Chapter 10 Project

What's Your Car Worth?

An activity to demonstrate the use of linear models in real life.

When buying a new car, there are a number of things to keep in mind: your monthly budget, length of the warranty, routine maintenance costs, potential repair costs, cost of insurance, etc.

One thing you may not have considered is the depreciation, or reduction in value, of the car over time. If you like to purchase a new car every 3 to 5 years, then the retention value of a car, or the portion of the original price remaining, is an important factor to keep in mind. If your new car depreciates in value quickly, you may have to settle for less money if you choose to resell it later or trade it in for a new one.

Below is a table of original Manufacturer's Suggested Retail Price (MSRP) values and the anticipated retention value after 3 years for three 2017 mid-price car models.

Car Model	2017 MSRP	Expected Value in 2020	Rate of Depreciation (slope)	Linear Equation
Mini Cooper	$21,800	$ 9,590		
Toyota Camry	$23,955	$11,211		
Ford Taurus	$28,220	$11,234		

1. The x-axis of the graph is labeled "Years after Purchase." Recall that the MSRP value for each car is for the year 2017 when the car was purchased.

a. What value on the x-axis will correspond to the year 2017?

b. Using the value from Part **a.** as the x-coordinate and the MSRP values in column two as the y-coordinates, plot three points on the graph corresponding to the value of the three cars at time of purchase.

c. What value on the x-axis will correspond to the year 2020?

d. Using the value from Part **c.** as the x-coordinate and the expected car values in column three as the y-coordinates, plot three points on the graph corresponding to the value of the three cars in 2020.

2. Draw a line segment on the graph connecting the pair of points for each car model. Label each line segment after the car model it represents and label each point with a coordinate pair, (x, y). Consider using a different color when plotting each line segment to help you identify the three models.

3. Use the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$, to answer the following questions.

- **a.** Calculate the rate of depreciation for each model by calculating the slope (or rate of change) between each pair of corresponding points using the slope formula and enter it into the appropriate row of column 4 of the table.
- **b.** Are the slopes calculated above positive or negative? Explain why.
- **c.** Interpret the meaning of the slope for the Toyota Camry making sure to include the units for the variables.
- **d.** Which car model depreciates in value the fastest? Explain how you determined this.

4. Use the slope-intercept form of an equation, $y = mx + b$, for the following problems.

- **a.** Write an equation to model the depreciation in value over time of each car (in years). Place these in column five of the table.
- **b.** What does the y-intercept represent for each car?

5. Use the equations from problem 4 for the following problems.

- **a.** Predict the value of the Mini Cooper 4 years after purchase.
- **b.** Predict the value of the Ford Taurus 2½ years after purchase.

6. Determine from the graph how long it takes from the time of purchase until the Ford Taurus and the Mini Cooper have the same value? (It may be difficult to read the coordinates for the point of intersection, but you can get a rough idea of the value from the graph. You can find the exact point of intersection by setting the two equations equal to one another and solving for x.)

- **a.** After how many years are the car values for the Ford Taurus and the Mini Cooper the same? (Round to the nearest tenth.)
- **b.** What is the approximate value of both cars at this point in time? (Round to the nearest 100 dollars.)

7. How long will it take for the Toyota Camry to fully depreciate (reach a value of zero)?

- **a.** For the first method, extend the line segment between the two points plotted for the Toyota Camry until it intersects the horizontal axis. The x-intercept is the time at which the value of the car is zero.
- **b.** Substitute 0 for y in the equation you developed for the Toyota Camry and solve for x. (Round to the nearest year.)
- **c.** Compare the results from Parts **a.** and **b.** Are the results similar? Why or why not?

8. How long will it take for the Ford Taurus to fully depreciate? (Repeat Problem 7 for the Ford Taurus.
Round to the nearest year.)

9. Why is there such a difference in depreciation for the Camry and the Taurus? Do some research on a reliable Internet site and list two reasons why cars depreciate at different rates.

10. Based on what you have learned from this activity, do you think retention value will be a significant factor when you purchase your next car? Why or why not?