KINEMATICS

The study of how things move

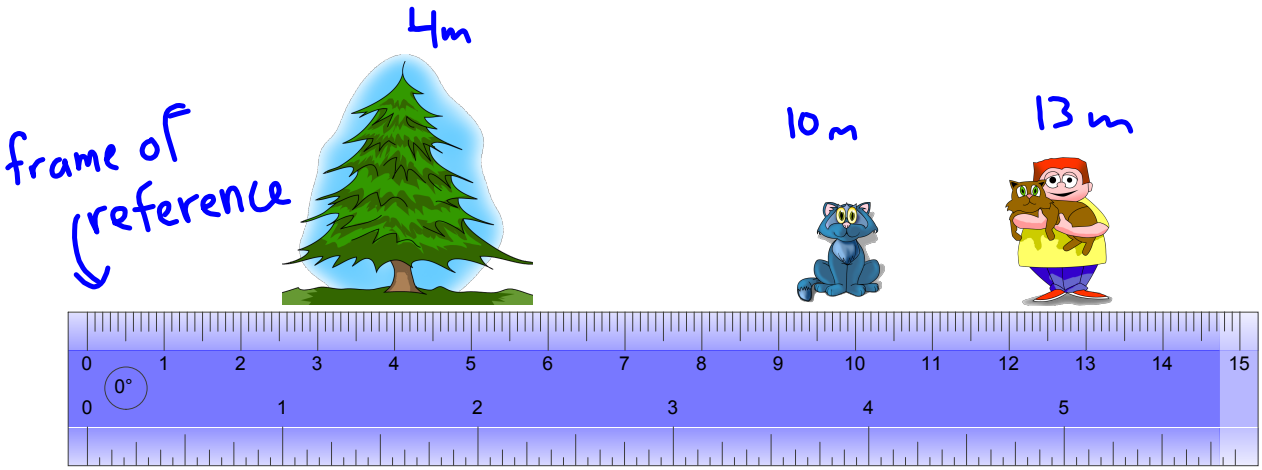
Position, Distance and Displacement

Goal:

- to understand the difference between distance and displacement

- to be able to find both quantities.

Where are the tree, the cat and the cat owner?



The cat walks to its owner.

What is the displacement? What is the distance traveled by the cat?

+3 m
or 3 m (right)

3 m

The cat walks to the tree.

What is the displacement? What is the distance traveled by the cat?

−6 m
or 6 m (left)

6 m

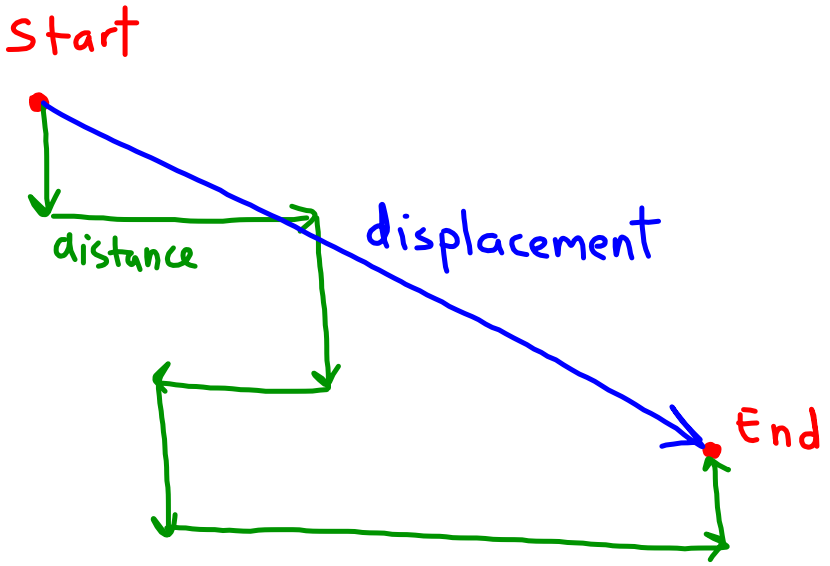
The cat walks to the tree and then its owner.

What is the displacement? What is the distance traveled by the cat?

+3 m !

6 m + 9 m = 15 m

In physics, there is a difference between distance and displacement.



Distance: the length of a path an object travels

direction does not matter

Displacement: the change in an object's position.

must include direction

I am at 5 km[N], then at 2 km[S] and finally at 8 km[N]. Find the displacement and total distance traveled.

displacement = 8 km [N] − 5 km [N]

= 3 km [N]

distance = |2 km [S] − 5 km [N]| + |8 km [N] − 2 km [S]|

= |− 2 km [N] − 5 km [N]| + |8 km [N] − (−2 km [N])|

= |− 7 km [N]| + |10 km [N]|

= 7 km + 10 km = 17 km

I travel 5 km[N], followed be 2 km[S] and finally 8 km[N]. Find the total displacement and distance traveled.

displacement = 5 km [N] + 2 km [S] + 8 km [N]

= 5 km [N] − 2 km [N] + 8 km [N]

= 11 km [N]

distance = 5 km + 2 km + 8 km

= 15 km