Assignment 3 – Part 2 - Solution

1. Due Date & Time: Tuesday, July 9th, 2013 by 23:59 hrs.
2. You MUST upload this part of the Assignment on MyStatLab in "pdf" format.
3. You MUST also attach the Printed/ Signed "Integrity Statement".
4. Use MiniTab if or Excel if you have to. However you should cut and paste your result and sufficient explanation.
5. You should provide detailed explanation for each of your solution. You must show your complete manual calculation if the question involves using formula or any kind of calculations.
6. This Assignment covers weeks 6-9 for chapters 9.3, 9.10, 9.11, 7, 4, 5.

Question 1. (Show your calculation in detail)

Customers arrive at a local retail store at an average rate of 22.7 per hour. Assume that the time between arrivals follows the exponential distribution. What is the probability that a randomly selected customer will arrive between 2 and 4 minutes after the previous customer?

Solution:

$$\lambda = \left(\frac{22.7 \text{ customers}}{1 \text{ hour}}\right)\left(\frac{1 \text{ hour}}{60 \text{ minutes}}\right) = 0.3783 \text{ customers per minute}$$

$$P(x \le 4) = 1 - e^{-(4)(0.3783)} = 1 - e^{-1.5132} = 1 - 0.2202 = 0.7798$$

$$P(x \le 2) = 1 - e^{-(2)(0.3783)} = 1 - e^{-0.7566} = 1 - 0.4693 = 0.5307$$

$$P(4 \le x \le 2) = 0.7798 - 0.5307 = 0.2491$$

Question 2. (Show your calculation in detail)

The Marseille Water Taxi ferries tourists from the harbor at Marseille, France, to the Frioul Islands in the Mediterranean Sea. The table below shows the number of passengers on the noontime ferry over seven randomly selected days along with the current ambient temperature in degrees Celsius.

Temperature	Passengers
16	15
19	20
22	20
26	22
18	10
24	18

Use the Marseille Water Taxi data to determine the correlation coefficient for this data and interpret its meaning.

Solution:

x	y	xy	x^2	y^2
16	15	240	256	225
19	20	380	361	400
22	20	440	484	400
26	22	572	676	484
18	10	180	324	100
24	18	432	576	324

$$\sum x = 125 \quad \sum y = 105 \quad \sum xy = 2,244 \quad \sum x^2 = 2,677 \quad \sum y^2 = 1,933$$

$$r = \frac{n\sum xy - \left(\sum x\right)\left(\sum y\right)}{\sqrt{\left[n\sum x^2 - \left(\sum x\right)^2\right]\left[n\sum y^2 - \left(\sum y\right)^2\right]}}$$

$$r = \frac{(6)(2,244) - (125)(105)}{\sqrt{\left[(6)(2,677) - (125)^2\right]\left[(6)(1,933) - (105)^2\right]}}$$

$$r = \frac{339}{\sqrt{[437][573]}} = \frac{339}{500.40} = 0.677$$

As the ambient temperature increases, the number of passengers on the water taxi tends to increase.

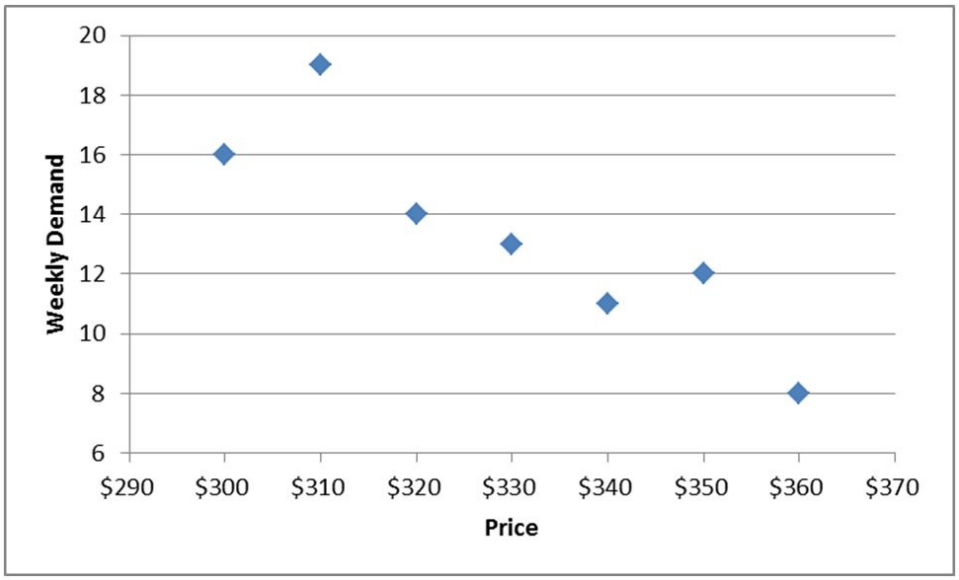
Question 3. (Show the graph and interpret the result)

The following table shows the weekly demand for a particular digital camera and the corresponding price of that camera during the week.

Weekly Demand	Price
16	$300
19	$310
14	$320
13	$330
11	$340
12	$350
8	$360

Construct a appropriate scatter plot to display this data. What conclusions can be drawn?

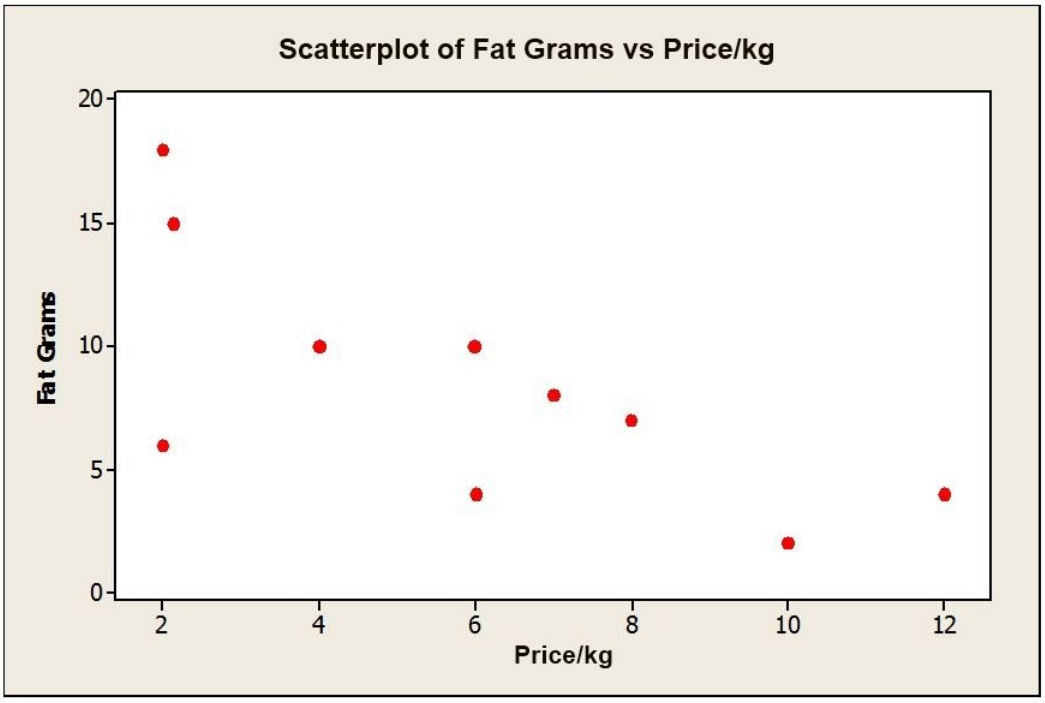
Solution :



It appears that as the price increases, demand for the camera decreases.

Question 4.

A consumer research group investigating the relationship between the price of meat (per kilogram) and the fat content (grams) gathered data that produced the following scatterplot.



a) Describe the association between the price of meat and fat content.

b) Estimate the correlation coefficient.

c) If the point in the lower left hand corner ($2.00 per kilogram, 6 grams of fat) is removed, would the correlation become stronger, weaker or remain the same? Explain.

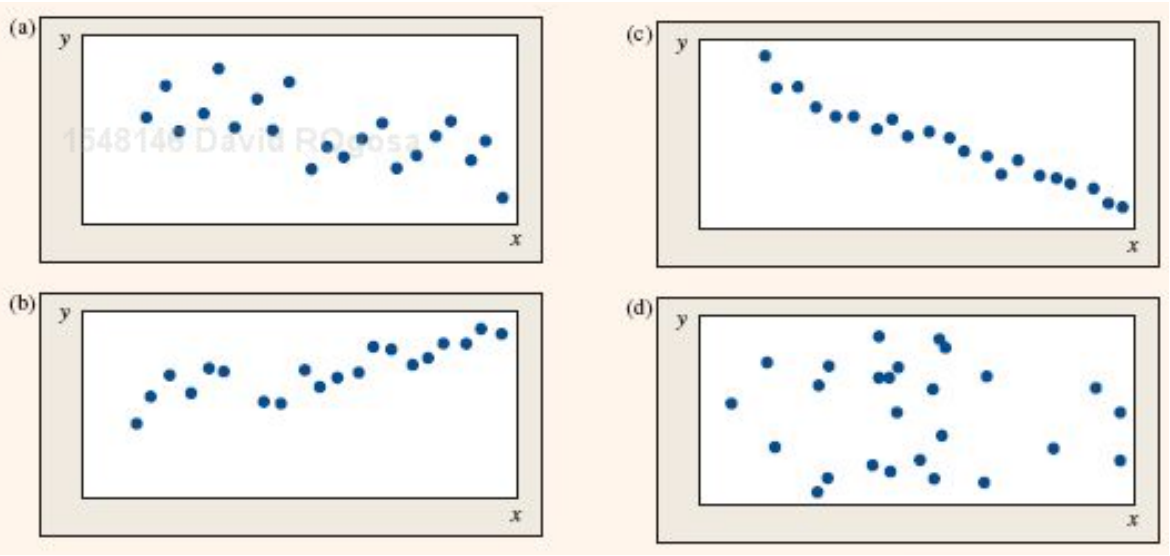
Solution :

a. Negative, moderately strong.
b. -.719, estimate between -.65 and -.75 acceptable.
c. It would become stronger (-.867).

Question 5.

Match the scatter plots below with the correlation values.

(1) _____ r = -0.9
(2) _____ r = -0.5
(3) _____ r = 0.0
(4) _____ r = 0.6



Solution:

(1) c r = -0.9
(2) a r = -0.5
(3) d r = 0.0
(4) b r = 0.6

Question 5.

The following data show the number of pairs of men's New Balance sneakers that were sold over the last 25 weeks at a discount shoe store.

1	4	6	6	8	8	9	11	11	11	12	12	14
14	14	15	17	17	17	19	19	20	21	24	24	

Note: Consider categorizing data into 5 classes for all parts of this question.

a) Construct a frequency distribution for this data.

Set $k = 5$

Estimated Class Width $= \frac{24 - 1}{5} = 4.6 \approx 5$

Number of Pairs	Frequency
1-5	2
6-10	5
11-15	9
16-20	6
21-25	3
Total	25

b) Construct a relative frequency distribution for this data and determine the probability that between 6 to 10 pairs of New Balance shoes will be sold next week.

Number of Pairs	Frequency	Relative Frequency
1-5	2	0.08
6-10	5	0.20
11-15	9	0.36
16-20	6	0.24
21-25	3	0.12
Total	25	1.00

$P(6 \leq x \leq 10\ ) = 0.20$

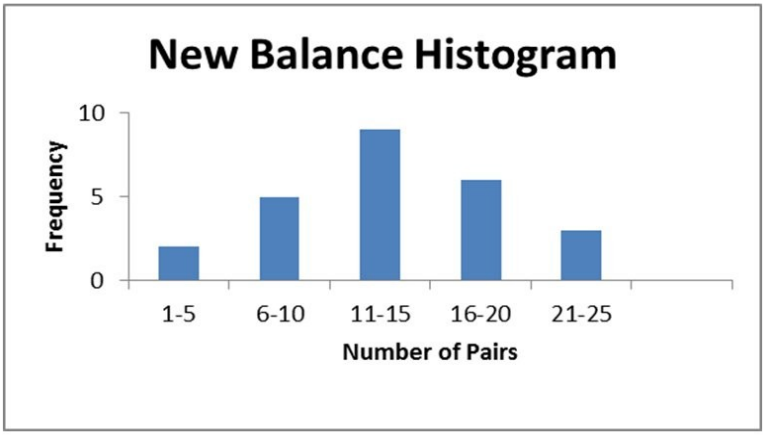
c) Construct a cumulative relative frequency distribution for this data and determine the probability that 15 or fewer pairs of New Balance shoes will be sold next week.

Number of Pairs	Frequency	Relative Frequency	Cumulative Relative Frequency
1-5	2	0.08	0.08
6-10	5	0.20	0.28
11-15	9	0.36	0.64
16-20	6	0.24	0.88
21-25	3	0.12	1.00
Total	25	1.00	

$P(x \leq 15) = 0.64$

d) Construct a histogram graph for this data.

Number of Pairs	Frequency
1-5	2
6-10	5
11-15	9
16-20	6
21-25	3
Total	25



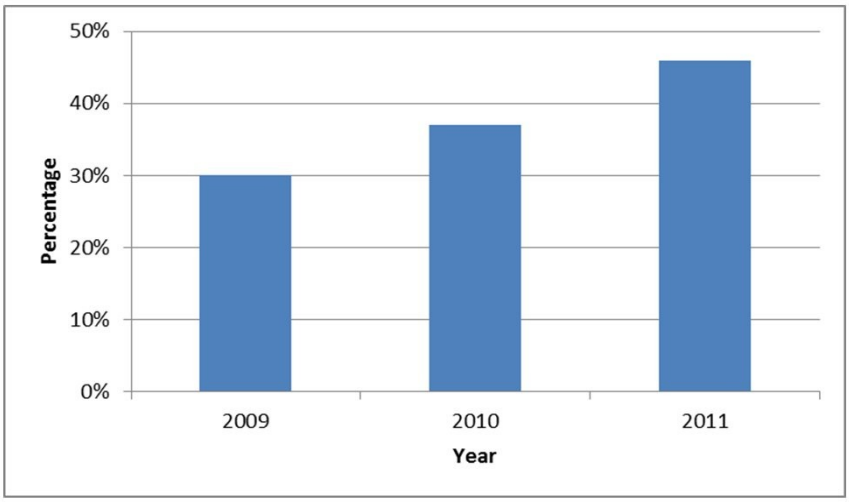
Question 6.

The following table shows the percentage of enterprise companies issuing personal computers running the MAC OS X operating system.

Year	Percentage
2009	30%
2010	37%
2011	46%

Construct the type of chart that would be most appropriate if the goal was to compare the percentages over time.

Answer:

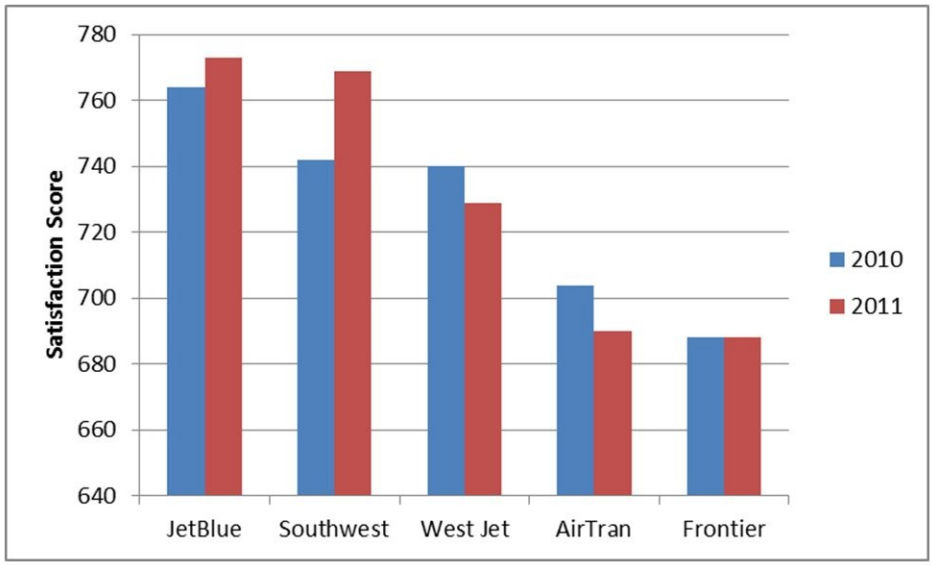


Question 7.

The following table shows customer satisfaction scores for five airlines in 2010 and 2011.

Airline	2010	2011
JetBlue	764	773
Southwest	742	769
West Jet	740	729
AirTran	704	690
Frontier	688	688

Construct the type of chart that would be most appropriate if the goal was to investigate changes in satisfaction scores for each airline between the two years.



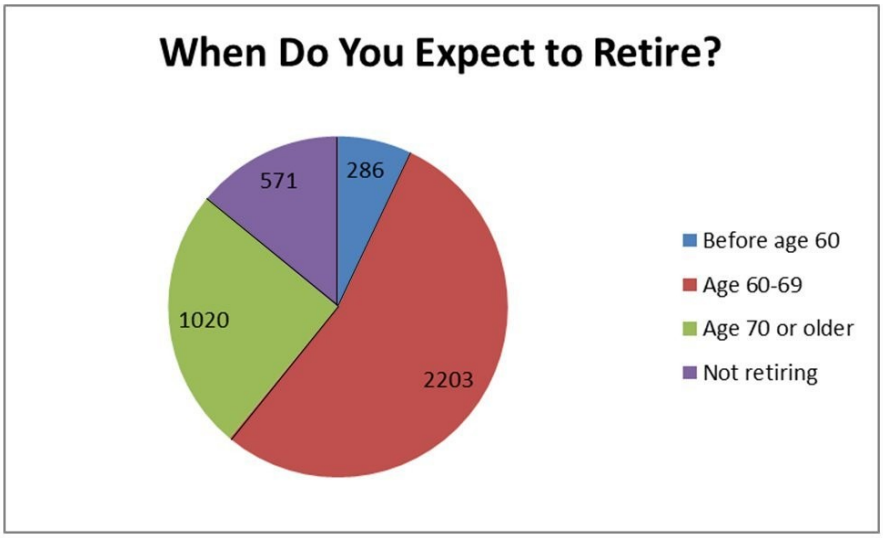
Question 8.

A survey of 4,080 workers was asked when they expected to retire. The following table shows the frequency distribution of the respondents.

Response	Frequency
Before age 60	286
Age 60-69	2,203
Age 70 or older	1,020
Not retiring	571

Construct a chart that best displays this data.

Answer:



Question 9.

Costco is a warehouse store that has two types of membership — standard and executive. The following table shows the gender and type of membership of the last 20 customers at a particular store.

Membership	Gender	Membership	Gender
standard	male	standard	female
executive	female	standard	male
standard	female	standard	female
executive	male	standard	male
standard	male	standard	female
executive	male	executive	female
standard	male	executive	female
executive	female	executive	male
standard	male	executive	female
executive	female	executive	female

Construct a contingency table for this data.

Hint :you can use excel pivot table feature to construct such table.

Answer:

	Standard	Executive
Female	4	7
Male	6	3

Question 10.

The following data represents the high ambient temperature for a particular city over the past 16 days.

52	56	56	58	59	60	62	65
69	73	73	74	76	76	77	78

Construct a stem and leaf display for this data.

Answer:

5 | 2 6 6 8 9
6 | 0 2 5 9
7 | 3 3 4 6 6 7 8

Question 11.

The following data represents the amount of money that the last nine customers spent at the checkout of a local Costco (rounded to the dollar).

$193 $120 $256 $78 $169 $183 $106 $255 $118

Calculate the median of this sample.

Answer:

$i = 0.5(9) = 4.5$
The median is the 5^{th} value in the sample.
$78 $106 $118 $120 $169 $183 $193 $255 $256

Median = $169

Question 12.

The following data represent the time between customer arrivals, in minutes, at a drive-thru for a fast food restaurant.

2 4 1 0 6 4 1 2 5 3

Determine the mode of this data set.

Answer:

There are three modes for this data set: 1, 2, and 4.

Question 13.

The following data represent the number of minutes eight taxpayers waited on hold for when calling into the IRS help line.

16 18 1 17 2 1 16 19

Describe the shape of this distribution as symmetrical, left-skewed, or right-skewed.

Hint: find the mean and median and compare them.

Answer:

$$\bar{x} = \frac{16 + 18 + 1 + 17 + 2 + 1 + 16 + 19}{8} = 11.25$$

$i = 0.5(8) = 4$

The median is halfway between the 4^{th} and 5^{th} values in the sample.

1 1 2 16 16 17 18 19

$$\text{Median} = \frac{16 + 16}{2} = 16$$

Because the mean is less than the median, the distribution is left-skewed.

Question 14.

The following data shows the number of minutes that seven customers waited for a table at a particular restaurant.

1 17 26 10 5 22 19 8

Calculate the coefficient of variation for this data. (Show your calculation)

Answer:

$$\bar{x} = \frac{1 + 17 + 26 + 10 + 5 + 22 + 19 + 8}{8} = 13.5$$

x_i	$x_i 2$
1	1
17	289
26	676
10	100
5	25
22	484
19	361
8	64

$$\sum_{i=1}^{8} x_i = 108 \qquad \sum_{i=1}^{8} x_i^2 = 2,000$$

$$\left(\sum_{i=1}^{n} x_i\right)^2 = (108)^2 = 11,664$$

$$s = \sqrt{\frac{\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}}{n-1}} = \sqrt{\frac{2,000 - \frac{11,664}{8}}{8-1}} = \sqrt{\frac{2,000 - 1,458}{7}} = 8.80$$

$$CV = \frac{8.80}{13.50}(100) = 65.2\%$$

Question 15.

The following data represent the square footage of 10 three-bedroom condos for sale in Hilton Head, South Carolina.

1,559 1,625 1,167 1,264 1,676 1,300 2,058 1,126 1,858 1,321

Determine the interquartile range for this sample. Are there any outliers in this data set? (Show your calculation)

Note: In order to be consistent, Please use the **second method** mentioned in the lecture notes for finding percentiles (which also applies to quartiles).

Answer:

1,126 1,167 1,264 1,300 1,321 1,559 1,625 1,676 1,858 2,058

Q_1: $i = \frac{25}{100}(10) = 2.5$

So Q_1 is the 3rd position.

$Q_1 = 1{,}264$

Q_3: $i = \frac{75}{100}(10) = 7.5$

So Q_3 is the 8th position.

$Q_3 = 1{,}676$

IRQ = 1,676 - 1,264 = 412
Upper Limit = 1,676 + 1.5(412) = 2,294
Lower Limit = 1,264 - 1.5(412) = 646

There are no outliers in this sample.

Question 16.

The following data represents the amount of money that individuals spent on gifts for Mother's Day.

$110 $132 $144 $168 $141 $100 $184 $137 $134 $148 $128 $166

Construct a box-and-whisker plot for this data. (Show your calculation)

Note: In order to be consistent, Please use the **second method** mentioned in the lecture notes for finding percentiles (which also applies to quartiles).

Answer:

100 110 128 132 134 137 141 144 148 166 168 184

Q_1: $i = \frac{25}{100}(12) = 3$

So Q_1 is the average of the 3rd and 4th positions.

$$Q1 = \frac{\$128 + \$132}{2} = \$130$$

$$Q2: i = \frac{50}{100}(12) = 6$$

So $Q2$ is the average of the 6^{th} and 7^{th} positions.

$$Q2 = \frac{\$137 + \$141}{2} = \$139$$

$$Q3: i = \frac{75}{100}(12) = 9$$

So $Q3$ is the average of the 9^{th} and 10^{th} positions.

$$Q3 = \frac{\$148 + \$166}{2} = \$157$$

IRQ = \$157 - \$139 = \$18
Upper Limit = \$157 + 1.5(\$18) = \$184
Lower Limit = \$130 - 1.5(\$18) = \$103