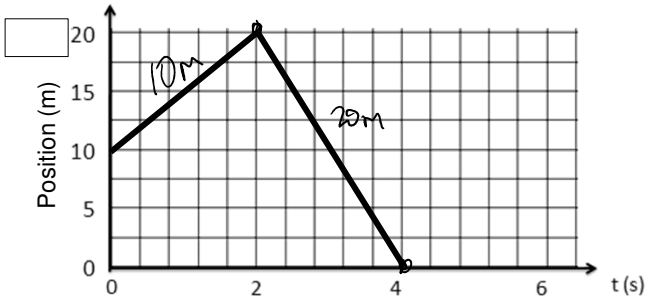
Graphing Motion in One Dimension

1

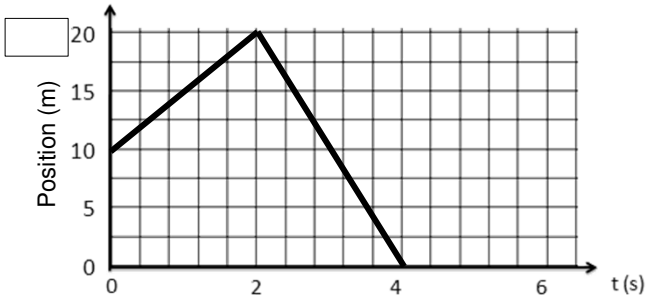
Position vs. Time Graphs



- **What distance did the object travel after 4 seconds?** 30m
- **What is the displacement after 4 seconds?** $\Delta x = x - x_0$
  $= 0 - 10 = -10\,m$

2

Position vs. Time Graphs

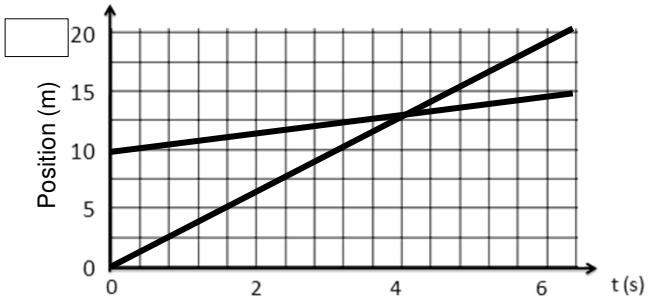


- **What are the units of the slope on the graph?** Slope $= \frac{\Delta y}{\Delta x} = \frac{m}{s}$
- **What quantity is measured in this unit?**

VELOCITY

3

Position vs. Time Graphs



- **Describe the motion of the two objects:**
  - **Do they start at the same location?** NO
  - **Are they traveling at the same rate?** NO, DIFFERENT SLOPES
  - **Are they traveling in the same direction?** YES, BOTH POSITIVE SLOPES

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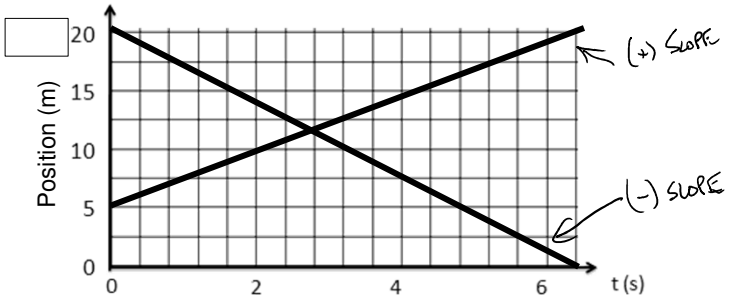
Position vs. Time Graphs



- **Describe the motion of the two objects:**
  - **Do they start at the same location?** No
  - **Are they traveling at the same rate?** Yes → # FOR SLOPE IS THE SAME BUT DIRECTION IS DIFF.
  - **Are they traveling in the same direction?** No

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Position-Time Graphs

- **Shows the position of an object or objects over time.**
- **Can be used to compare the position of two or more objects.**
- **<u>Slope</u> tells you the <u>velocity</u> of the object.**

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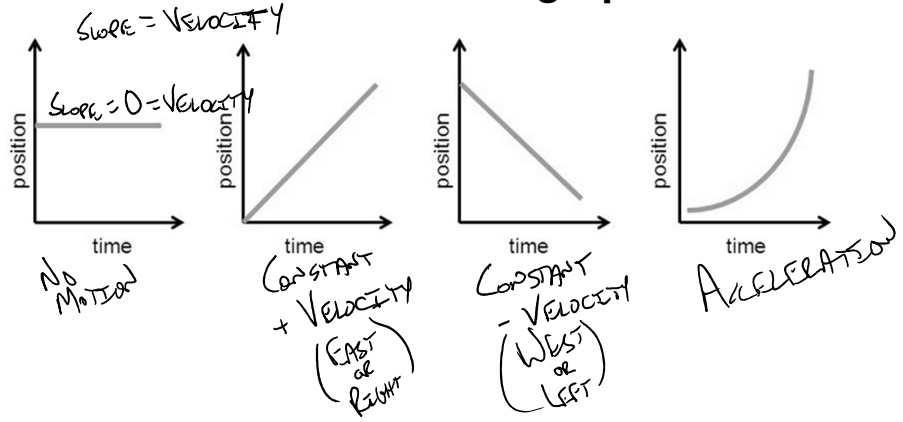
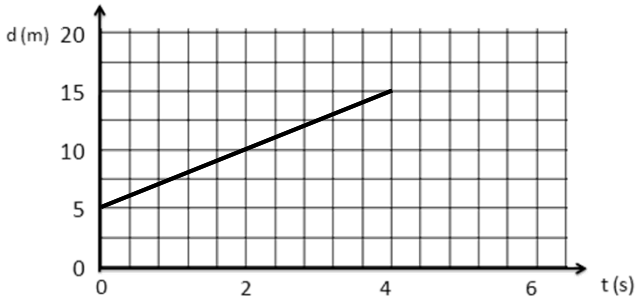
Position-Time Graphs

- **Describe the motion of the graphs below:**



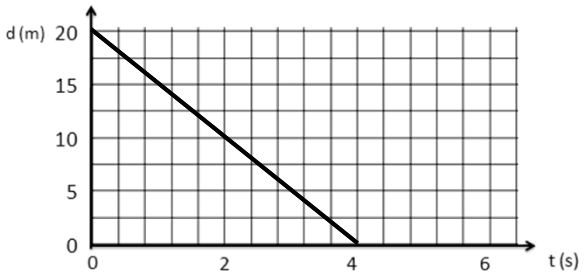
SLOPE = VELOCITY
SLOPE = 0 = VELOCITY
NO MOTION
CONSTANT + VELOCITY (FAST OR RIGHT)
CONSTANT - VELOCITY (WEST OR LEFT)
ACCELERATION

Position Time Graphs



- **Describe the motion of the object.**
  CONSTANT + VELOCITY
- **Determine the object's average velocity.**
  VELOCITY = SLOPE = $\frac{\Delta y}{\Delta x} = \frac{10}{4} = \frac{5}{2} = 2.5$ m/s
- **What is the unique equation for the object?**
  $y = 2.5x + 5$
- **Determine the object's position at 12s.**
  $y = 2.5(12) + 5$
  $= 30 + 5$
  $= 35$m

Position Time Graphs



$\rightarrow y = -5(8) + 20$
$= -20m$

- **Describe the motion of the object.** Constant (-) Velocity
- **Determine the object's average velocity.** Velocity = Slope = $\frac{\Delta y}{\Delta x} = \frac{-20}{4} = -5 m/s$
- **What is the unique equation for the object?** $y = -5x + 20$
- **Determine the object's position at 8s.**

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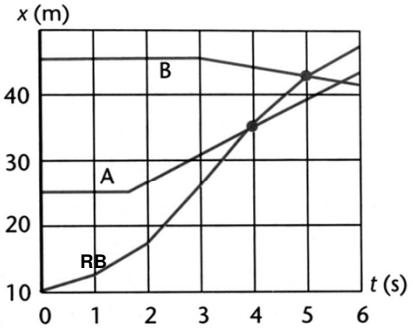
Graphing Two or More Objects



- **When and where can A and B tackle the RB?** $\rightarrow 4s, 35m$ $\rightarrow 5s, 42m$
- **Who has the greatest velocity?** RB **When?** 4.5s
- **When are the players traveling at the same velocity?** A + B, $v = 0$ btwn 0 + 1.5s; A + RB, same slope btwn 5 + 6s
- **Rank the velocity of the players at 4.5 seconds from fast to slow.** RB, A, B

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