U1:L2 Position, Distance, Displacement

Draw a car in MOTION...

FRAME OF REFERENCE is the set of _____ or _____

to which measurements and judgements can be made based on_____ and

_____.

- ❖ *One example of scientists using a frame of reference is in studying stars. The movement of stars is calculated based on the frame of reference created by other stars and the horizon.*

- ❖ *Sometimes when you do not have a frame of reference, you do not feel constant motion. Examples: sleeping in a car, or flying in an airplane with the windows shut.*

POINT OF ORIGIN is the _____ point you take to be

your _____ or 'zero'.

SCALAR quantities are solely the _____ of the quantity, not

the_____.

VECTOR quantities measure the _____ and _____.

POSITION is the _____ and _____ an object is located

from an _____.

- Position refers to where the objects lies on a _____ (x / y direction).

- MEASURED BY: scale or graph that we arbitrarily make.

DISTANCE is the measurement _____.

- Distance is a _____ quantity – how much ground an object has covered.

- Distance measures the _____ path of movement.

- MEASUREMENT TOOLS: rulers, tape measurers, measuring wheels, etc.

DISPLACEMENT is the overall_____ in position.

- Displacement is a _____ quantity which accounts for position AND

  direction (5 km North).

- Displacement is how far _____ an object is.

- Displacement measures the _____ path connecting the point of origin and ____

  _____.

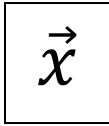- When allocating a direction to displacement, we will often

  use:_____ etc.

On a number line, we allocate an arbitrary direction which usually has the right as positive

and left as negative, or up as positive and down as negative.
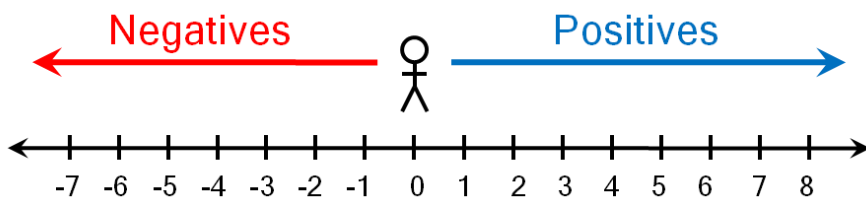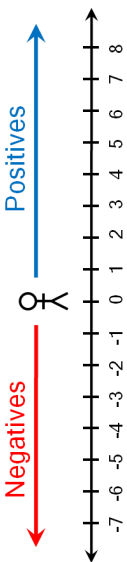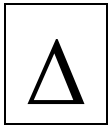
| Δ | Many concepts in Mechanics and Kinematics speak about a **change** in something. This change, in physics, is represented by the symbol '_____'. |

| $\vec{x}$ | Vectors are written with _____ on top of their symbols to designate that it includes _____. |

	SYMBOL	**VECTOR / SCALAR**	**UNITS**
POSITION			
DISTANCE			
DISPLACEMENT			

> **EXAMPLE**: Let us say that Position 1 is 3cm from our origin (0), and Position 2 is 10 cm from the origin. What equation can we build to figure out what displacement occurred between P1 and P2?

SUBSCRIPTS -- _____, in kinematics, will often be seen with subscripts.

- Different from Chemistry, these subscripts are often_____ rather than numbers.
- Often in physics we will use the subscript "_____" for final, and "_____" for initial.
- These subscripts are arbitrary though, and not all textbooks or professors / teachers will use the same symbols (subscripts are sometimes numbers to indicate first, second, etc.)

X_f X_o

-7   -6   -5   -4   -3   -2   -1   0   1   2   3   4   5   6   7

Meters

Meters
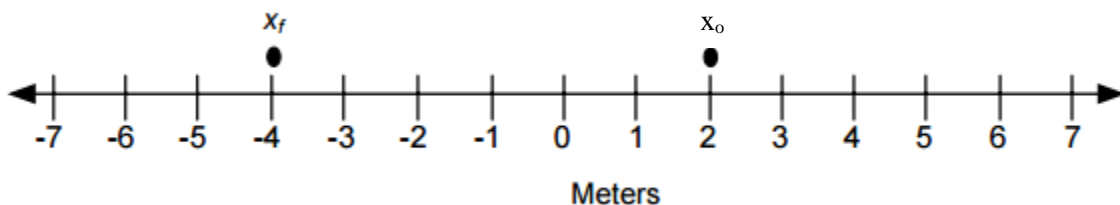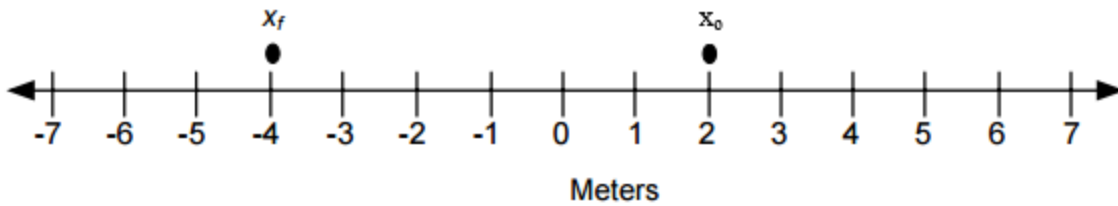
QUESTIONS:

- What is the point of origin?_____
- What is the distance travelled?_____
- What is the displacement? (Make sure to include direction)_____

TIME refers to a particular _____ or _____.

IE:

- Jimmy started walking to school at 8:00 am.
- 5 minutes into the film, Ana decided she hated it and turned it off.

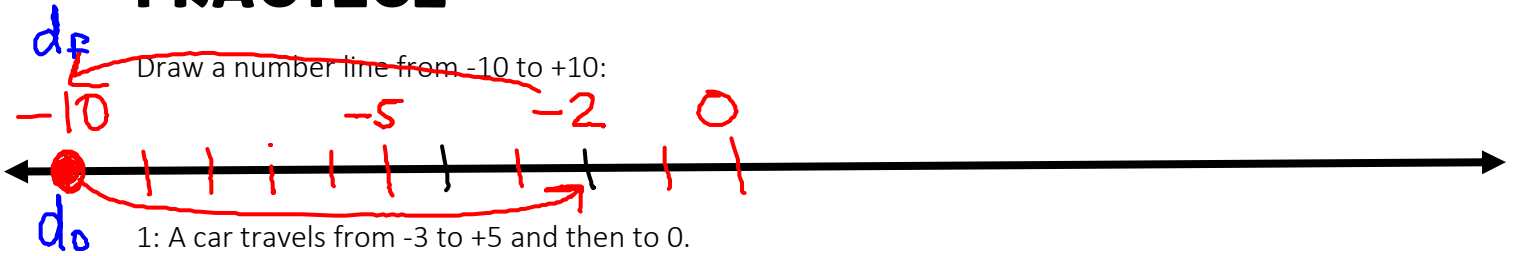## TIME INTERVAL refers to the _____ of an event.

- An interval of time can also be considered the _____ of time from the _____ and _____ time.

IE:

- The movie was 2.5 hours long.
- Ms. Burns drove at 250 km/h for 10 minutes before noticing she was speeding.

	SYMBOL	SCALAR / VECTOR	UNIT
TIME			
TIME INTERVAL			

PRACTICE

d_F

Draw a number line from -10 to +10:

-10 -5 -2 0

d_o

1: A car travels from -3 to +5 and then to 0.

    a) What is the car's point of origin? _____

    b) What is the car's distance travelled?_____

    c) What is the car's displacement?_____

2: A bunny rabbit hops from -10 to -2 and then back to -10.

    a) What is the bunny's point of origin? __-10_____

    b) What is the bunny's distance travelled? __16_____

    c) What is the bunny's displacement? __0_____

3: Two taxis are travelling along Portage Ave. in opposite directions.

    0 6 10

    - Taxi A changes its position from +6 to +10.

    - Taxi B moves from +6 to +1.

$\Delta \vec{d}$

    a) Calculate the displacement of each taxi.

$$A = d_F - d_o = 10 - 6 = \boxed{+4}$$
$$\Delta \vec{d} B = d_F - d_o = 1 - 6 = \boxed{-5}$$

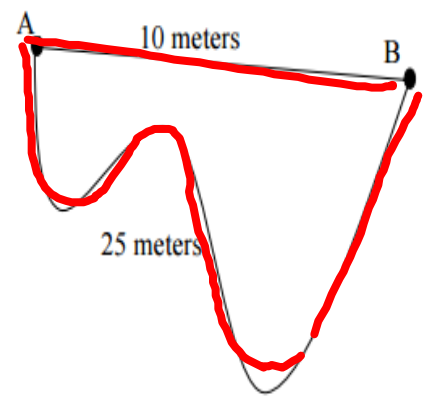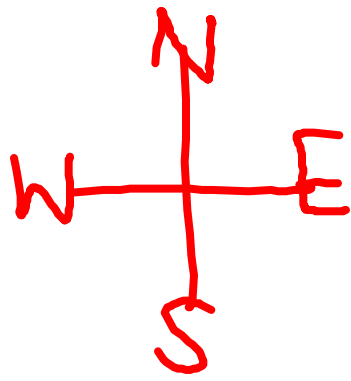   b) What can we conclude about the speed of each taxi?

B is faster

    c) How do the positions of each taxi change if we decide to move the origin?

d_F changes with change in d_o

    d) How do the displacements of each taxi change with the change of origin?

$\Delta \vec{d}$ does not change with d_o

N

W — E

S

A   10 meters   B

25 meters

4: Consider the above diagram.

a) What is Bessy the Cow's distance travelled? **25m**

b) What is Feathers the Bird's distance travelled? **10m**

c) What is Bessy the Cow's displacement? **10m Right/E /SE**

d) What is Feathers the Bird's displacement? **"**

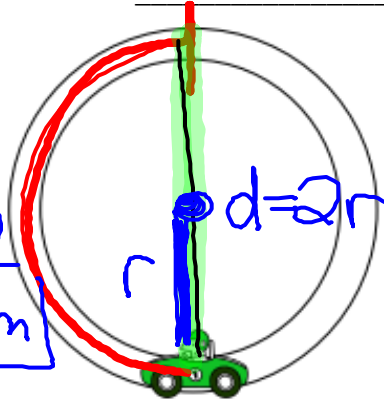$$\frac{C}{2\pi} = \frac{2\pi r}{2\pi}$$

$$\frac{C}{2\pi} = r$$

$$\frac{100}{2\pi} = r$$

$$15.92 = r$$

$$d = 2r$$
$$d = 2(15.92)$$
$$d = 31.84m$$

r

$d = 2r$

$C = 2\pi r$

the track is 100 meters around

$C = 2\pi r$

5: Consider the above diagram.

a) Brian (the driver) does three laps of the track. What is his distance travelled? **300m**

b) Brian does three laps of the track. What is his displacement? **0m**

c) Brian does half a lap of the track. What is his distance travelled? **50m**

d) Brian does half lap of the track. What is his displacement? _____

CIRCULAR MOVEMENT AND ORBITS: *How far does the Earth travel in one year? In terms of*

distance, quite far (the circumference of the Earth's orbit is nearly one trillion meters), but in

terms of displacement, not far at all (zero, actually). At the end of a year's time the Earth is right

back where it started from. It hasn't gone anywhere.