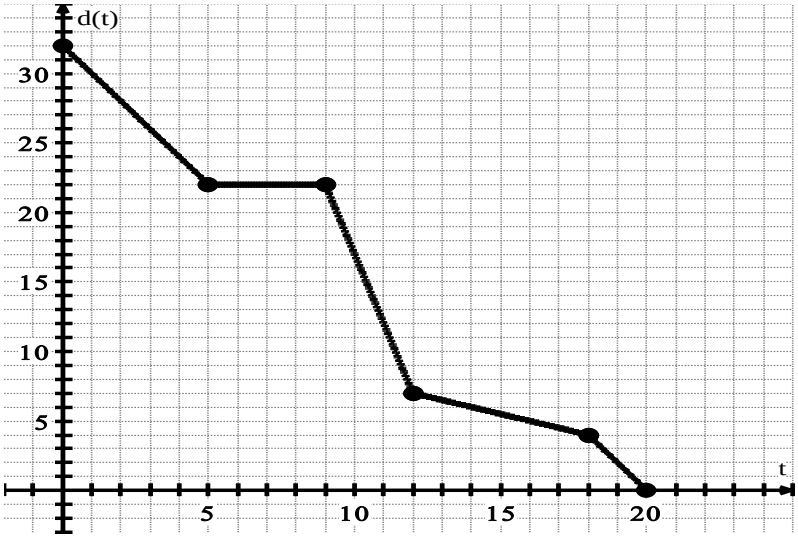
Position, Velocity, and Acceleration

Position- the location of an objection at a given time

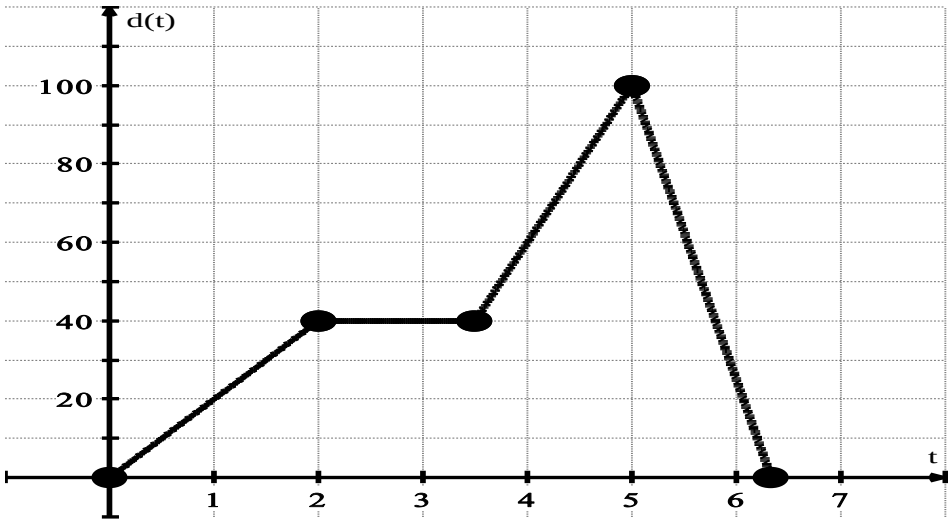
This activity is designed to explore the concept of position and will start to make the connection to velocity. Make sure to read and answer each question completely.

Problem 1: Stephanie rides her bicycle to and from work each day. The graph represents Stephanie's distance from home in mile as a function of time in minutes. Use the graph to answer the questions below.



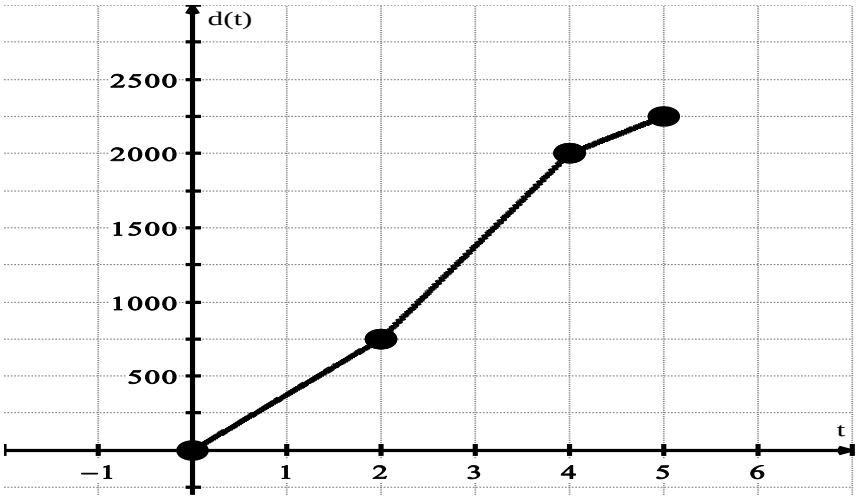
- Does the graph represent Stephanie riding her bicycle to work or from work? Justify your response.
- How long did Stephanie's trip take?
- On what interval is $d(t)$ remaining constant? Why might her distance remain constant?
- Evaluate $d(5)$. What does this represent in the context of the situation.
- Determine the value of t when $d(t) = 17$.
- Write a piecewise function to represent $d(t)$.
- Evaluate $d(13)$.
- What is the average rate of change between $(0, d(0))$ and $(12, d(12))$?
- What is the average rate of change on the interval [9,20]?

Problem 2: Frank decided to run some errands. His distance from home is measured in mile and the time spent out is measured in hours. The graph shows Franks distance as a function of time.



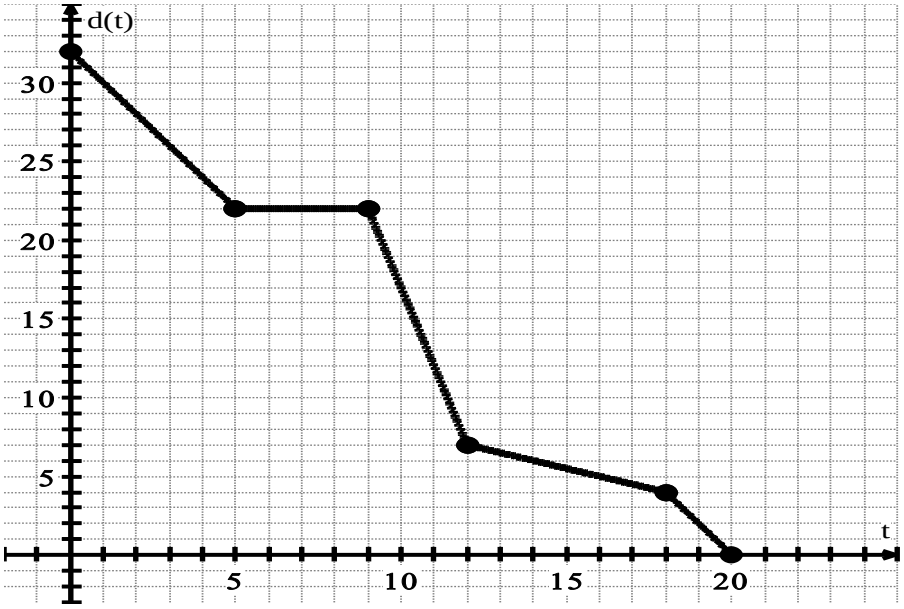
- What is the value of $d(0)$ and based on the context of the situation what does it represents?
- How far is Frank from home at $t = 2$?
- At what value of t is $h(t) = 100$?
- On what intervals of t is d(t) increasing?
- Note: $distance = rate \cdot time \quad or\ d = rt$ →solve the equation for r and explain meaning of the new equation.
- Since slopes is average rate of change calculated by $\frac{y_2-y_1}{x_2-x_1} = \frac{\Delta y}{\Delta x}$ we can say the average rate (or average speed) is $\frac{d_2-d_1}{t_2-t_1} = \frac{\Delta d}{\Delta t}$. What would be Frank's average speed on the interval [0,2]?
- On what interval of t is the average speed the greatest. Explain your answer.
- Write a piecewise function to represent the average speed of $d(t)$.
- If the graph was transformed such that $d(t)' = 2d(t) + 10$ [note: $d(t)'$ means new graph], evaluate $d(0)'$ and explain in the context of the situation.

Problem 3#: An airplane leaves LAX (Los Angeles, California) headed to BWI (Baltimore, Maryland). The graph below represents the distance from LAX in miles as a function of time in hours. Use the graph to answer the following questions.

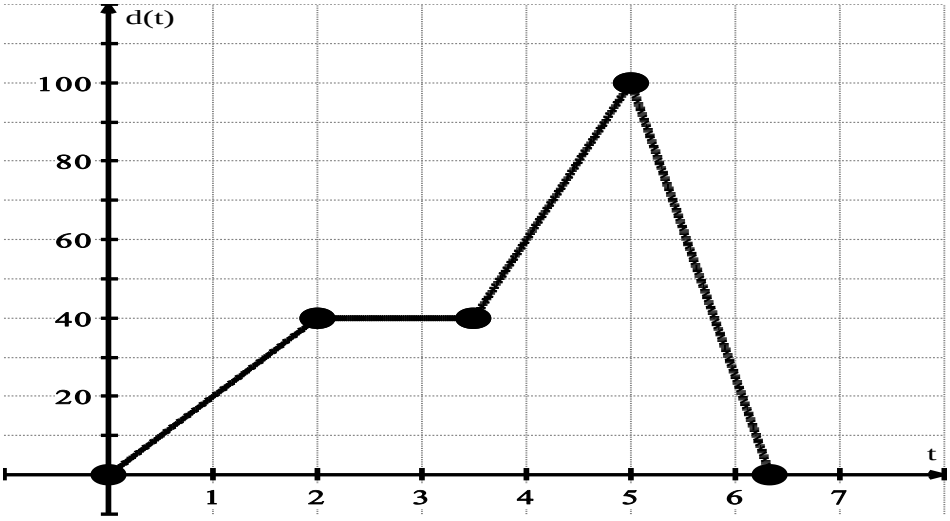


- What is the value of $d(2)$? Explain the meaning of the answer in context of the problem.
- What is the value of $d(1)$? Evaluate when $d(t) = 1500$?
- How long was the flight from LAX to BWI?
- Determine the plane's average speed on the given interval;
    - [0,5]?
    - [1,4]?
    - [2,4]?
    - [2,3]?
- Is the average speed on the interval [0,5] a good representation of the average speed of the overall flight? Justify your response.
- What do you notice about the average speed on the interval [2,4] and [2,3]? Explain what is happening to the average speed and why this is happening?
- Write a piecewise function representing the average speed of the plane.

Problem 1:



Problem 2:



Problem 3: