

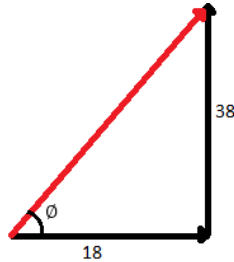
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Vector Sums Magnitude and Direction - Guided Lesson Explanation

Explanation #1

Step 1: Drawing the vectors u and v with the resultant vector " $u+v$ ":

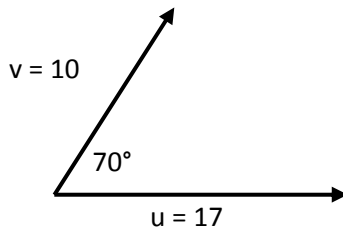


Step 2: Use Pythagorean Theorem to calculate the magnitude of the resultant force.

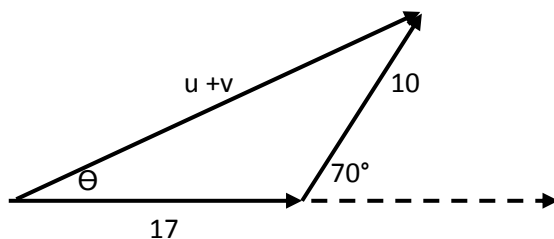
$$\sqrt{18^2 + 38^2} = 42.05$$

Explanation #2

Step 1: Start by sketching the vectors.



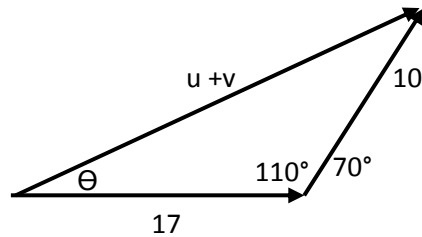
Step 2: Translate and draw the resultant vector:



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Find the supplementary angle to find an angle of the triangle.



Step 3: Use law of cosines to find the magnitude of the resultant vector, substituting and simplify. Let "m" be the magnitude of the resultant vector.

$$m^2 = u^2 + v^2 - 2uv \cos 110^\circ$$

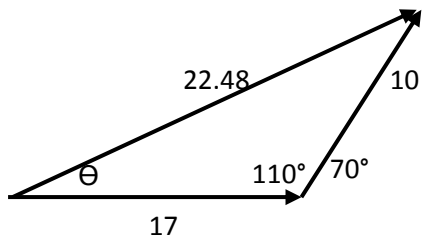
$$m^2 = (17)^2 + (10)^2 - 2(17)(10) \cos 110^\circ$$

$$m^2 = 289 + 100 - 340 \cos 110^\circ$$

$$m = \sqrt{289 + 100 - 340 \cos 110^\circ}$$

$$m = \sqrt{505.29}$$

$$m = 22.48$$



Step 4: Now use Law of Sines to find the required angle "φ".

$$\text{Law of Sines} = \frac{\sin A}{m} = \frac{\sin \phi}{v}$$

Substituting the values:
$$\frac{\sin 110^\circ}{22.48} = \frac{\sin \phi}{10}$$

$$\sin \phi = \left(\frac{\sin 110^\circ}{22.48} \right) (10) = 0.418$$

Taking inverse on both sides to find φ:

$$\phi = \sin^{-1}(0.418) = 24.70^\circ$$

Rounding the answer to the nearest whole number: $\phi = 25^\circ$



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Explanation #3

Step 1) First, you have to see what is being asked.

“Find the measurement of the angle between the resultant vector and the vector of the 22 pounds force to the nearest whole degree.”

Step 2) Use the Law of cosines to angle between resultant vector and the vector with 22 pounds force, substituting the values and simplify.

$$a^2 = b^2 + c^2 - 2bc \cos \theta$$

$$(40)^2 = (22)^2 + (20)^2 - 2(22)(20)\cos \theta$$

$$1600 = 484 + 400 - 880 \cos \theta$$

$$1600 = 884 - 880 \cos \theta$$

$$716 = -880 \cos \theta$$

$$\cos \theta = -716/880$$

$$\cos \theta = -0.814$$

Taking inverse on both sides to find the value of θ :

$$\theta = \cos^{-1}(-0.814) = 144.45^\circ$$

Rounding the answer to the nearest whole number:

$$\theta = 144^\circ$$

