

Piecewise Linear Functions: Extending Stories to Graphs

Summary	
In this lesson students develop an understanding of piece-wise linear functions by relating the graphs to familiar situations. Situations are represented numerically, graphically and algebraically. Students use the CBR to create piece-wise graphs and write their own piece-wise functions.	
Utah State Core Standard	
Algebra II - Standard 2, Objective 2.3	
Desired Results	
Benchmark/Enduring Understanding	
Many situations are represented by graphs that have different patterns in distinct sections. Students will be able to interpret these graphs and represent the situations algebraically.	
Essential Questions	Skills
<ul style="list-style-type: none"> How can we model situations on a graph that make distinct changes over time? 	<ul style="list-style-type: none"> Interpreting piece-wise linear graphs. Representing piece-wise graphs algebraically. Interpreting slope as the rate of change.
Assessment Evidence	
Students create their own situation that can be modeled using a piece-wise function. Students represent the situation graphically and algebraically.	
Instructional Activities	
Materials Needed	
Worksheet, Calculators, CBRs	

Piecewise Linear Functions: Extending Stories to Graphs

My dog, Penne, is like a member of our family. We have tracked her growth throughout her life. In her first year, we found the following data:

Age	Weight
1 month	4 pounds
2 months	7.4 pounds
3 months	10.8 pounds
4 months	14.2 pounds
6 months	21 pounds
9 months	31.2 pound
1 year	41.4 pounds

Write an equation that models Penne's growth for the first year of her life. Explain and justify your model. What do the numbers in your equation mean? Include units of measure in your explanation.

Would it be reasonable to use this model to predict Penne's weight when she is 8 years old? Why or why not?

As Penne ages, we have continued to track her weight. We have found the following results:

Age	Weight
2 years	42 pounds
3 years	42 pounds

4 years	42 pounds
5 years	42 pounds
6 years	42.7 pounds
7 years	43.4 pounds
8 years	44.1 pounds
9 years	44.8 pounds
10 years	45.5 pounds
11 years	46.2 pounds

Graph Penne's growth from birth to 11 years. Be sure your graph is properly labeled with correct units.

Break the graph into sections and write an equation that models Penne's growth in each section. Use correct notation to show the interval (x values) of the graph that goes with each equation.

Interval (x values)

Equation

Based on your model, what would you expect was Penne's weight at the following ages:

8 months

38 months

108 months

138 months

Explain how you got your answers.

Use the CBR motion detector to create a distance-time graph that has at least three changes. Copy your graph here. Be sure to properly label the graph, including units.

Write a linear equation that models your motion for each time interval on the graph.

Interval (t values)

Equation

What is the physical interpretation of the slope in each equation? What are the units of the slope?

What is the physical interpretation of the y -intercept in the first equation, when $t = 0$?

Dan used the CBR to create a distance-time graph by starting at the 2 meter mark on the floor. He walked towards the CBR at 0.25 m/s for 4 seconds, stood still for 2 seconds, walked away from the CBR at 0.4 m/s for 2 seconds, and then stopped for 2 seconds. What was Dan's final position? Explain how you got your answer.

Assessment

Write your own story that corresponds to a graph with at least three distinct linear sections.

Draw and label the graph using correct units.

For each section of the graph, write an equation that models the situation and specify the interval (x values) for which the equation applies.

Interval (x values)

Equation