

Answer on Question#58050 – Physics – Relativity

Suppose you walk 12.5m a direction exactly 23 degrees south of west then you walk 21 m in a direction exactly 44 degrees west of north.

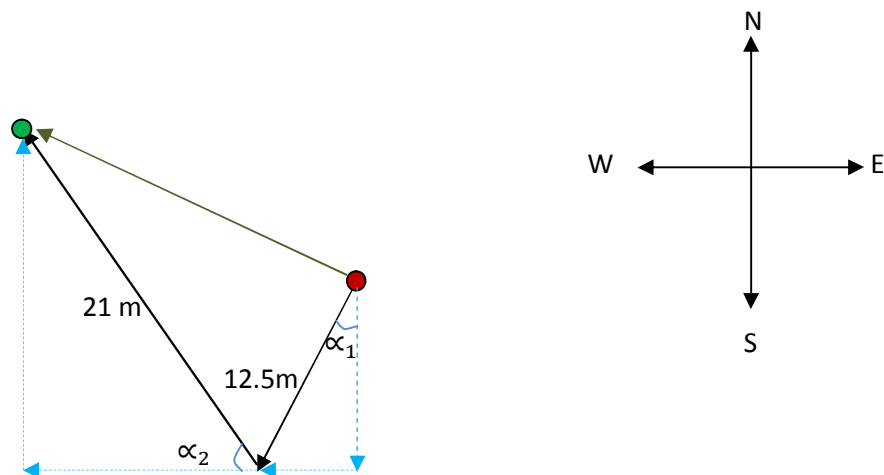
For part A (I got) was The resultant, 28.03 meters

Now part b says:

What is the angle of the compass direction of a line connecting your starting point to your final position measured North of West in degrees?

Solution.

Draw the resulting position using vectors.



● – the starting point. ● – final point.

According to the problem $\alpha_1 = 23^\circ$ and $\alpha_2 = 44^\circ$.

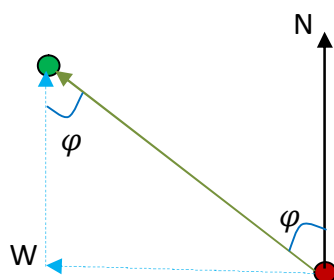
Find components of displacement using the algebraic method of vector addition. The first vector has component $12.5 \cos 23^\circ \approx 11.5063$ directed to the south and $12.5 \sin 23^\circ \approx 4.8841$ directed to the west. The second vector has component $21 \cos 44^\circ \approx 15.1061$ directed to the west and $21 \sin 44^\circ \approx 14.5878$ directed to the north. Hence, the components of the displacement vector equal

$$21 \sin 44^\circ - 12.5 \cos 23^\circ = 14.5878 - 11.5063 = 3.0815 \text{ directed to the north}$$

$$12.5 \sin 23^\circ + 21 \cos 44^\circ = 4.8841 + 15.1061 = 19.9902 \text{ directed to the west}$$

Magnitude of vector for the Pythagorean theorem

$$d = \sqrt{3.0815^2 + 19.9902^2} \approx 20.22$$



φ – the angle of the compass direction of a line connecting your starting point to your final position measured North of West. Using right triangle will get

$$\sin \varphi = \frac{19,9902}{20,22} \rightarrow \varphi = 81^{\circ}21'$$

Answer: $\varphi = 81^{\circ}21'$.