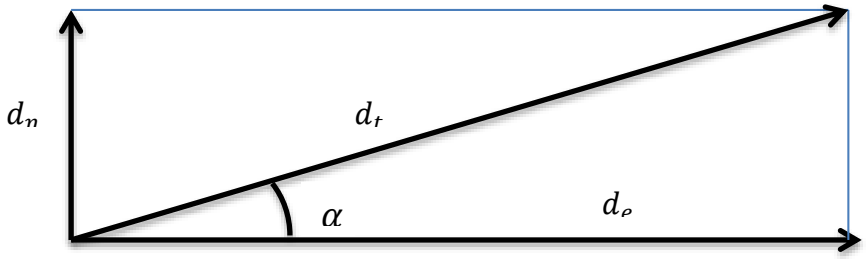
Answer on Question #37697, Physics, Mechanics

Question:

An airplane taxis to the end of a runway before taking off. The magnitude of the planes total displacement is 599m. If the northern component of this displacement is 89m, what is the displacements eastern component? What is the direction of the total displacement?

Answer:



where d_n - northern component, d_e - eastern component, d_t - total displacement.

Displacement to the east equals (using Pythagorean theorem):

$$d_e = \sqrt{d_t^2 - d_n^2} = 592\ m$$

Sine of the angle α equals:

$$\sin\alpha = \frac{d_n}{d_t}$$

Therefore, α equals:

$$\alpha = \sin^{-1}\frac{d_n}{d_t} = 8.54°$$

So, direction of the total displacement is 8.54 degrees north of east

Answer: $d_e = 592\ m$, direction of the total displacement is 8.54 degrees north of east.