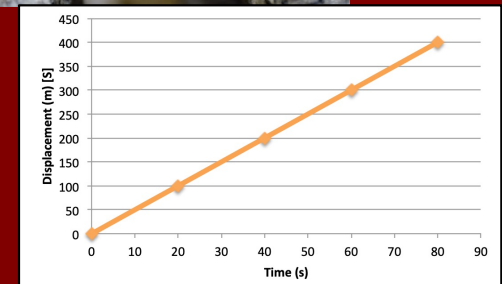


Speed and Velocity in One and Two Dimensions

- Linear Motion in One Dimension
- Linear Motion in Two Dimensions
- Speed and Other Scalar Quantities
- Velocity and Other Vector Quantities
- Position and Displacement
- Position and Velocity Graphs
- Tangents and Instantaneous velocities
- Displacement and Velocity in Two Dimensions
- Vector Addition, Cosine Law and Sine Law



Preview File

Please enjoy this preview of your Student Version of the presentation. Please note within this sample file:

- Some slides appear blank because they have been removed
- Student versions have portions of the text removed which is given in the teacher version and appear as _____ which the students are to fill in
- Other slides may have on them, this represents writing that has been removed on this sample

The paid full version of your resource includes both Google Slides and PowerPoint and is Google Classroom Ready



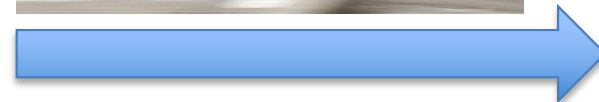
Kinematics

The study of motion



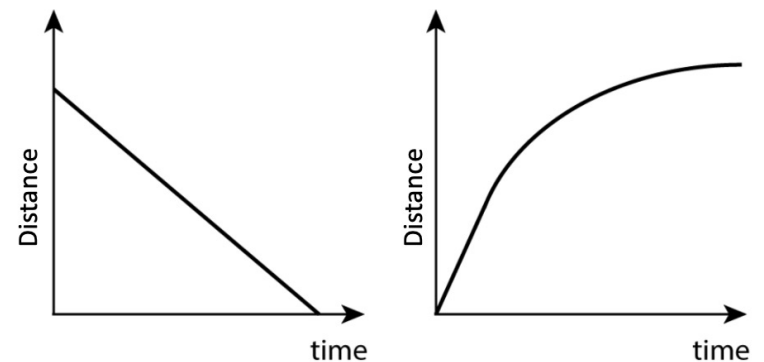
Linear Motion in One Dimension

- ---
- Example
 - Motion of a train along a straight line
 - An object, like a ball, falling freely, vertically under gravity
 - The vertical up and down oscillations of an object suspended from a vertical spring



Linear Motion in Two Dimensions

- _____
- A particle moving along a curved path in a plane has two-dimensional motion.
 - Example: A dog running on level ground 24 m eastward and then 11 m southward undergoes motion in two dimensions



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Check Your Understanding

- a) What is the average speed of a cheetah that sprints 100 meters in 4 seconds?
- b) If a car has an average speed of 60 km/h, how far will it travel in 10 hours?
- c) If your odometer reading increases by 40 km over a 30-minute time period, what was your average speed?

Velocity and Other Vector Quantities



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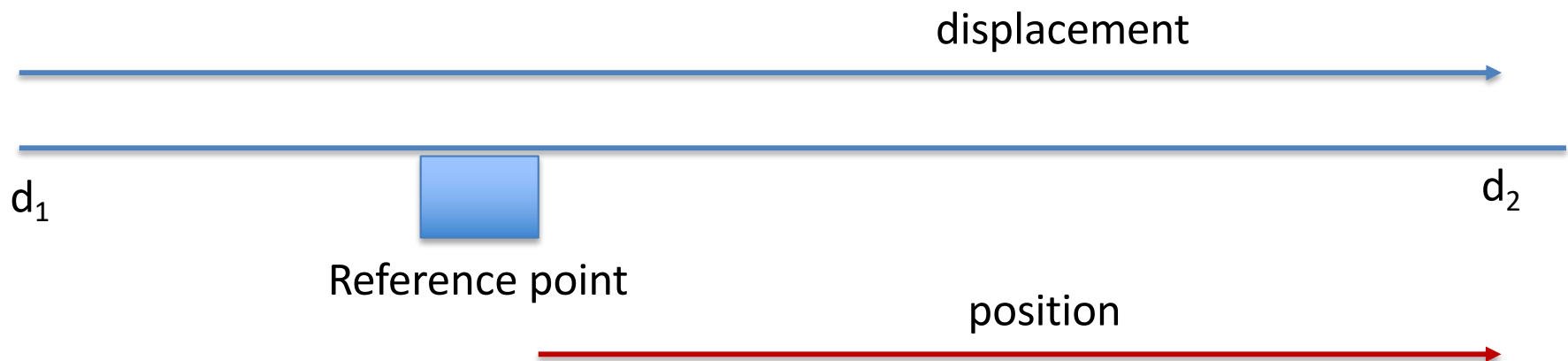
-
- I.e. Displacement, and velocity
 - I.e. 20 km/h [E]

Position and Displacement

-

- Displacement is how far an object is from its starting point

Final position – starting position



Velocity

- _____
- _____
- Change of position divided by the time interval for that change

$$v = \frac{d}{t}$$

Check Your Understanding

A cyclist takes 25.1 s to cover the displacement of 115 m [E] from d_1 to d_2 .

- a) Calculate the cyclist's average velocity.
- b) If the cyclist maintains the same average velocity for 1.00 h, what is the total displacement?
- c) If the cyclist turns around at d_2 and travels 565 m [W] to position d_3 in 72.5 s, what is the average velocity for the entire motion?

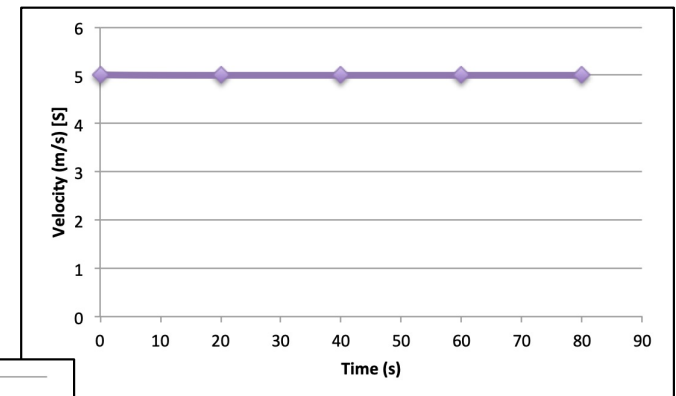
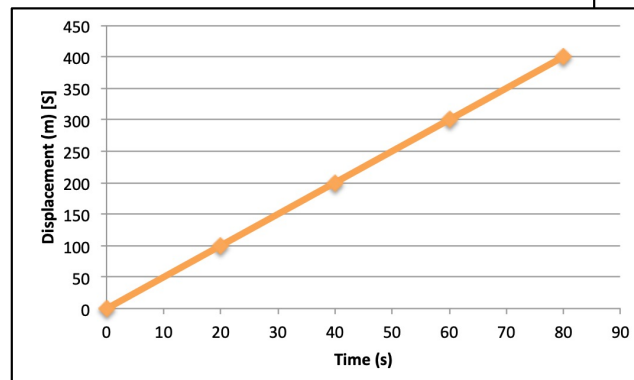
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Position and Velocity

Graphs – Uniform Motion

For a constant velocity motion (the same velocity is maintained), the position-time graph is a straight line, and the velocity-time graph is horizontal

Time (s)	Displacement (m) [S]
0	0
20	100
40	200
60	300
80	400

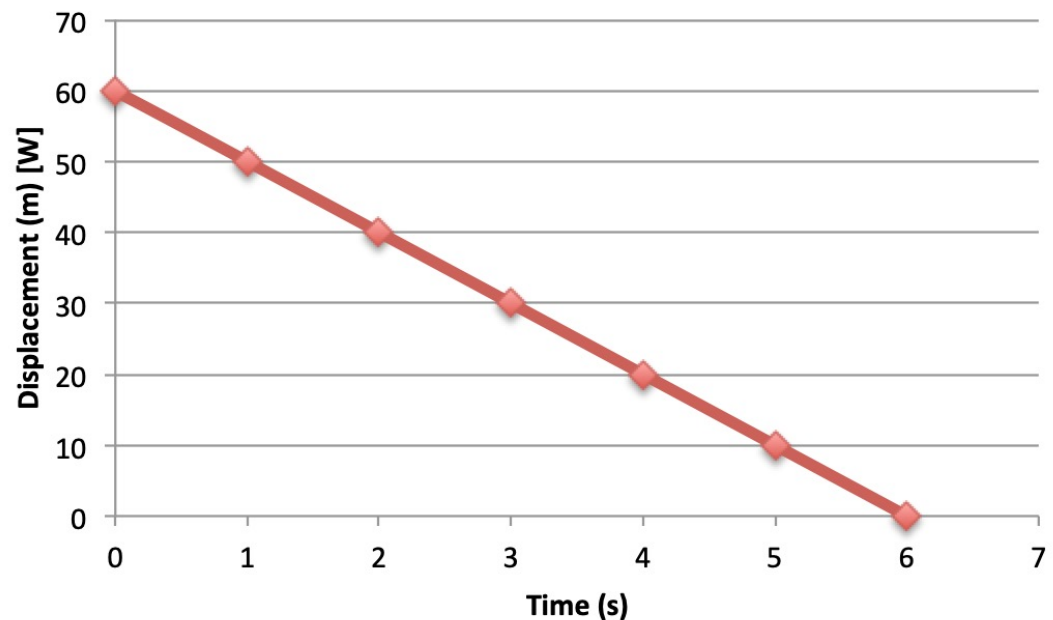


Position-Time Data

Position-Time & Velocity-Time Graphs

Check Your Understanding

- Describe the motion for the graph on the right and sketch the corresponding velocity-time graph
- How do you know what the v-t looks like?



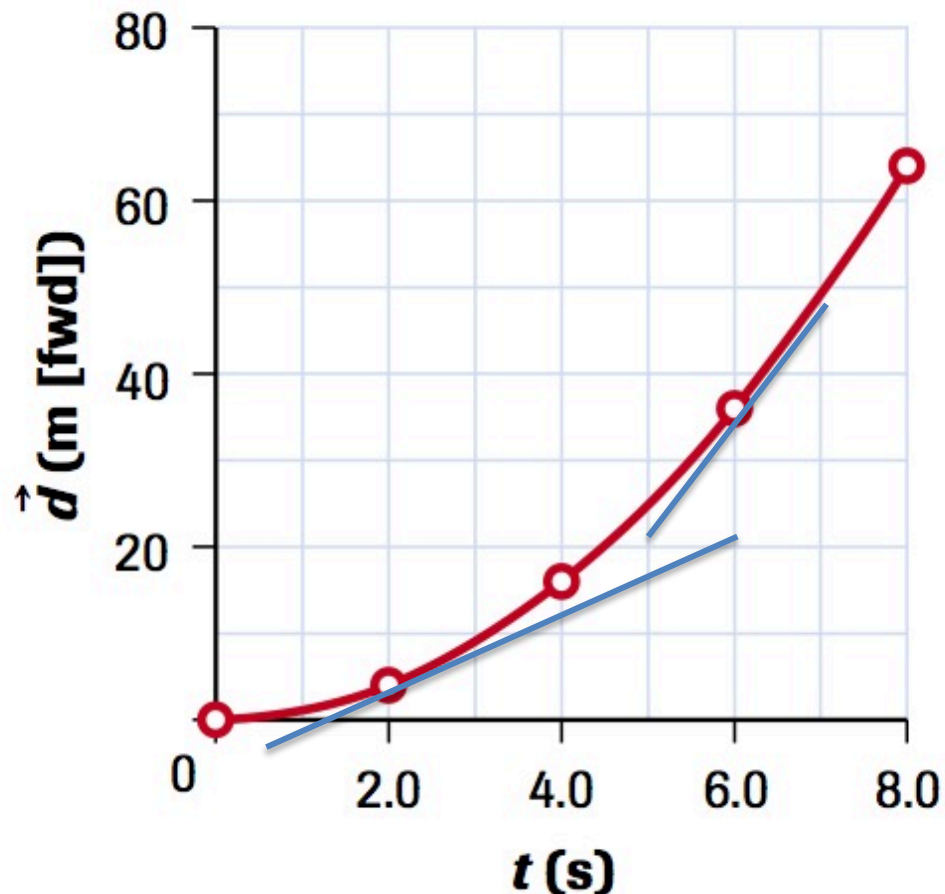
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Position and Velocity Graphs – Non-uniform Motion

- _____
- To find the slope of a curved line at a particular instant, we draw a straight line touching the curve at that point. This straight line is called a tangent to the curve. The slope of the tangent is the instantaneous velocity.
- Average velocity can be found by _____

Tangents and Instantaneous velocities

- Draw the tangent at times 2 and 6 seconds
- Determine the instantaneous velocities at those points



Check Your Understanding

- a) At $t = 0$, the slope (velocity) is 0 therefore, the object starts from rest. The magnitude of the slope increases as time increases but in the negative direction, therefore the object speeds up towards the origin
- b) The instantaneous velocity at $t = 3.0\text{s}$ is 3.0 m/s [W]
- c) The average velocity between 3.0 s and 6.0 s .
 $= 5.0\text{ m/s [W]}$

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Displacement and Velocity in Two Dimensions

- As you're driving north on a highway, you come to a bridge closed for repairs. Your destination is across the bridge on the north side of the river. Using a map, you discover a road that goes eastward, then northward across the river, then westward to your destination
- Draw this situation described above

Displacement and Velocity in Two Dimensions

In order to solve this kind of problem, we will need to involve additional steps to first solve for our displacements and/or velocities vectors

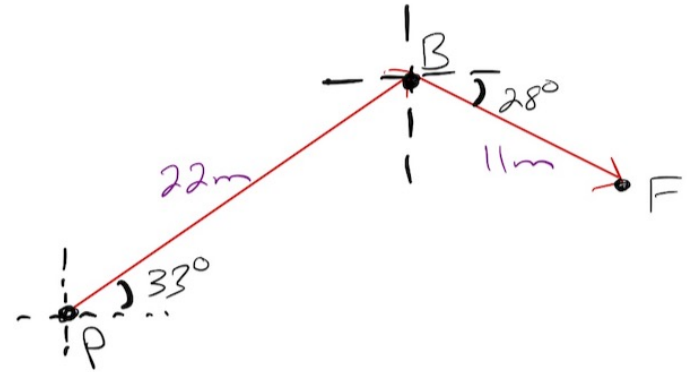
Vector Addition, Cosine Law and Sine Law

- _____
- Sine Law: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
- Vector Component Addition: Determine all the sum of the x and y components, create a right triangle and solve the hypotenuse using the Pythagorean Theorem

Check Your Understanding

In 4.4 s, a chickadee flies in a horizontal plane from a fence post (P) to a bush (B) and then to a bird feeder (F), as shown below. Find the following:

- a) total distance travelled
- b) average speed
- c) total displacement
- d) average velocity



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Check Your Understanding

A skater on Ottawa's Rideau Canal travels in a straight line 8.5×10^2 m [E 25° N] and then 5.6×10^2 m in a straight line [21° E of N]. The entire motion takes 4.2 min.

- a) What is the skater's displacement?
- b) What are the skater's average speed (m/s) and average velocity (m/s)?