Physics Notes

by

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Week 2

Chapter 1. Simple Motion

1.1 Vectors and Scalars (P2.2A)

a. Vectors

Vector quantities have a magnitude, a unit and a direction. The direction is an important piece of information.

Example:

- A displacement 2 meters north from where you are standing is expressed as 2.0 m[N]. That means (2.0 is the magnitude, m is the unit meter and N is north direction)
- A velocity of 80 km/h[E] (80 is the magnitude, km/h is the unit kilometer/hour and E is East direction)
- A force of 40 N[W] (4.0 is the magnitude, N is the unit Newton and W is West direction)

Note: N is for North. S is for South. E is for East. W is for West

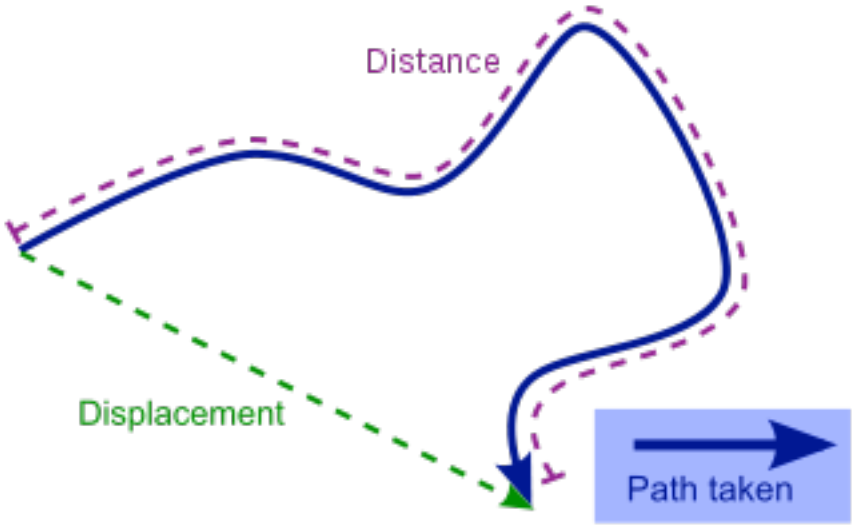
b. Scalars

Scalar quantities have a magnitude and a unit.

Example:

- A distance of 2.0 m (2.0 is the magnitude, m is the unit meter)
- A speed of 80 km/h (80 is the magnitude, km/h is the unit kilometer/hour)
- A time of 3.2 h (3.2 is the magnitude, h is the unit hour)

1.2, 1.3 Position, Distance and Displacement



a. Displacement is a <u>vector</u> quantity that is a measure of the change in position.

Displacement
$\vec{\Delta}d = \vec{d_2} - \vec{d_1}$

Where:

$\vec{d_1}$ is the initial position,

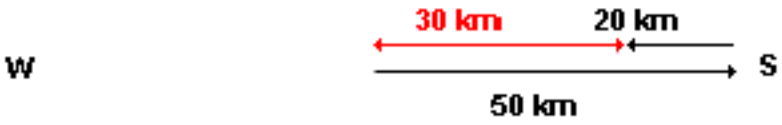
$\vec{d_2}$ the final position and

$\vec{\Delta}d$ is the displacement

Δ is a mathematical symbol called Delta.

b. Distance is a scalar quantity, that is, a measure of the length of path.

Distance and **displacement** are different. When you traveled 50 km to the East and then 20 km to the West, the total distance you traveled is 70 km, but your displacement is 30 km East.



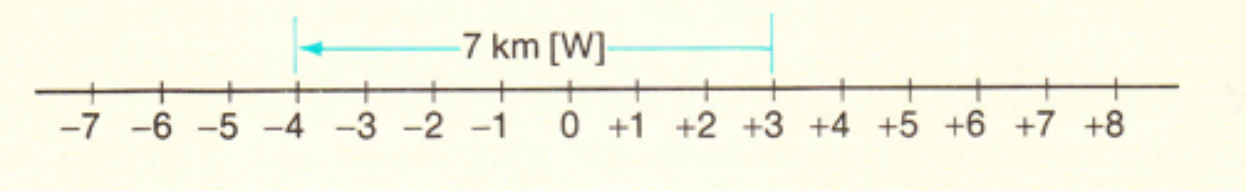
What to do?

1. Study sample problem below
2. Do practice exercises numbers 1, 2, 3, 4, 5, 6, 7, 8.
3. Show your work and submit.
4. Answers are shown below (in blue) to verify your work.
5. When submitting, write the section number, Example:

   Section 1.1 (Vector and Scalar,) Exercises numbers 1, 2, 3, 4, 5, 6, 7, 8)

Sample problems:

1. Find the displacement for a driver who started at marker +3 km and ended at marker -4 km.



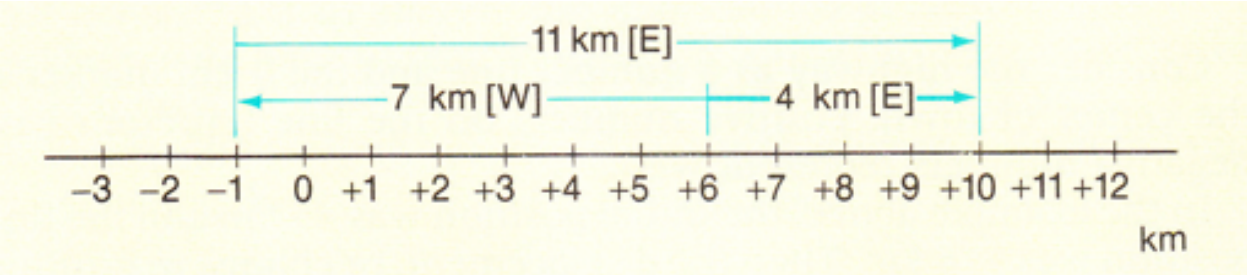
$$\vec{\Delta d} = \vec{d}_2 - \vec{d}_1$$

= -4 km - (+3 km)

= -4 km - 3 km

= -7 km or 7 km [W]

2. Find the displacement of a cyclist who starts at maker + 6 km moves to -1 km and then proceeds to marker +10 km. Remember that displacement for an interval is simply the difference between the final position and the initial position.



$$\vec{\Delta d} = \vec{d}_2 - \vec{d}_1$$

$$= + 10 \text{ km} - (+ 6 \text{ km})$$

$$= + 10 \text{ km} - 6 \text{ km}$$

$$= + 4 \text{ km, or } 4 \text{ km [E]}$$

Practice:

Use a number line to determine the displacements for the following changes in position:

1. - 4 km to + 5 km
2. - 4 km to - 9 km
3. + 5 km to + 11 km
4. + 3 km to -5 km to + 7 km
5. + 8 km to - 8 km
6. + 2 km to - 3 km to + 3 km
7. 4 km [E] to 10 km [W]
8. 23 km [W] to 2 km [W]

Answers:

1. + 9 km
2. - 5 km
3. + 6 km
4. + 4 km
5. - 16 km
6. + 1 km
7. 14 km [W]
8. 21 km [E]