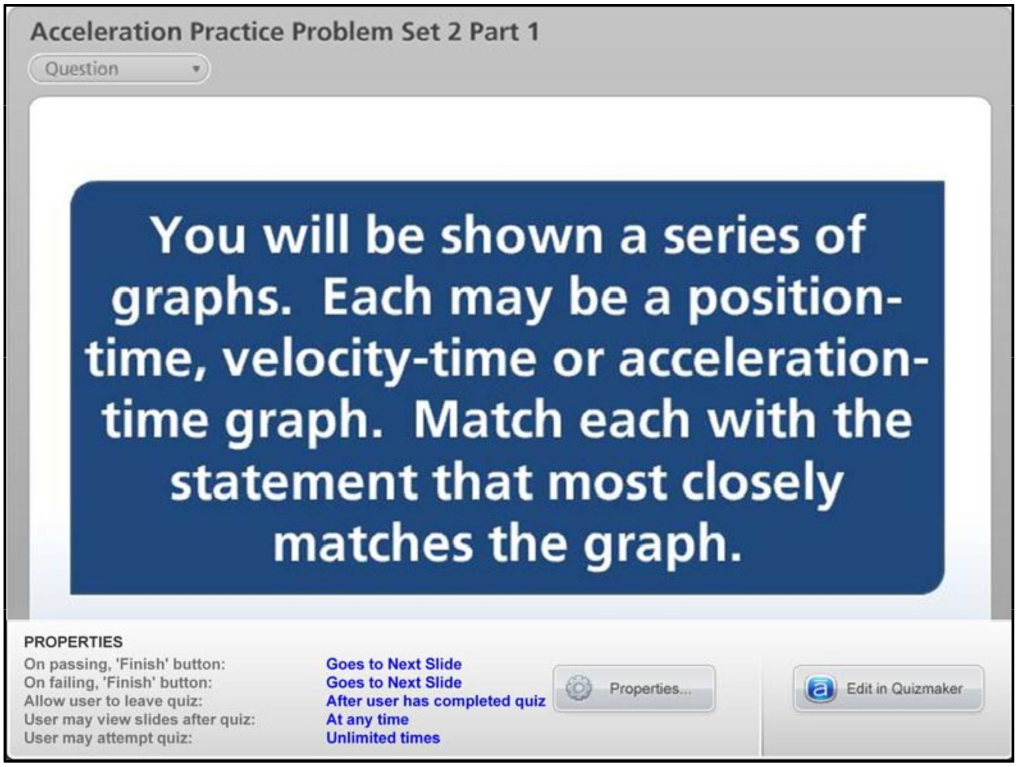
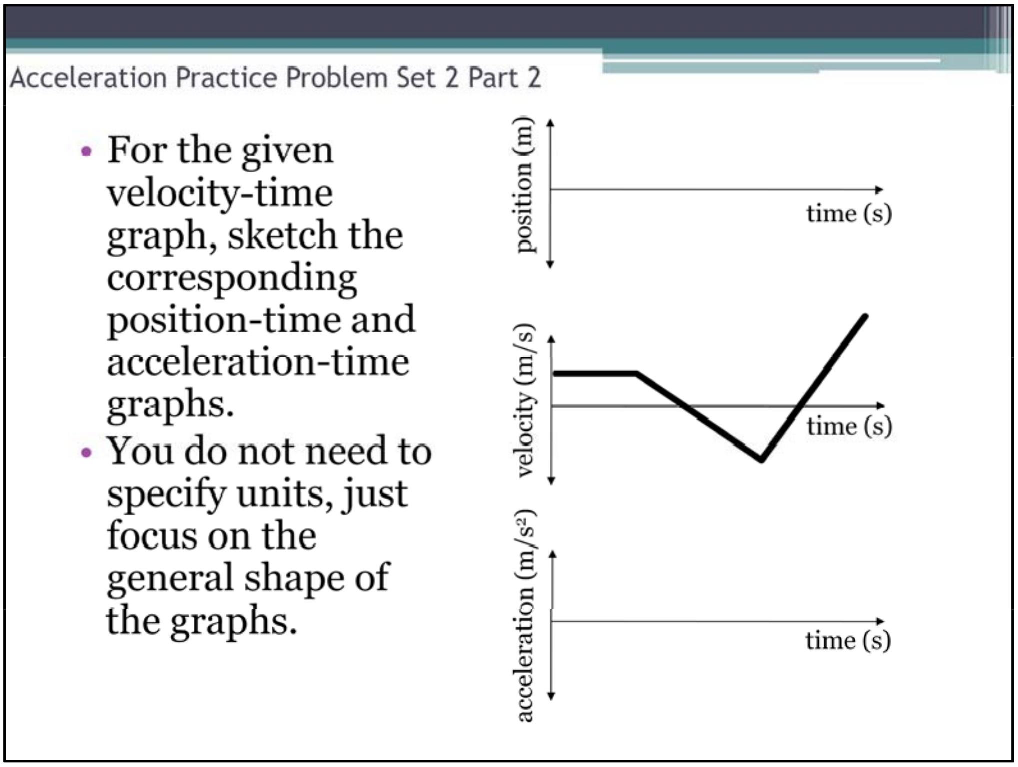
Module 1: Describing Motion
Topic 3 Content: Acceleration Practice – Motion Graphs

Now that you've had a chance to play with motion graphs and see the relationships between how position, velocity and acceleration are represented, you will have an opportunity to apply your understanding.



Acceleration Practice Problem Set 2 Part 1
Question
You will be shown a series of graphs. Each may be a position-time, velocity-time or acceleration-time graph. Match each with the statement that most closely matches the graph.
PROPERTIES
On passing, 'Finish' button: Goes to Next Slide
On failing, 'Finish' button: Goes to Next Slide
Allow user to leave quiz: After user has completed quiz
User may view slides after quiz: At any time
User may attempt quiz: Unlimited times
Properties...
Edit in Quizmaker



Look at the provided velocity-time graph and sketch the corresponding position-time and acceleration-time graphs. You do not need to specify units, but you should focus on the general shape of the graphs.

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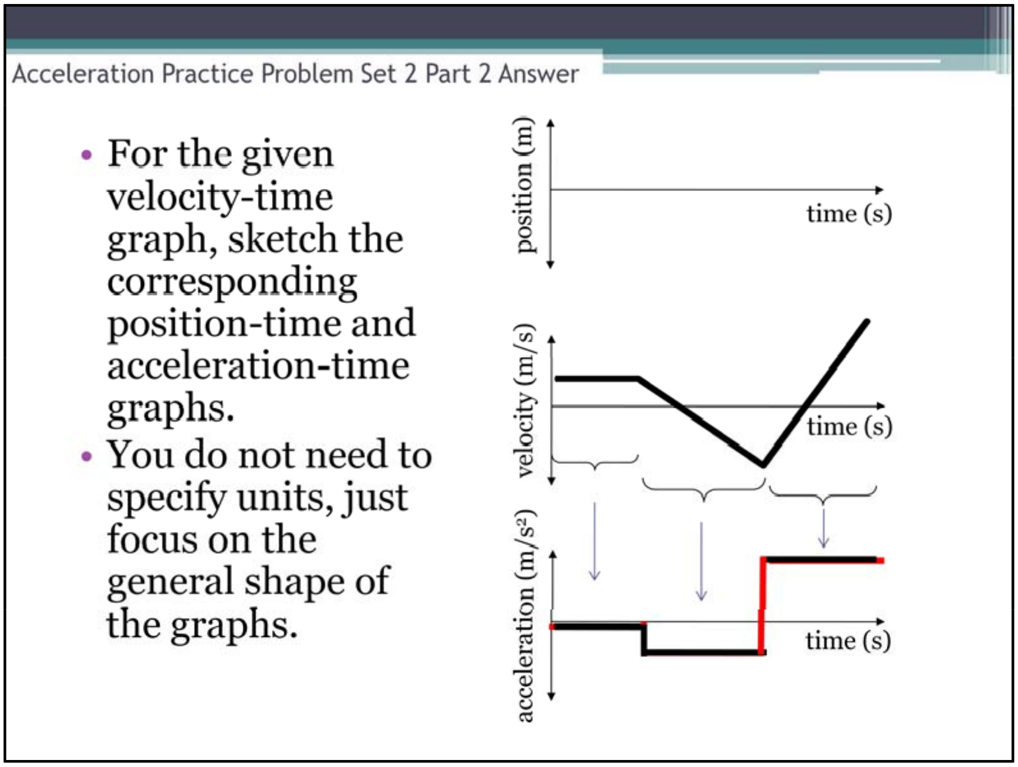

Let's look at the acceleration-time graph first. The velocity-time graph starts out flat, with zero slope. Since the velocity is not changing over time, the acceleration during this time period is constantly zero. You draw a line at zero on the acceleration-time graph.

The next section of the velocity-time graph shows a constant steep negative slope. The slope is unchanging over this time period, so it would represent a constant acceleration. The slope is negative, so the value for acceleration would be negative.

Notice that even though the velocity is zero at some point, the acceleration remains constant and negative, since the slope is constant and negative.

You'll connect these segments with a vertical line, even though the acceleration of real objects would never change instantaneously.

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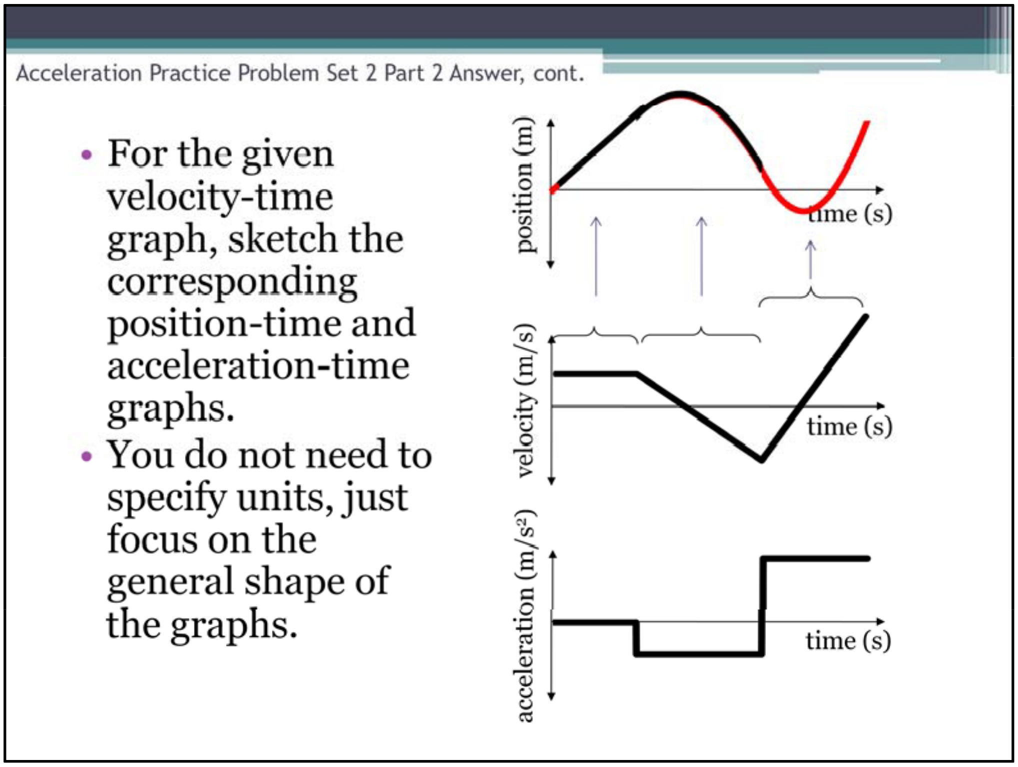
Your final segment of the velocity graph shows a constant positive slope, which is more gentle than the slope of the preceding line. Your acceleration is the slope of the velocity graph, so we have a constant positive value for acceleration over this time period.

Again, even though the velocity passes through zero, the slope is constant and positive, so the acceleration is constant and positive.

Again, you'll connect the lines with a vertical line, realizing that acceleration of real objects could never change instantaneously.



Now, let's look at the position-time graph.

For the first section of the velocity-time graph, we have a constant positive velocity. Since the velocity graph represents the slope of the position time graph, this segment of the position time graph would have a constant positive slope.

Here we will assume the object starts from rest, even though this information is not specified in the velocity-time graph. The object moves in the positive direction at a constant speed, with its position from the origin steadily increasing over time.

This next section is a challenging concept for most students. A constant negative slope means a constant negative acceleration, and therefore a portion of a downward curving parabola. Velocity is initially positive but gets smaller, goes through zero and then gets bigger in the negative direction. This means the slope of the position graph is initially positive, but decreases to zero and becomes increasingly negative. At some point, the velocity is zero, and this would be where the object is at the maximum distance from its starting point. This is where the curve is at a slope of zero.

Here, the object that was traveling at a constant speed in the positive direction slows down briefly to a stop, where the velocity graph crosses zero, and then speeds up in the negative direction, therefore going back towards the origin.

For our final segment, the velocity increases over time at a constant rate. A constant acceleration is represented by an upward-curving portion of a parabola. The beginning velocity is negative, which indicates a negative slope for the line on the position graph. The velocity goes from negative to zero, so the slope of the position graph goes from negative to zero, where the object is momentarily at rest. Then the velocity continues to increase from zero to positive, so the slope of the position graph goes from zero to a positive slope, getting increasingly positive.

The object that was moving in a negative direction continues moving in the negative direction, but slowing down as it does so. It slows down to a stop, then turns around and speeds up in the positive direction.

To determine the precise position of the object at each point in time, and therefore to draw an accurate position-time graph requires additional analysis tools that you will learn in later lessons. The purpose of this lesson was to have you understand the general shapes of each graph and to relate the shapes of one graph to the shapes of the others.