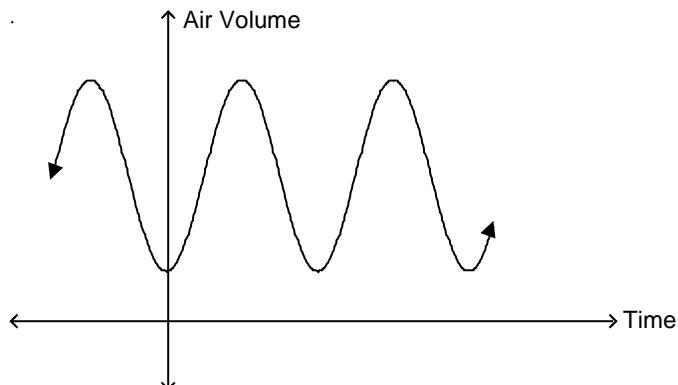


Section 2.12 – Sinusoidal Functions as Mathematical Models

Recall that in Section 1.2, we found several real-world situations in which a dependent variable repeated its values at regular intervals as the independent variable changed. For example, the volume of air in your lungs varies periodically with time as you breathe.



Since the graph looks like a sinusoid, a sine or cosine function would be a reasonable mathematical model. We know how to write an equation for a sinusoidal function for any given amplitude, period, phase displacement, and axis location. We will use this technique for mathematical modeling.

Objectives: Given a situation from the real world in which something varies sinusoidally, derive an equation and use it as a mathematical model to make predictions and reach conclusions about the real world.

Some strategies to use when creating a mathematical model:

- 1) Sketch a graph, as in Section 1.2, for what you think the problem looks like.
- 2) Decide what the x and y (independent and dependent) variables represent.
Examples: Distance to ground, time, temperature, height of water, etc.
- 3) Use the given information to determine any points on your graph.
- 4) Using critical points on your graph, determine VD , A , B , and PD for the given situation. Remember that the phase displacement is easily found for the cosine function, since a cycle starts at a high point.
- 5) Write the sinusoidal equation.
- 6) Use the equation to calculate y for given values of x , or x for given values of y , as in Section 2.11.