Name: _____ Business Data Analysis
Date: 201-316-VA

Solutions to In Class Exercise # 6: Correlation & Regression

1. **IPhones**

   In 2018, Apple sold a whopping 217.72 million IPhones worldwide. Most models are made from steel, have limited color options, and retail for $799 per unit. But if you have $48.5 million to spare, you can buy the Falcon Supernova Pink Diamond IPhone 6, which has a case made of 18-carat gold and has a large pink diamond on its back. There is also a slightly more affordable version of this phone, which retails for $42.5 million dollars; it just comes with an orange diamond instead of a pink one[1].

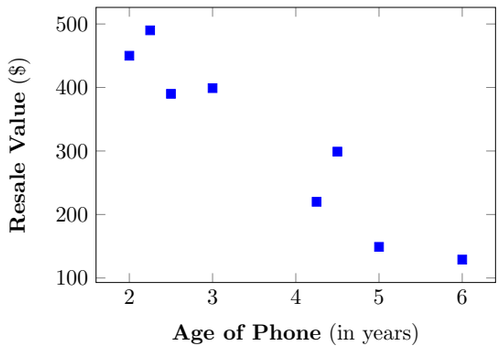
   A pawn shop is offering eight IPhones for sale. The table below shows the age of each phone in years (x) and its selling price in dollars (y):

x : **Age of Phone** (in years)	2	2.25	2.5	3	4.25	4.5	5	6
y : **Price** ($)	450	490	390	399	220	299	149	129

   Also,

   - **Coefficient of determination:** $r^2 = 0.9107$
   - **Least-squares line:** $\hat{y} = 648.79 - 90.316x$

   (a) Make a scatter plot for the data given in the table above.



   (b) Write a sentence (or two) interpreting the intercept of the regression line.

   The initial resale value of an IPhone is $648.79

   (c) Write a sentence (or two) interpreting the slope.

   With each year in age, the resale value of an IPhone decreases by $90.316

   (d) Find the coefficient of correlation, and interpret the value of r in the context of this problem.

   $r = \sqrt{r^2} = \sqrt{0.9107} = -0.9543$; Negative because the scatter plot indicates a downward trend in the data.

   Interpretation:
   There is a strong negative correlation between the age of the phone and its resale value. The older the phone, the less it will sell for.

   (e) Make a prediction for the sale price of a phone that is 3.5 years old. Comment on the trustworthiness of this estimate.

$$\begin{aligned}\hat{y} &= 648.79 - 90.316x \\ &= 648.79 - 90.316(3.5) = \$\,332.684\end{aligned}$$; this estimate is trustworthy

   (f) Make a prediction for the sale price of a phone that is 10 years old. Is this a reliable estimate?

$$\begin{aligned}\hat{y} &= 648.79 - 90.316x \\ &= 648.79 - 90.316(10) = -\$\,254.37\end{aligned}$$; this estimate is not trustworthy

   (g) A phone that is 48 month old actually sold for $275. Calculate the residual and interpret it in the context of the problem.

$$\begin{aligned}R &= y - \hat{y} \\ &= 275 - 287.526 \\ &= -\$\,12.526\end{aligned}$$

   Interpretation: This model overestimates the resale value of a phone that is 4 years old by $12.53

[1] https://economictimes.indiatimes.com/spending-lifestyle/ten-absurdly-expensive-gadgets-money-can-buy/slideshow/44407395.cms