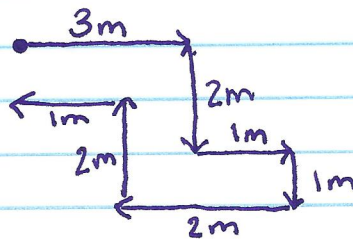


Distance vs. Displacement

Distance - the entire length of the path the object traveled.

ex)

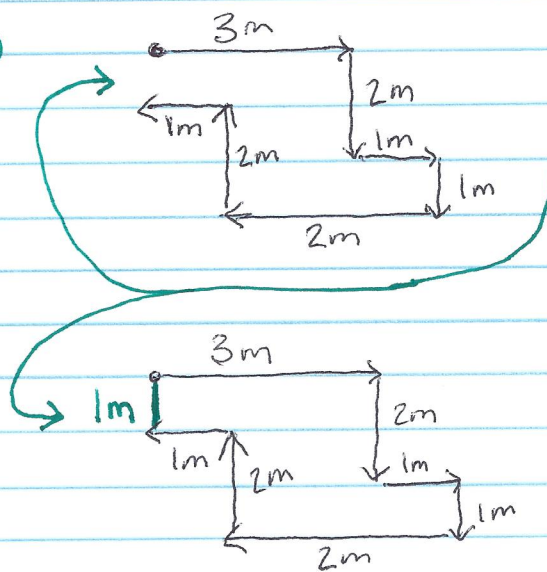


$$\text{Distance} = 12\text{m}$$

$$3 + 2 + 1 + 1 + 2 + 2 + 1$$

Displacement - the shortest straight line path between the object's starting point and ending point.

ex)



In this situation, the shortest straight line path between starting point & ending point is 1 meter ↓ from the starting point.

$$\text{Displacement} = 1\text{m} \downarrow$$

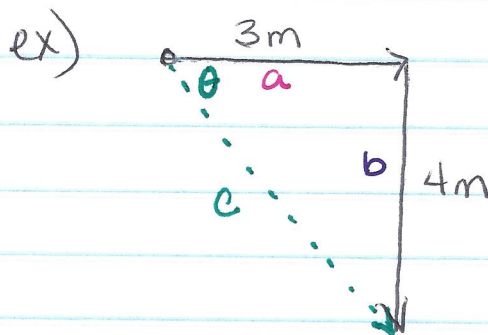
If the object starts and ends at the same spot, the displacement is Φ .

Position - Where the object is located at a specific point in time.

Objects that have been Displaced both Horizontally & Vertically

Sometimes objects have both horizontal & vertical displacement.

In situations like this, you can use Pythagorean theorem to calculate the object's displacement



This object has been displaced both horizontally (3m →) and vertically (4m ↓)

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

The shortest straight line path is along the diagonal. This is the object's displacement

So...

$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

$$\sqrt{25} = \sqrt{c^2}$$

$$\boxed{5 = c}$$

displacement = 5m

To find the direction (θ)

$$\sin \theta = \frac{a}{c}$$

$$\sin \theta = \frac{3}{5}$$

$$\theta = \sin^{-1}\left(\frac{3}{5}\right)$$

$$\boxed{\theta = 36.87^\circ \text{ SE}}$$