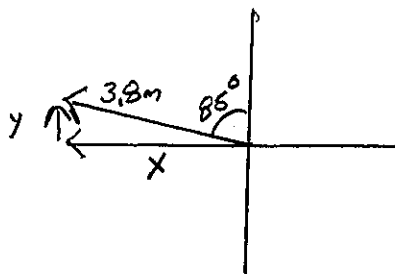
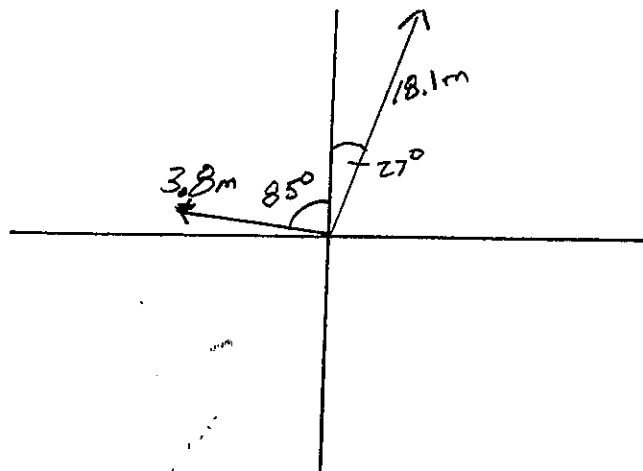
1. $d_1 = 18.1 \text{ m @ } 27^\circ$ (or 27° E of N)
 $d_2 = 3.8 \text{ m @ } 275^\circ$ (or 85° W of N)

2. $v_1 = 4.3 \text{ m/s @ } 72^\circ$ (or 72° E of N)
 $v_2 = 10.7 \text{ m/s @ } 247^\circ$ (or 23° S of W)

3. $F_1 = 6.7 \text{ N @ } 306^\circ$ (or 54° W of N)
 $F_2 = 9.2 \text{ N @ } 206^\circ$ (or 26° W of S)

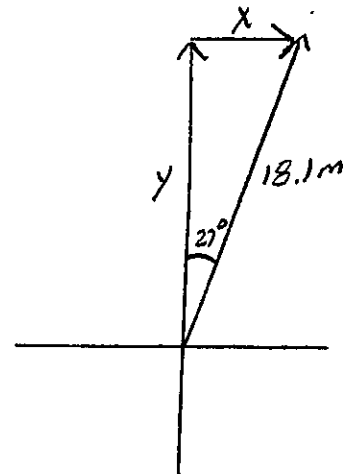
4. $F_1 = 16.2 \text{ N @ } 48.0^\circ$ (or 48.0° E of N)
 $F_2 = 39.6 \text{ N @ } 297.0^\circ$ (or 27.0° N of W)
 $F_3 = 11.2 \text{ N @ } 356.0^\circ$ (or 4.00° W of N)

#1



$$\cos 5^\circ = \frac{x}{3.8m} \quad x = 3.79m$$

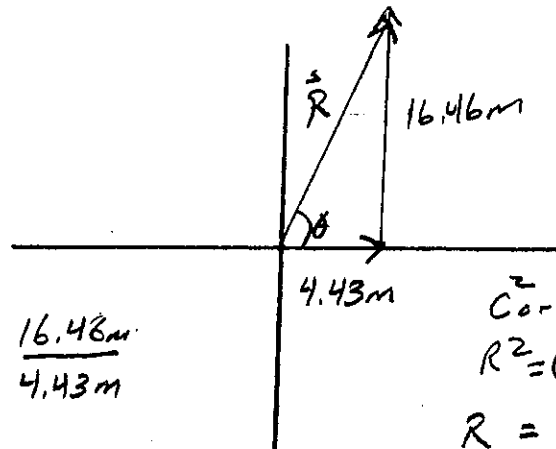
$$\sin 5^\circ = \frac{y}{3.8m} \quad y = .33m$$



$$\cos 27^\circ = \frac{y}{18.1m} \quad y = 16.13m$$

$$\sin 27^\circ = \frac{x}{18.1m} \quad x = 8.22m$$

	x	y
3.8m	-3.79m	.33m
18.1m	8.22m	16.13m
\vec{R}	4.43m	16.46m



$$\tan \theta = \frac{16.46m}{4.43m}$$

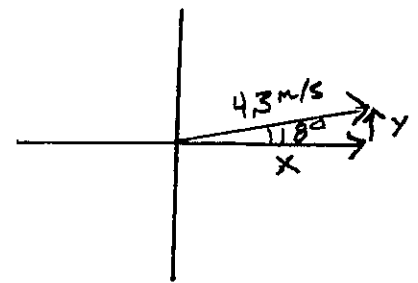
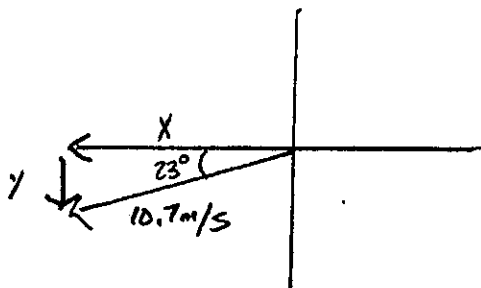
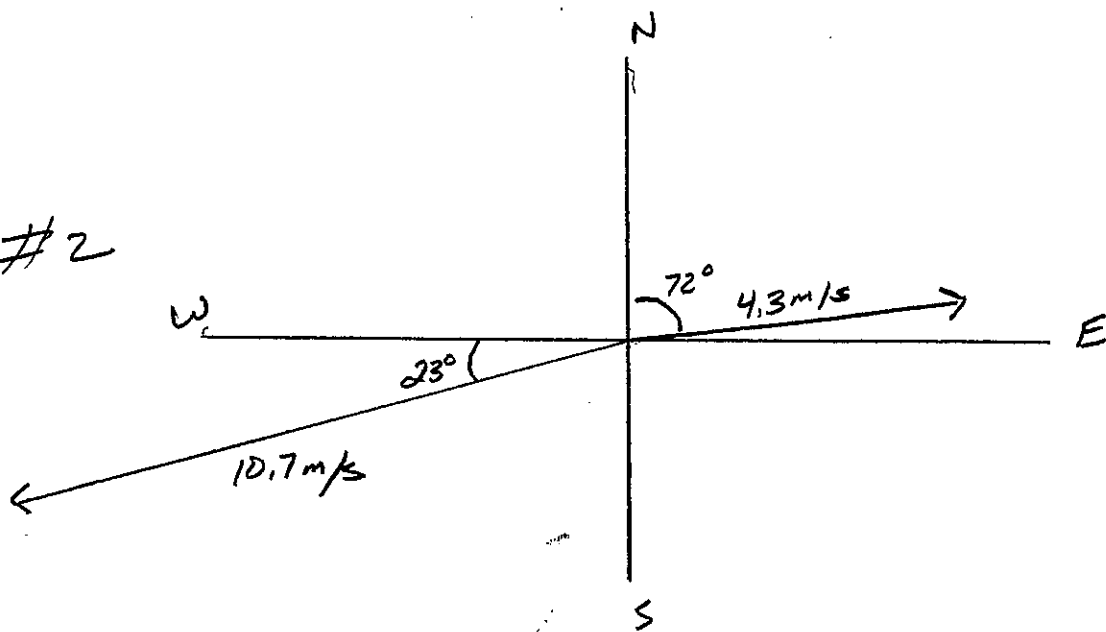
$$\theta = 75^\circ$$

$$\begin{aligned} \cos R^2 &= a^2 + b^2 \\ R^2 &= (4.43m)^2 + (16.46m)^2 \\ R &= 17.05m \end{aligned}$$

$\vec{R} = 17.05m \quad 75^\circ \text{ N of E}$
 (or)
 $17.05m \quad 15^\circ \text{ E of N}$



#2



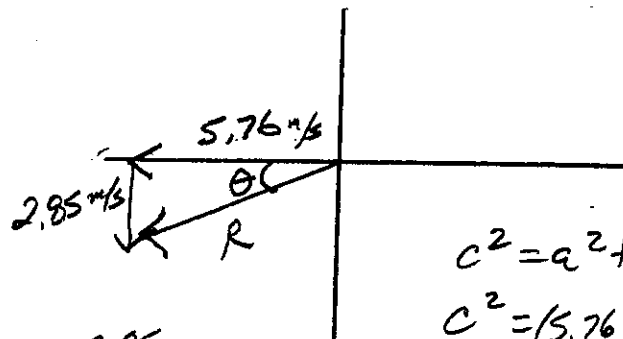
$$\sin 23^\circ = \frac{y}{10.7 \text{ m/s}} \quad y = -4.18 \text{ m/s}$$

$$\sin 18^\circ = \frac{y}{4.3 \text{ m/s}} \quad y = 1.33$$

$$\cos 23^\circ = \frac{x}{10.7 \text{ m/s}} \quad x = -9.85 \text{ m/s}$$

$$\cos 18^\circ = \frac{x}{4.3 \text{ m/s}} \quad x = 4.09$$

	X	Y
10.7 m/s	-9.85	-4.18
4.3 m/s	4.09	1.33
\vec{R}	-5.76	-2.85



$$\tan \theta = \frac{2.85}{5.76}$$

$$\theta = 26.33^\circ$$

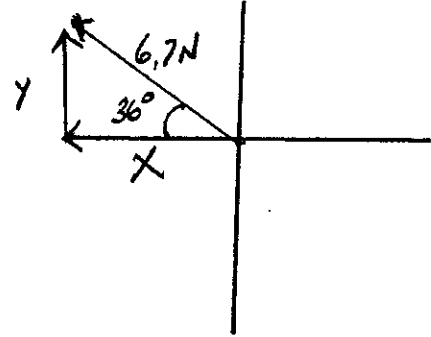
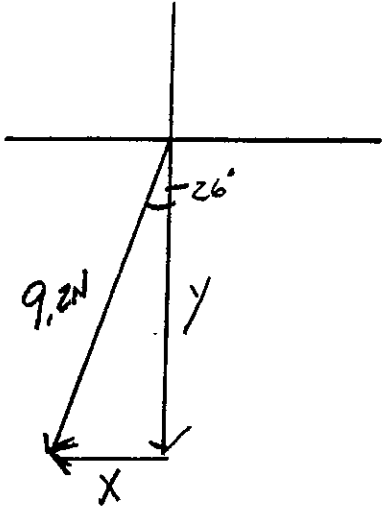
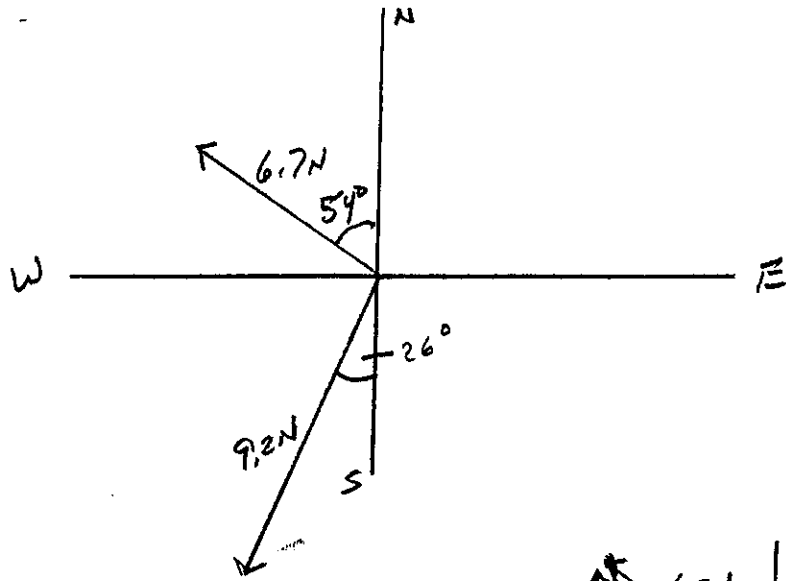
$$c^2 = a^2 + b^2$$

$$c^2 = (5.76)^2 + (2.85)^2$$

$$c = 6.43 \text{ m/s}$$

$$\vec{R} = 6.43 \text{ m/s } @ 26.33^\circ \text{ S of W}$$

3



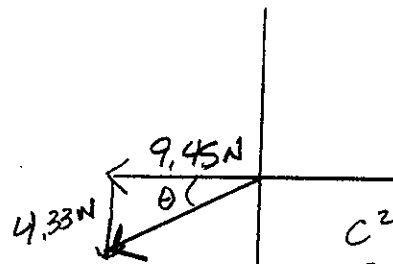
$$\sin 26^\circ = \frac{x}{9.2N} \quad x = 4.03N$$

$$\cos 36^\circ = \frac{x}{6.7N} \quad x = 5.42N$$

$$\cos 26^\circ = \frac{y}{9.2N} \quad y = 8.27N$$

$$\sin 36^\circ = \frac{y}{6.7N} \quad y = 3.94N$$

	X	Y
6.7N	-5.42	3.94
9.2N	-4.03	-8.27
\vec{R}	-9.45	-4.33



$$\tan \theta = \frac{4.33}{9.45}$$

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

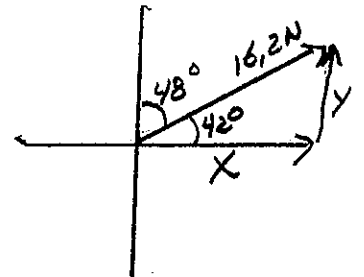
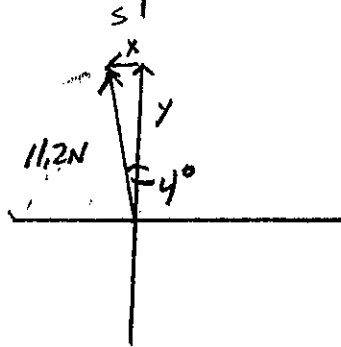
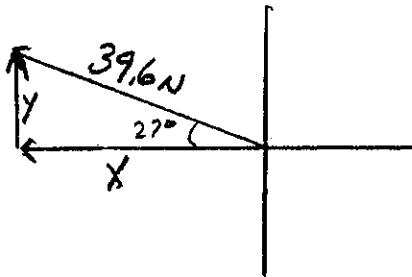
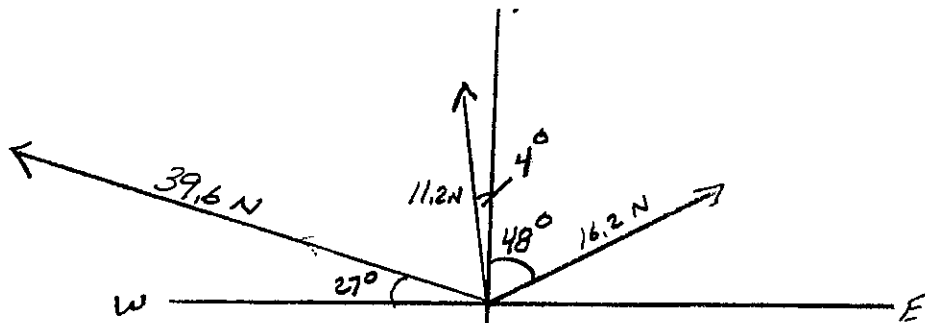
$$c^2 = (9.45)^2 + (4.33)^2$$

$$c = 10.39N$$

$$\theta = 24.62^\circ$$

$\vec{R} = 10.39N @ 24.62^\circ \text{ S of W}$

#4



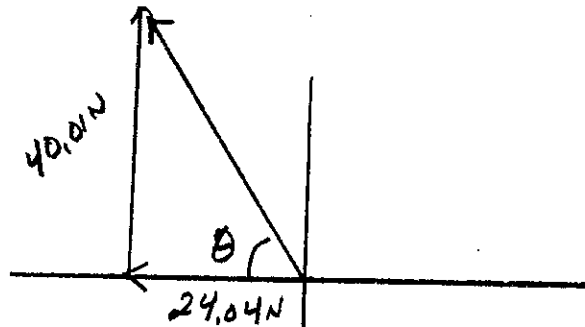
$$\cos 27^\circ = \frac{x}{39.6\text{N}} \quad x = 35.3\text{N} \quad \sin 4^\circ = \frac{x}{11.2\text{N}} \quad x = .78$$

$$\cos 42^\circ = \frac{x}{16.2\text{N}} \quad x = 12.04$$

$$\sin 27^\circ = \frac{y}{39.6\text{N}} \quad y = 18.0\text{N} \quad \cos 4^\circ = \frac{y}{11.2\text{N}} \quad y = 11.17$$

$$\sin 42^\circ = \frac{y}{16.2\text{N}} \quad y = 10.84$$

	x	y
39.6N	-35.3N	18.0N
11.2N	-.78N	11.17N
16.2N	12.04N	10.84N
R	-24.04N	40.01



$$\tan \theta = \frac{40.01\text{N}}{24.04\text{N}}$$

$$\theta = 59^\circ$$

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

$$c^2 = (24.04)^2 + (40)^2$$

$$c = 46.67\text{N}$$

$\vec{R} = 46.67\text{N} @ 59^\circ \text{ N of W}$