

Linear Modeling

In this example we will write a formula for a linear function. Recall the form of a linear function is $f(x) = ax + b$.

Example 1. As dry air moves upward, it expands and cools.

- If the ground temperature is 20°C and the temperature at a height of 1 km is 10°C , use a linear model to express the temperature T (in $^{\circ}\text{C}$) as a function of the height h (in km).
- Draw the graph of the function in part (a).
- What is the temperature at a height of 2.5 km?

In this next example, we will make a scatterplot of the data given, then compare the linear function using specific data in the table with a linear regression model found using a calculator.

Example 2. The table below lists the average carbon dioxide level in the atmosphere, measured in parts per million at Mauna Loa Observatory from 1980 to 2002. Use the data to find a linear model for the carbon dioxide level.

Year	CO_2 level (in ppm)
1980	338.7
1982	341.1
1984	344.4
1986	347.2
1988	351.5
1990	354.2
1992	356.4
1994	358.9
1996	362.6
1998	366.6
2000	369.4
2002	372.9

- Use the first and last data points to write a linear function
- Use your calculator to find a linear regression model for the data.
- Use the model from part (b) to estimate the average CO_2 level for 1987.
- Use the model from part (b) to predict the average CO_2 level for 2010.
- According to the model from part (b), when will the CO_2 level exceed 400 ppm?

