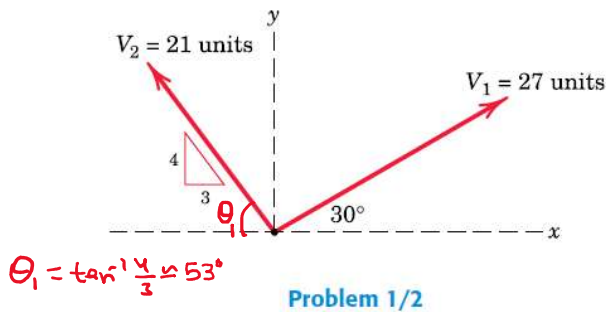


Solution of Problem 1/2 Magnitude of Vector Sum

1/2 Determine the magnitude of the vector sum $V = V_1 + V_2$ and the angle θ_x which V makes with the positive x-axis. Complete both graphical and algebraic solutions.



Graphical Method:

Scale: 1 cm = 7 units of force.

$\Rightarrow 1 \text{ unit} = 1/7 \text{ cm}$

$\Rightarrow V_2 = 21 \text{ units} = 21 * \left(\frac{1}{7}\right) = \frac{21}{7} = 3 \text{ cm}$

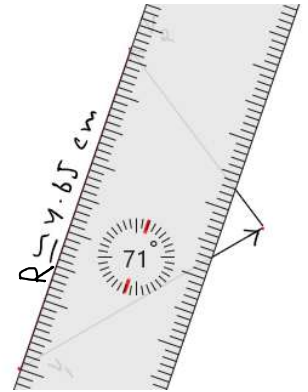
$\Rightarrow V_1 = 27 \text{ units} = 27 * \left(\frac{1}{7}\right) \approx 3.86 \text{ cm}$

Draw the Force Triangle as shown in Fig. 1.2.1

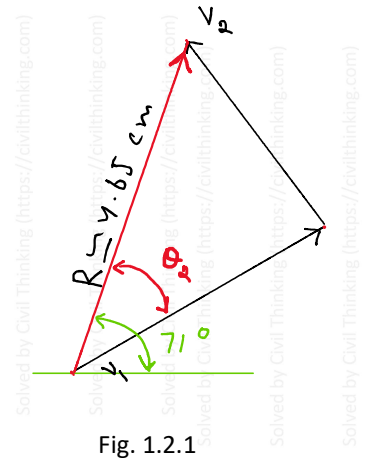
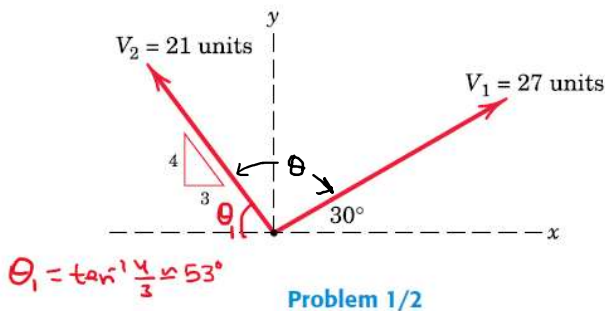
From Fig. 1.2.1, Resultant, $R \approx 4.65 \text{ cm}$

Since 1 cm = 7 units $\Rightarrow R = 4.65 * 7 \approx 32.55$ units of Force,

Making an angle of approx. 71° with the horizontal.



Algebraic Method:



Let R be the resultant of sum of V_1 and V_2 .

$$R = \sqrt{v_1^2 + v_2^2 + 2V_1V_2\cos\theta}$$

$$\theta = 180 - \theta_1 - 30 = 180 - 53 - 30 = 97^\circ$$

$$\Rightarrow R = \sqrt{27^2 + 21^2 + 2 * 27 * 21 * \cos 97^\circ} \approx 32.122 \text{ units}$$

Note: A very small variation in graphic method and algebraic method is nothing to worry. The more precise you're in graphic method, the accurate you will be.

$$\theta_2 = \tan^{-1}(V_2/V_1)$$

$$\Rightarrow \theta_2 = \tan^{-1}(21/27) \approx 37.9^\circ$$

Final Answer:

Resultant, $R \approx 32$ units, making an angle 37.9° with V_1 as shown in figure 1.2.2

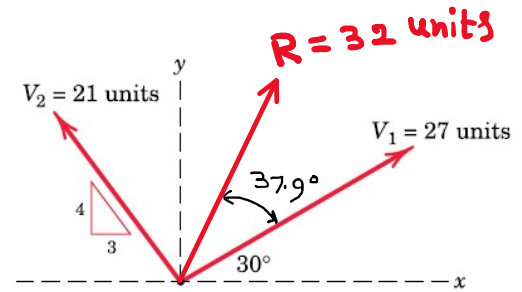


Fig. 1.2.2

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