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SKU: 9781119368373-SOLUTIONS

SOLUTIONS TO PROBLEMS IN CHAPTER 2: ORGANIZING AND VISUALIZING DATA

2.1

Airlines	Number of passengers (in millions)	Percentage	Cumulative
Delta	164.6	20.9%	20.9%
United	140.4	17.8%	38.7%
Southwest	134.0	17.0%	55.7%
American	107.9	13.7%	69.4%
China Southern	86.5	11.0%	80.4%
Ryanair	79.6	10.1%	90.5%
Lufthansa	74.7	9.5%	100.0%
TOTAL	***787.7***	100.0%	

2.2

Firm	Revenue ($U.S. millions)	Percentage	Cumulative
Pfizer	67,809	23.3%	23.3%
Novartis	53,324	18.3%	41.6%
Merck & Co.	45,987	15.8%	57.4%
Bayer	44,200	15.2%	72.6%
GlaxoSmithKline	42,813	14.7%	87.3%
Johnson and Johnson	37,020	12.7%	100.0%
TOTAL	***291,153***	100.0%	

2.3

		One-Way Commute Distance (in km)			
		0 - 3	4 - 10	More than 10	**Total**
Number of Annual	0 - 2	95	184	117	396
Non-vacation -Day	3 - 5	21	40	53	114
Absences	More than 5	3	7	12	22
	Total	119	231	182	532

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There is a slight tendency for there to be a few more absences as plant workers commute further distances. Say, 6.6% of those who commute more than 10 km had more than 5 non-vacation absent days, as compared to 2.5% and 3% for those who commute 0-3 km and 4-10 km respectively. Comparing workers who travel 4-10 km to those who travel 0-3 km, there is about a 2:1 ratio in all three cells (0-2, 3-5, more than 5 non-vacation day absences) indicating that for these two categories (0-3 and 4-10), number of absences is essentially independent of commute distance.

2.4

		Level of Education		
		High School only	University Degree	**Total**
Rating of Service	Acceptable	9	6	15
	Unacceptable	2	8	10
	Total	11	14	25

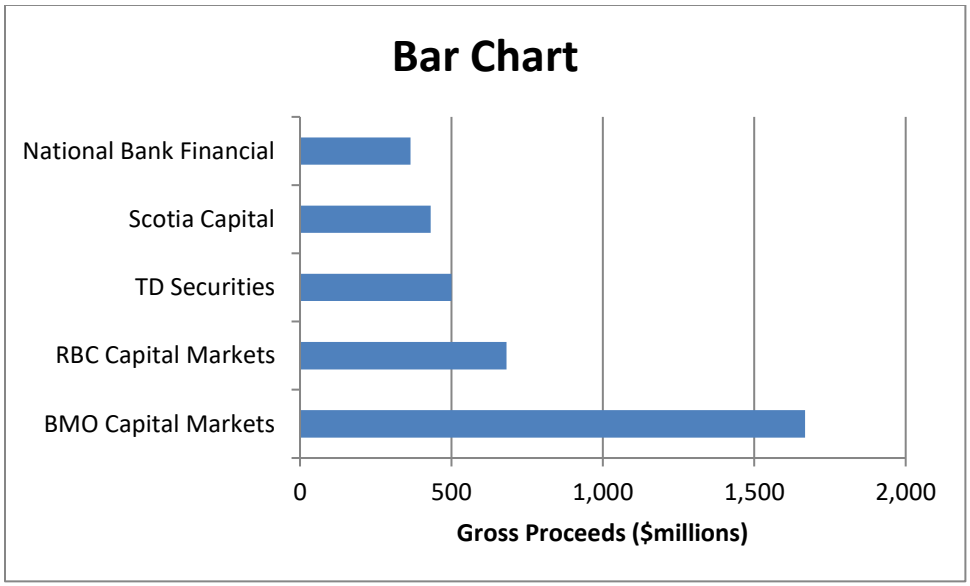
There is a tendency that the lower the level of education, the more acceptable is the service. First of all, according to the table, the numbers of customers with different level of education are almost the same (11 with “high school only” and 14 with “university degree”). It appears that a much higher proportion of high school level education customers rate the service as “acceptable” than as “unacceptable” (9 to 2 ratio or about 4.5 times as many). On the other hand, more of the university degree educated customers rated the service as “unacceptable” than as “acceptable” (8 to 6 ratio). In addition, 60% or 9 customers out of 15 who rate the service as “acceptable” have only high school education, and 80% or 8 customers out of 10 who rate the service as “unacceptable” are university degree level educated.

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2.5

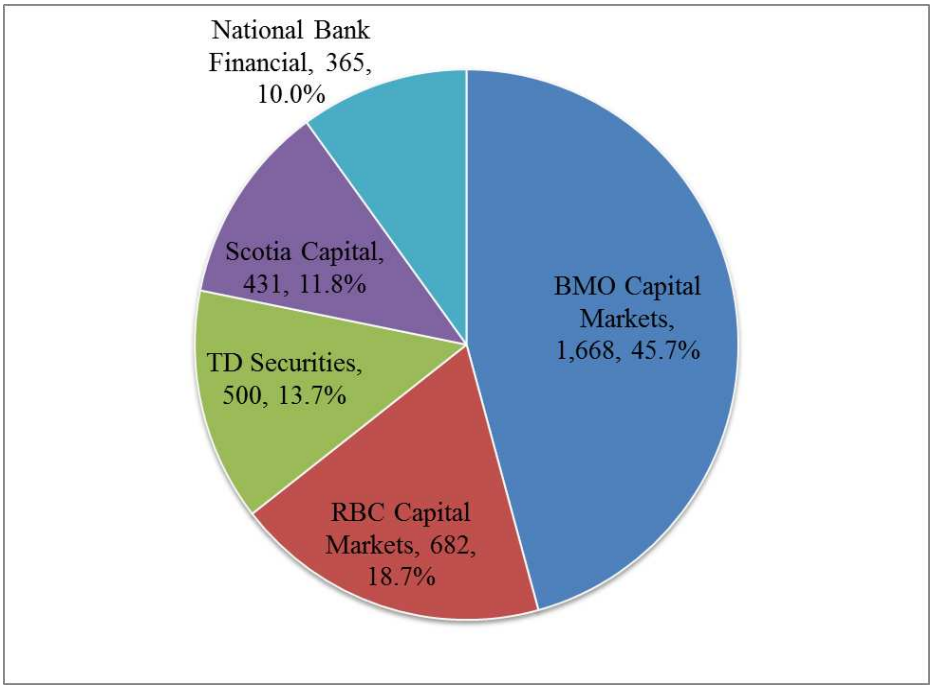
Underwriting Firm	Gross Proceeds ($ millions)	Proportion
BMO Capital Markets	1,668	1,668/3,646=0.457
RBC Capital Markets	682	0.187
TD Securities	500	0.137
Scotia Capital	431	0.118
National Bank Financial	365	0.100
Totals	3,646	1.000



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Pie chart:



The proportion, sizes and color of the pie slices clearly shows that BMO Capital Markets has the highest revenue ($1,668 million, 45.7%) and National Bank Financial has the lowest revenue ($365 million, 10.0%).

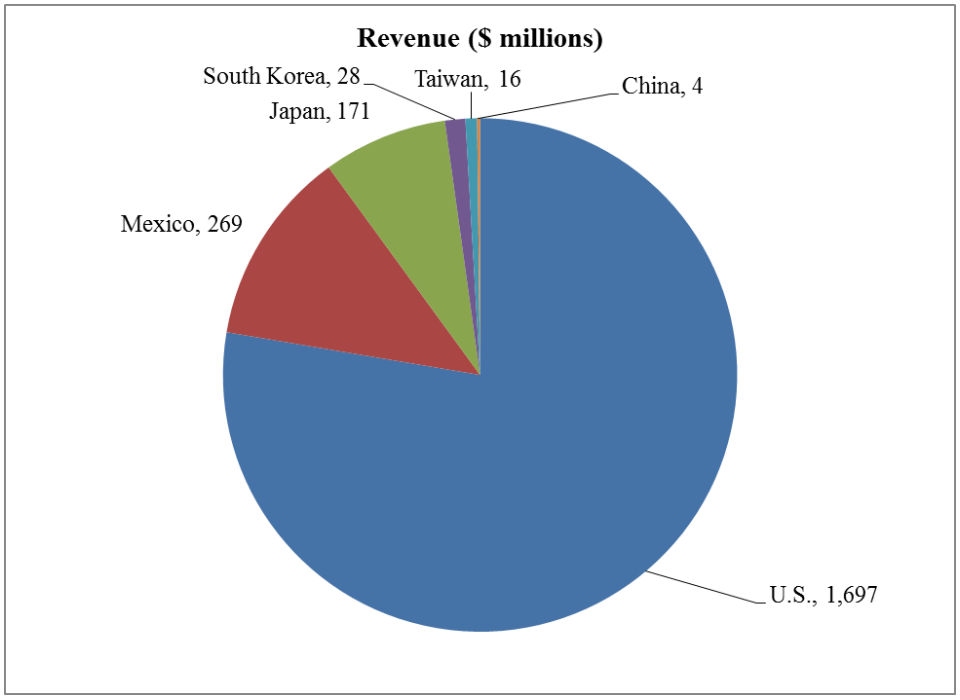
2.6

Destination	**Revenue ($ millions)**	**Proportion**
U.S.	1,697	0.7767
Mexico	269	0.1231
Japan	171	0.0783
South Korea	28	0.0128
Taiwan	16	0.0073
China	4	0.0018
Totals	2,185	1.0000

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Pie Chart:

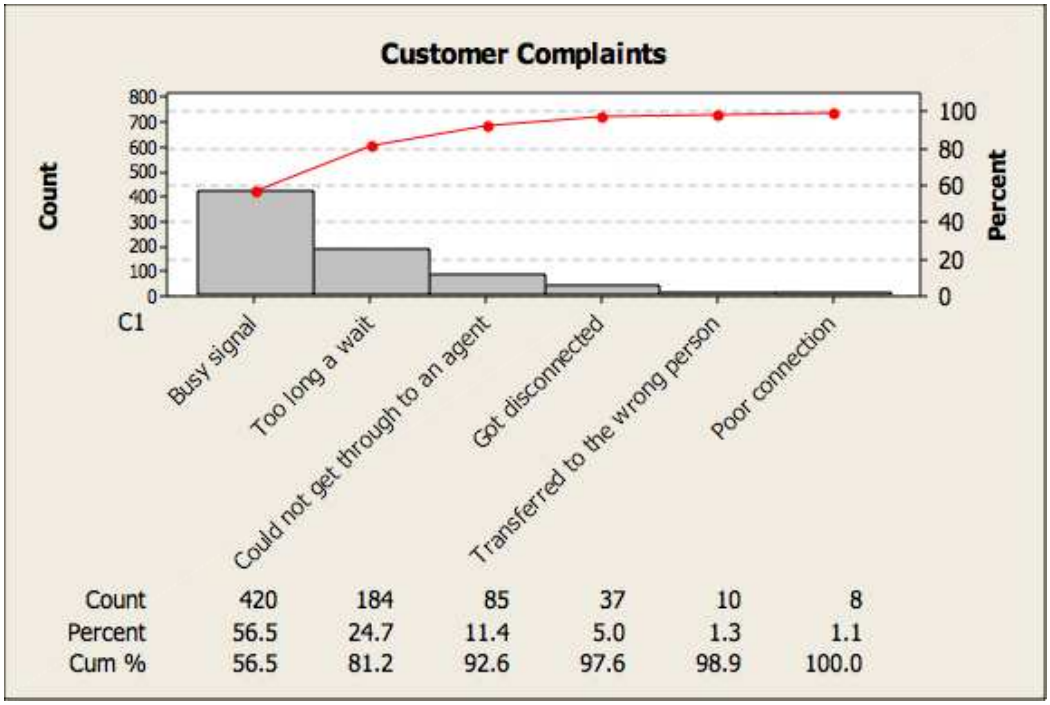


2.7

Complaint	Number	% of Total
Busy Signal	420	56.45
Too long a Wait	184	24.73
Could not get through	85	11.42
Got Disconnected	37	4.97
Transferred to the Wrong Person	10	1.34
Poor Connection	8	1.08
Total	744	99.99

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2.8 a) One possible 5 class frequency distribution:

Class Interval	Frequency
−15 - under −6	7
−6 - under 3	12
3 - under 12	13
12 - under 21	9
21 - under 30	9
Totals	50

b) One possible 10 class frequency distribution:

Class Interval	Frequency
−15 - under −10	2
−10 - under −5	5
−5 - under 0	7
0 - under 5	10
5 - under 10	7
10 - under 15	3
15 - under 20	7
20 - under 25	4
25 - under 30	5
30 - under 35	0
Totals	50

c) The ten class frequency distribution gives a more detailed breakdown of temperatures. It allows locating more accurately the temperatures with the greatest frequency. The temperatures with the highest frequency, 10, are in

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the 0 – under 5 class. The five class distribution collapses the intervals into broader classes making it appear that there are nearly equal frequencies in each class.

2.9 One possible frequency distribution is the one below with 12 classes and class width of 2.

Class Interval	Frequency
39 - under 41	2
41 - under 43	1
43 - under 45	5
45 - under 47	10
47 - under 49	18
49 - under 51	13
51 - under 53	15
53 - under 55	15
55 - under 57	7
57 - under 59	9
59 - under 61	4
61 - under 63	1
Totals	100

The distribution reveals that only 13 of the 100 boxes of raisins contain 50 ± 1 raisin (49 - under 51). However, 71 of the 100 boxes of raisins contain 45 - under 55 raisins. It shows that there are five boxes that have 9 or more extra raisins (59 - under 61 and 61 - under 63) and two boxes that have 9-11 less raisins (39 – under 41) than the boxes are supposed to contain.

2.10

Class Interval	Frequency	Relative Frequency	Cumulative Frequency
0 – under 5	6	6/86 = .0698	6
5 – under 10	8	.0930	14
10 – under 15	17	.1977	31
15 – under 20	23	.2674	54
20 – under 25	18	.2093	72
25 – under 30	10	.1163	82
30 – under 35	4	.0465	86
TOTAL	86	1.0000	

The relative frequency tells us that it is most probable that a customer is in the 15 - 20 category (.2674). Over two thirds (.6744) of the customers are between 10 and 25 years of age.

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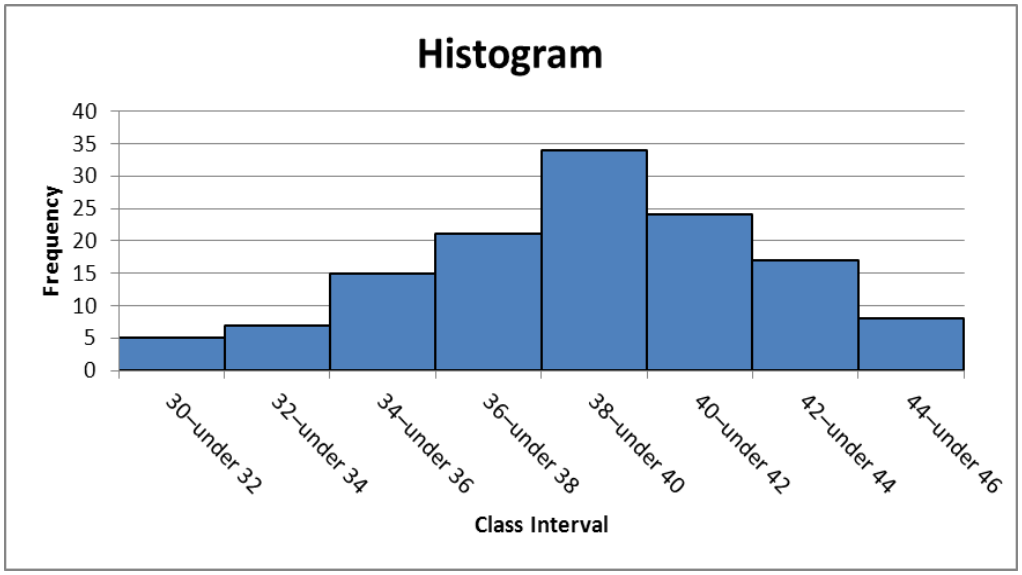
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2.11

Class Interval	Frequency	Relative Frequency	Cumulative Frequency
0- under 2	218	.436	218
2- under 4	207	.414	425
4- under 6	56	.112	481
6- under 8	11	.022	492
8- under 10	8	.016	500
TOTAL	500	1.000	

2.12 Some examples of cumulative frequencies in business:
sales for the fiscal year,
costs for the fiscal year,
spending for the fiscal year,
inventory build-up,
accumulation of workers during a hiring buildup,
production output over a time period.

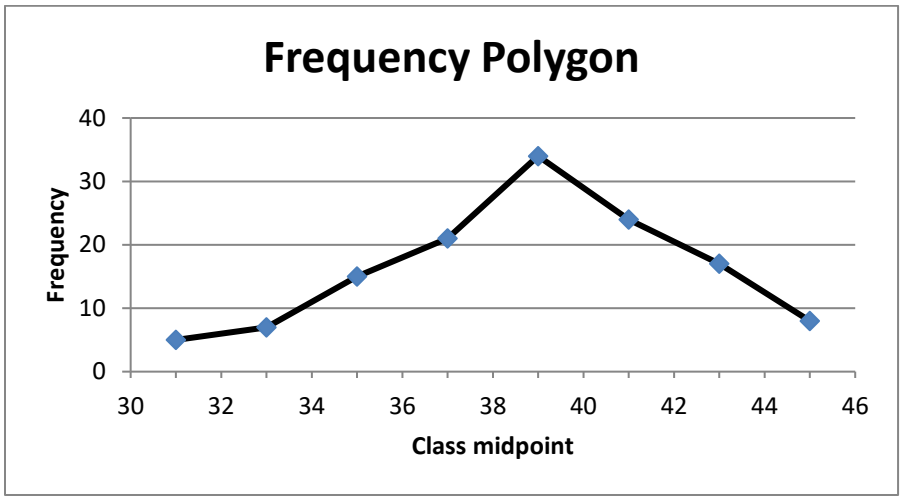
2.13



Class Interval	Class midpoint	Frequency
30–under 32	31	5
32–under 34	33	7
34–under 36	35	15
36–under 38	37	21
38–under 40	39	34
40–under 42	41	24
42–under 44	43	17
44–under 46	45	8

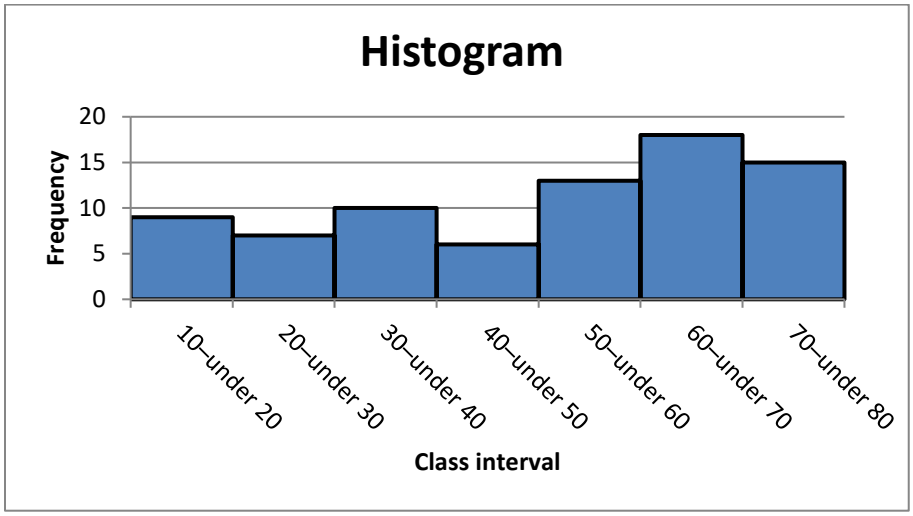
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Comment: The assembly times "pile up" near the middle of the graphs indicating that many of the assembly times are between 36 and 42 minutes.

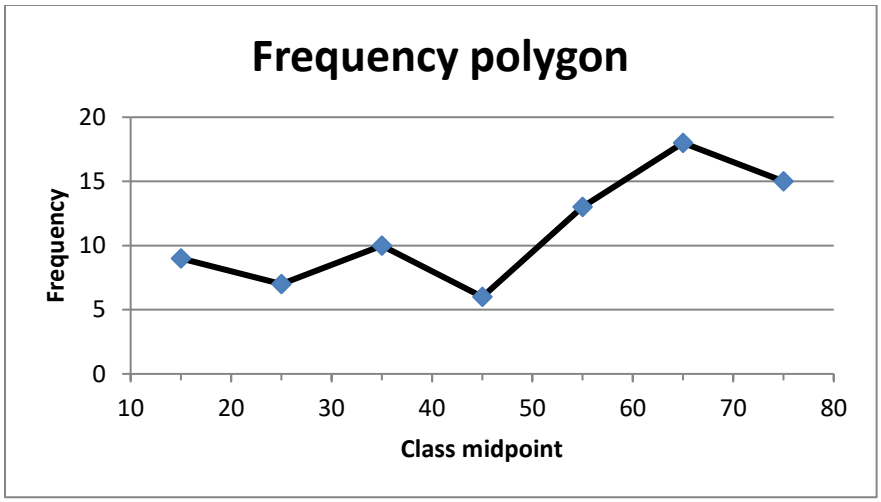
2.14



Class Interval	Class midpoint	Frequency
10–under 20	15	9
20–under 30	25	7
30–under 40	35	10
40–under 50	45	6
50–under 60	55	13
60–under 70	65	18
70–under 80	75	15

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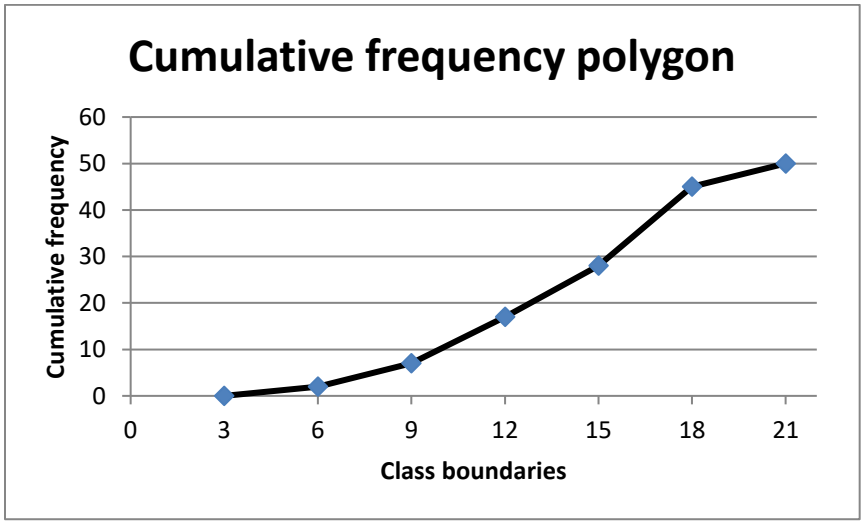
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Comment: The histogram/frequency polygon indicates that the number of calls per shift varies widely. However, the heavy numbers of calls per shift fall in the 50 to 80 range. Since these numbers occur quite frequently, staffing planning should be done with these number of calls in mind realizing from the rest of the graph that there may be shifts with as few as 10 to 20 calls.

2.15

Class boundaries	Cumulative frequency
3	0
6	2
9	7
12	17
15	28
18	45
21	50



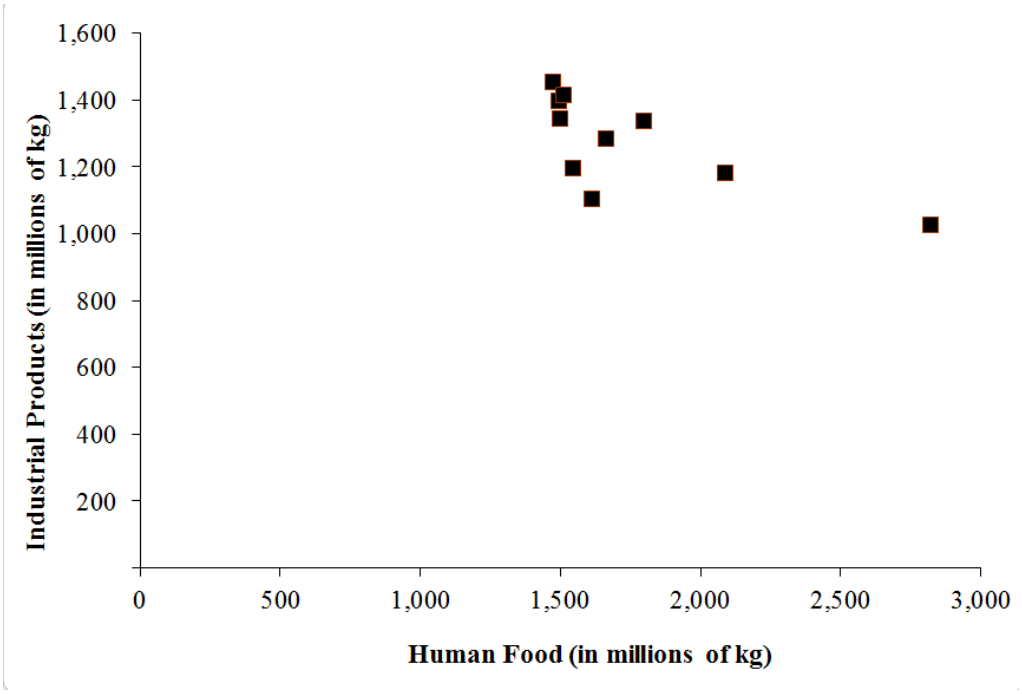
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2.16 The histogram shows that there is only one airport with more than 70 million passengers and from the given problem information, we know that that airport is Atlanta's Hartsfield-Jackson International Airport which has more than 90 million passengers. There are no airports with 70 to 90 million passengers. Nearly one-half (14) of the top 30 airports have between 30 and 40 million passengers. The next largest grouping is between 50 and 60 million passengers in which there are six airports.

2.17 We assume that the class endpoints (10, 20, 30, …) are indicated on the horizontal axis and the marks between them represent the class midpoints; the cumulative frequencies are marked on the vertical axis. The graph shows that out of 200, 50 pots contain less than 10 legal king crabs. About 90 selected pots (45%) have fewer than 20 legal king crabs, and about 120 (60%) contain less than 30 legal king crabs. However, 180 pots (90%) have less than 80 legal king crabs.

2.18

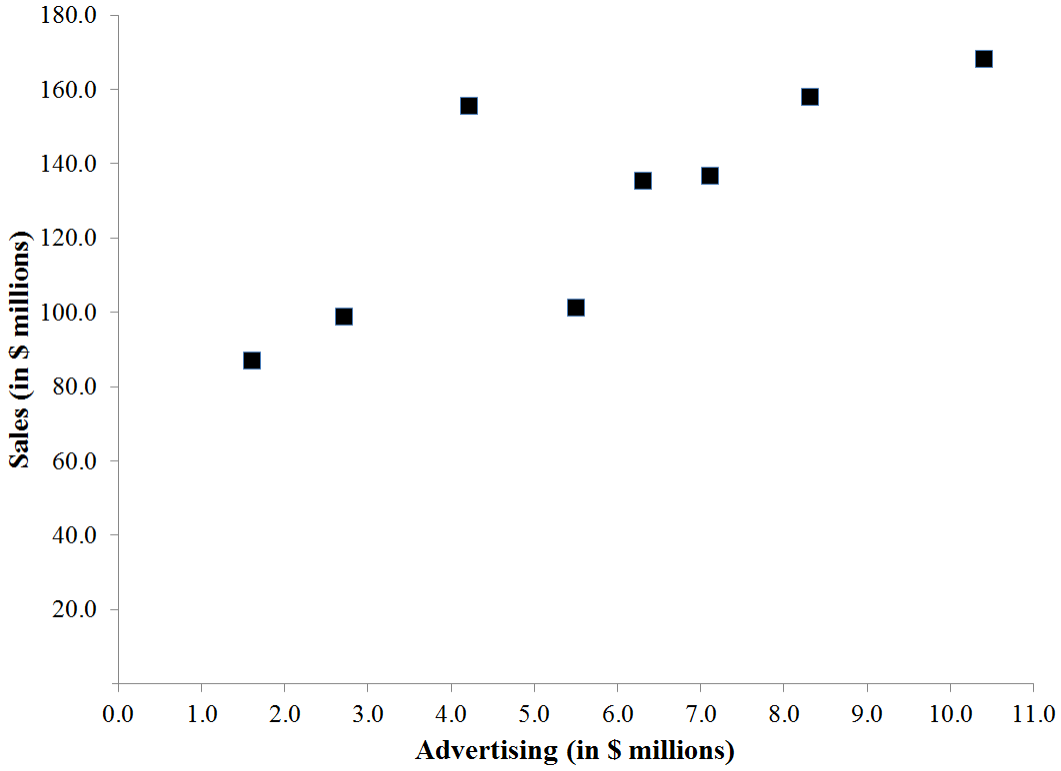


Generally speaking, the tendency is that less fish caught and used for industrial products when more fish is caught and used for human food.

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2.19



Generally speaking, the tendency is that sales are higher when more money is spent on advertising.

2.20 It appears from the graph that as job satisfaction decreases, there is an increase in tardiness. Thus, there appears to be an inverse relationship between job satisfaction and tardiness. The scatter plot also shows that when employees are highly satisfied, the level of tardiness is low.

2.21

Class Interval	Frequency
16 - under 23	6
23 - under 30	9
30 - under 37	4
37 - under 44	4
44 - under 51	4
51 - under 58	3
TOTAL	30

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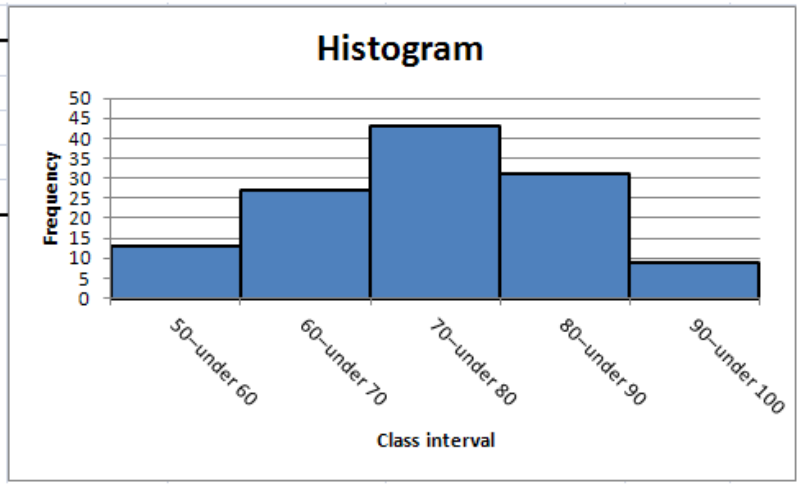
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2.22

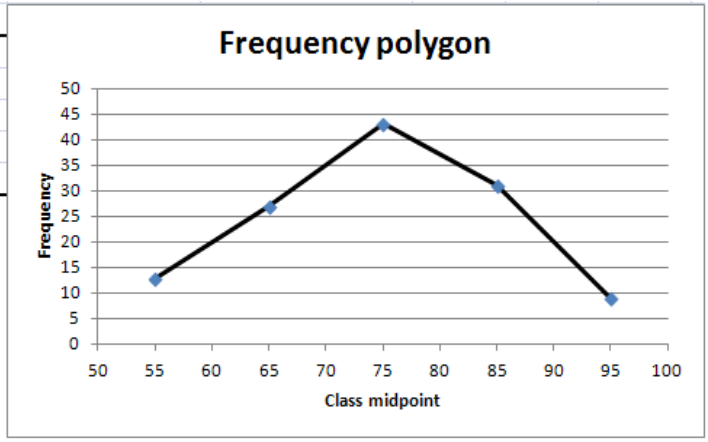
Class Interval	Frequency	Relative Frequency	Cumulative Frequency
20 - under 25	17	.207	17
25 - under 30	20	.244	37
30 - under 35	16	.195	53
35 - under 40	15	.183	68
40 - under 45	8	.098	76
45 - under 50	6	.073	82
TOTAL	82	1.000	

2.23

Class Interval	Frequency
50–under 60	13
60–under 70	27
70–under 80	43
80–under 90	31
90–under 100	9



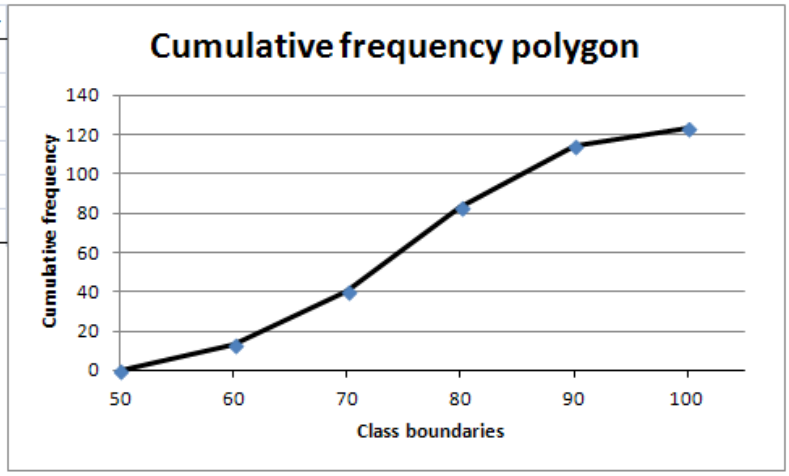
Class Interval	Class midpoint	Frequency
50–under 60	55	13
60–under 70	65	27
70–under 80	75	43
80–under 90	85	31
90–under 100	95	9



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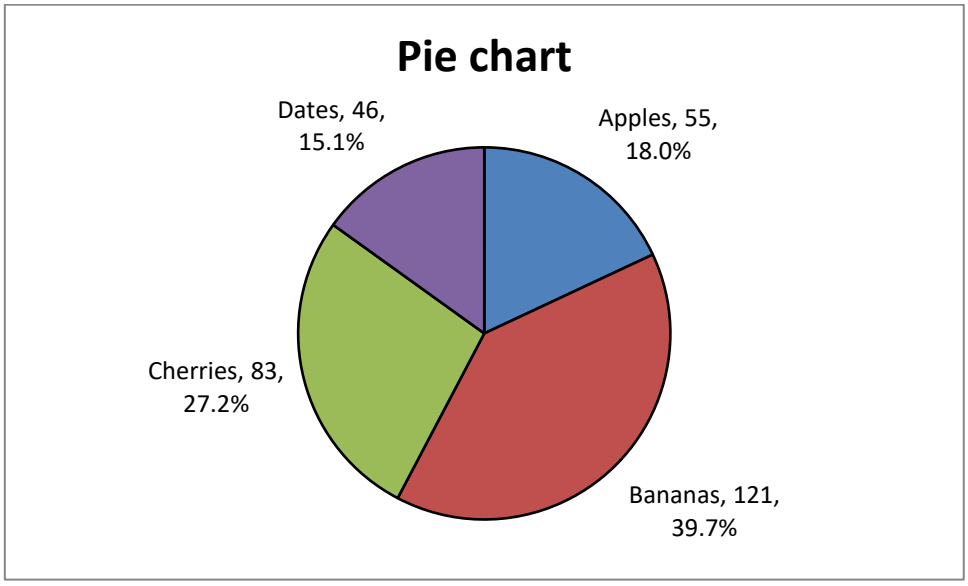
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Class boundaries	Cumulative frequency
50	0
60	13
70	40
80	83
90	114
100	123



2.24

Label	Value	Proportion
Apples	55	0.180
Bananas	121	0.397
Cherries	83	0.272
Dates	46	0.151
Totals	305	1.000

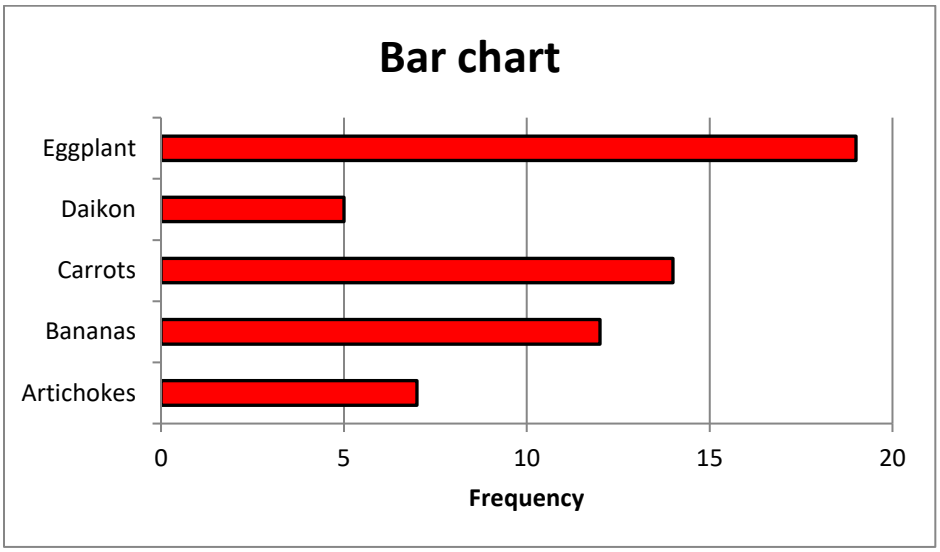


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2.25

Category	Frequency
Artichokes	7
Bananas	12
Carrots	14
Daikon	5
Eggplant	19



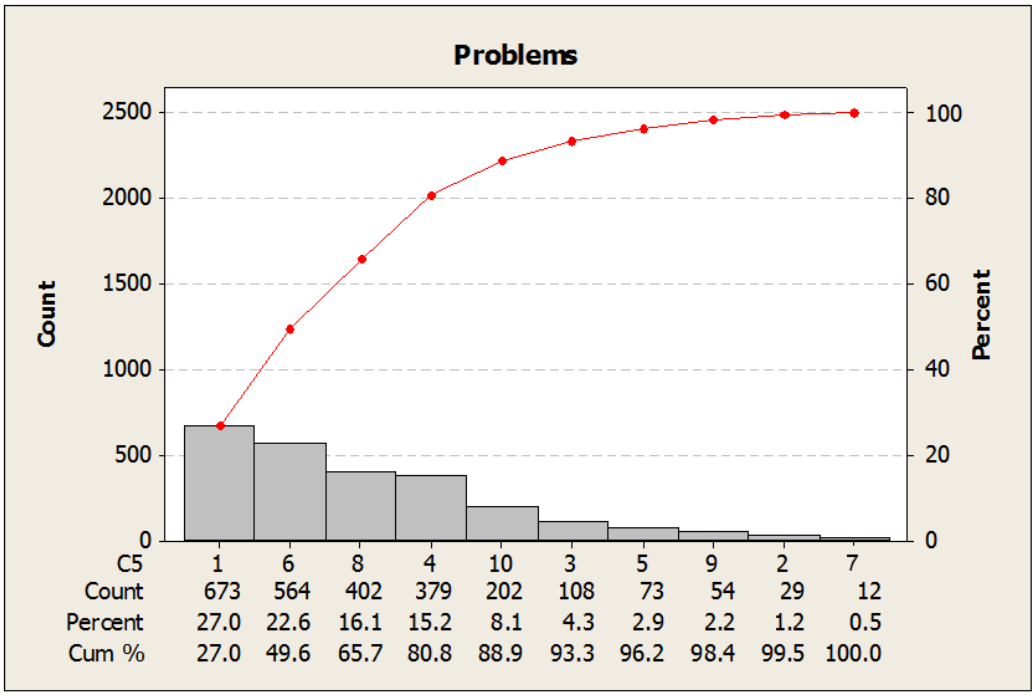
2.26

Problem	Frequency	Percent of Total
1	673	26.96
2	29	1.16
3	108	4.33
4	379	15.18
5	73	2.92
6	564	22.60
7	12	0.48
8	402	16.11
9	54	2.16
10	202	8.09
Totals	2496	

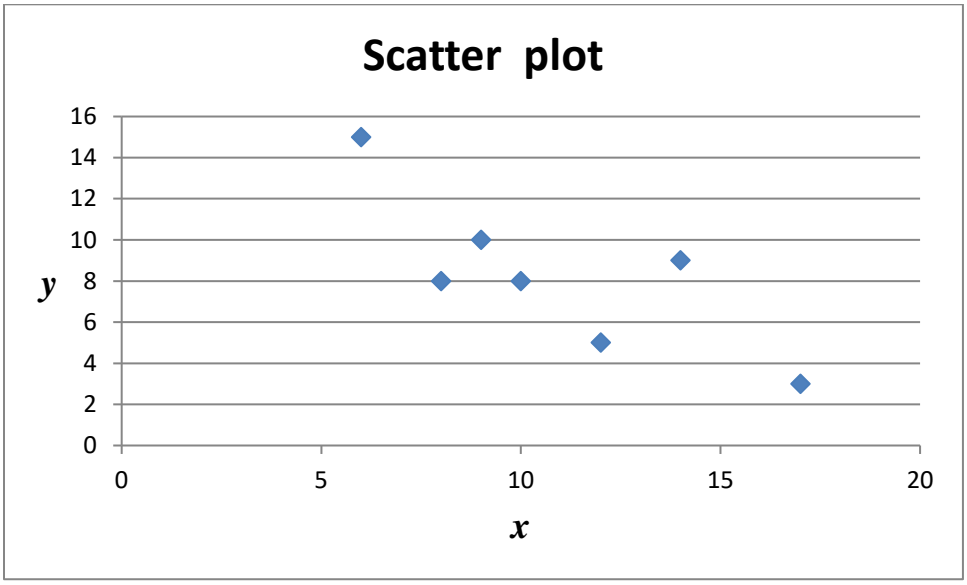
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Pareto Chart:



2.27



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2.28

Class Interval	Frequency
32 - under 37	1
37 - under 42	4
42 - under 47	12
47 - under 52	11
52 - under 57	14
57 - under 62	5
62 - under 67	2
67 - under 72	1
TOTAL	50

The highest frequencies are between 42 and 57.

2.29

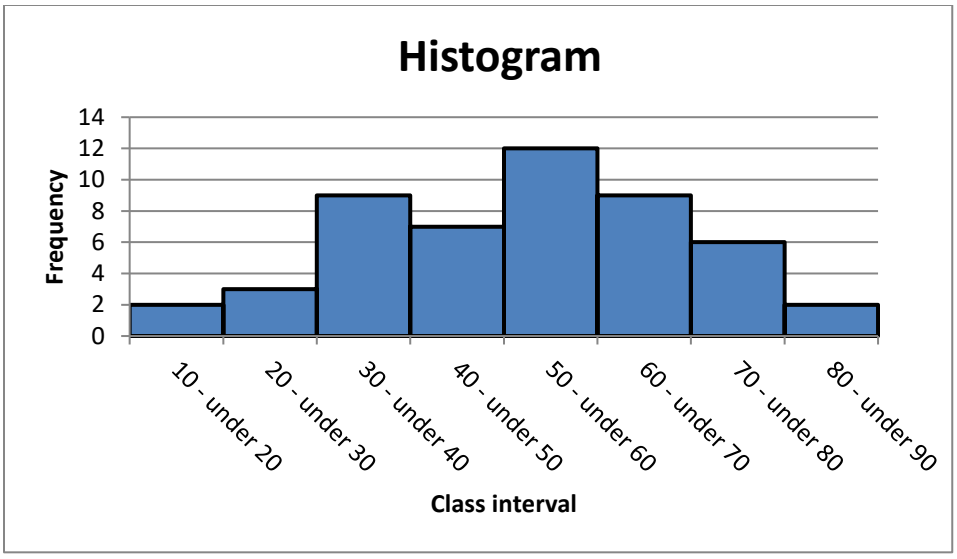
Class Interval	Frequency	Relative Frequency	Cumulative Frequency
20 – 25	8	8/53 = .1509	8
25 – 30	6	.1132	14
30 – 35	5	.0943	19
35 – 40	12	.2264	31
40 – 45	15	.2830	46
45 – 50	7	.1321	53
TOTAL	53	.9999 ≈ 1	

2.30

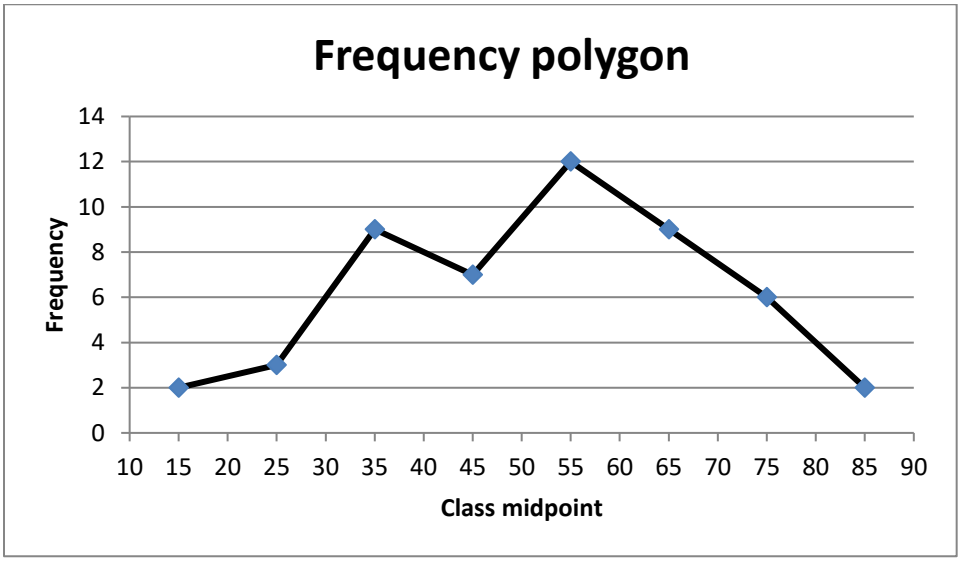
Class Interval	**Frequency**
10 - under 20	2
20 - under 30	3
30 - under 40	9
40 - under 50	7
50 - under 60	12
60 - under 70	9
70 - under 80	6
80 - under 90	2

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Class Interval	Class midpoint	Frequency
10 - under 20	15	2
20 - under 30	25	3
30 - under 40	35	9
40 - under 50	45	7
50 - under 60	55	12
60 - under 70	65	9
70 - under 80	75	6
80 - under 90	85	2



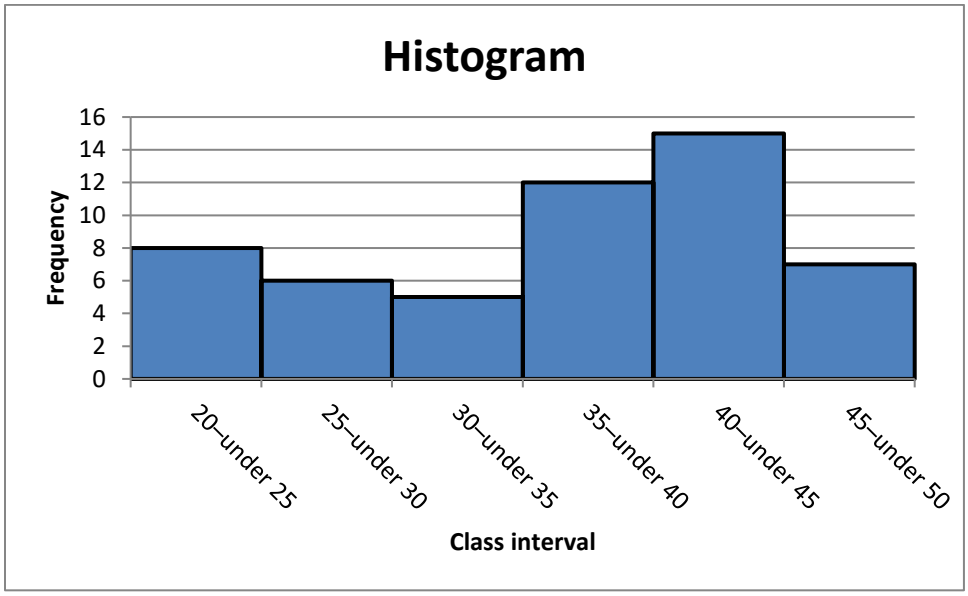
The normal distribution appears to peak near the center and diminish towards the end intervals.

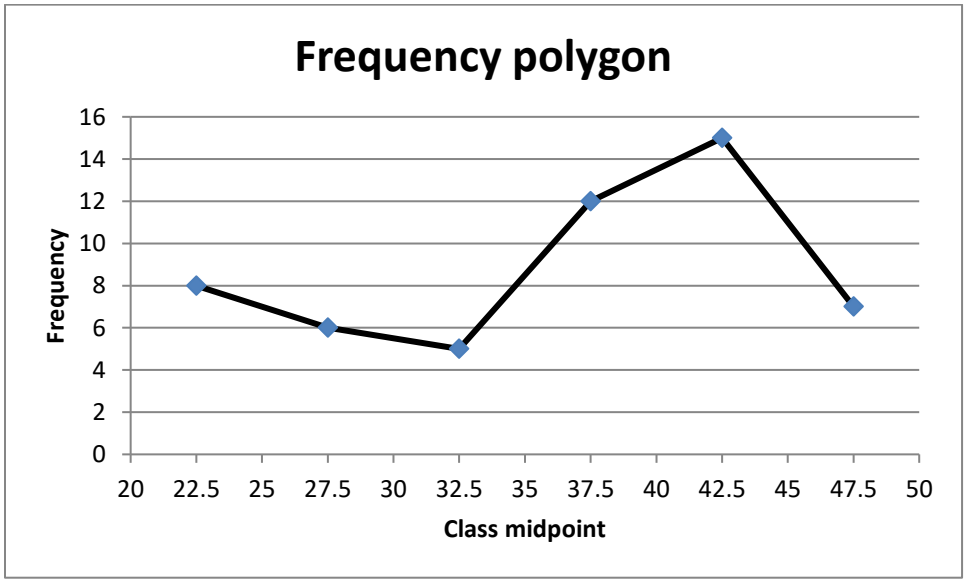
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2.31 a)

Class Interval	Class midpoint	Frequency
20–under 25	22.5	8
25–under 30	27.5	6
30–under 35	32.5	5
35–under 40	37.5	12
40–under 45	42.5	15
45–under 50	47.5	7



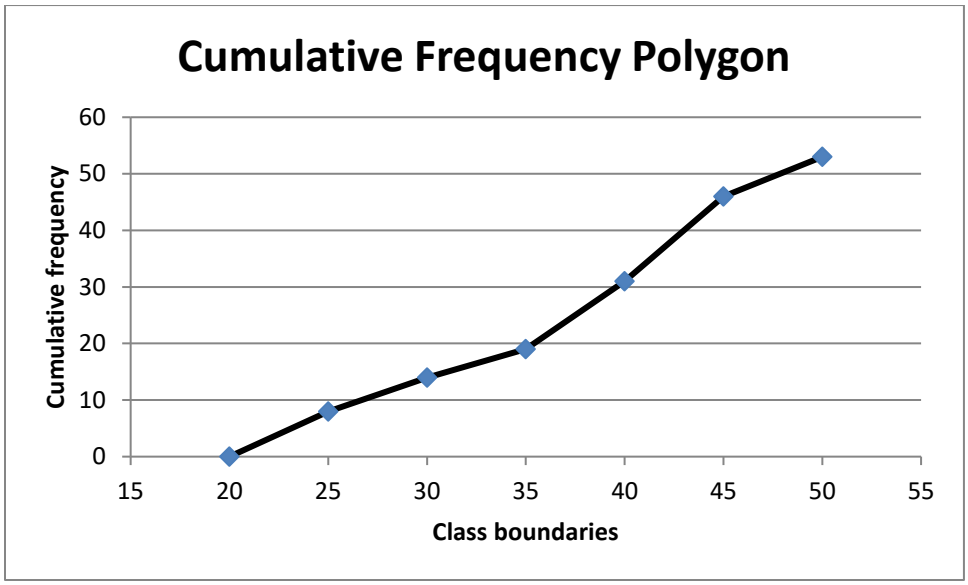


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b)

Class boundaries	Cumulative Frequency
20	0
25	8
30	14
35	19
40	31
45	46
50	53

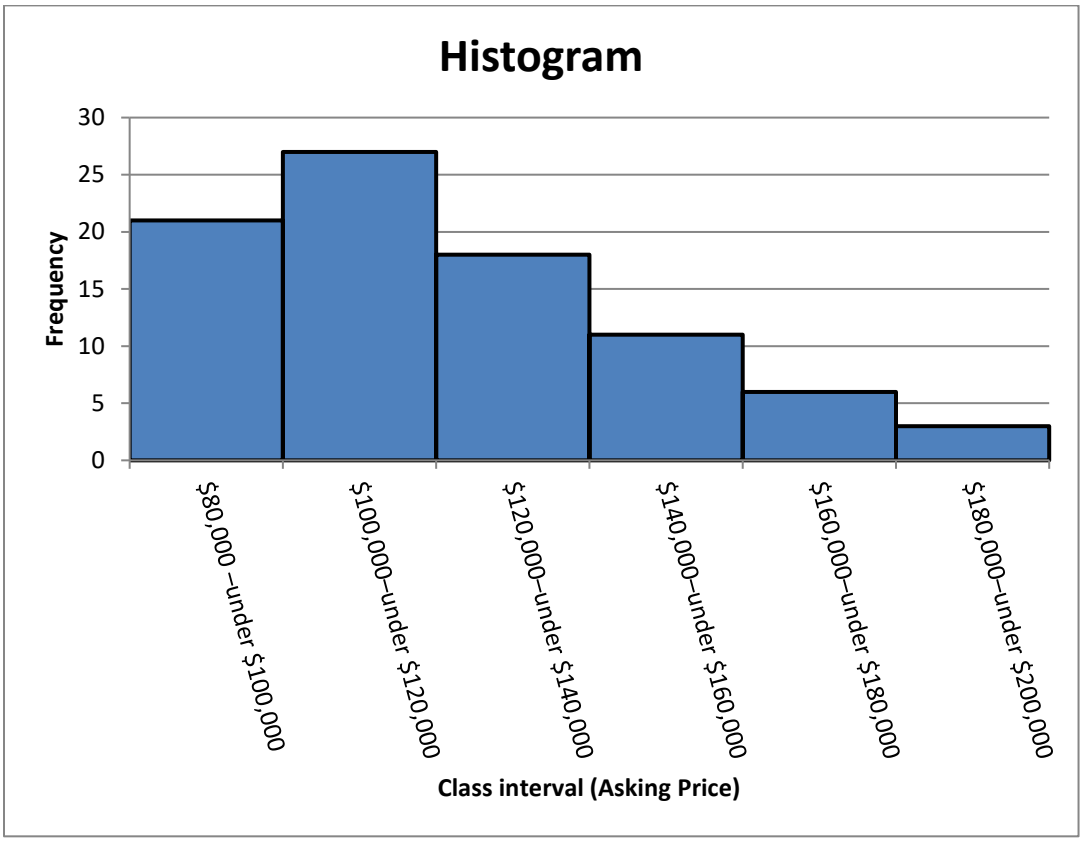


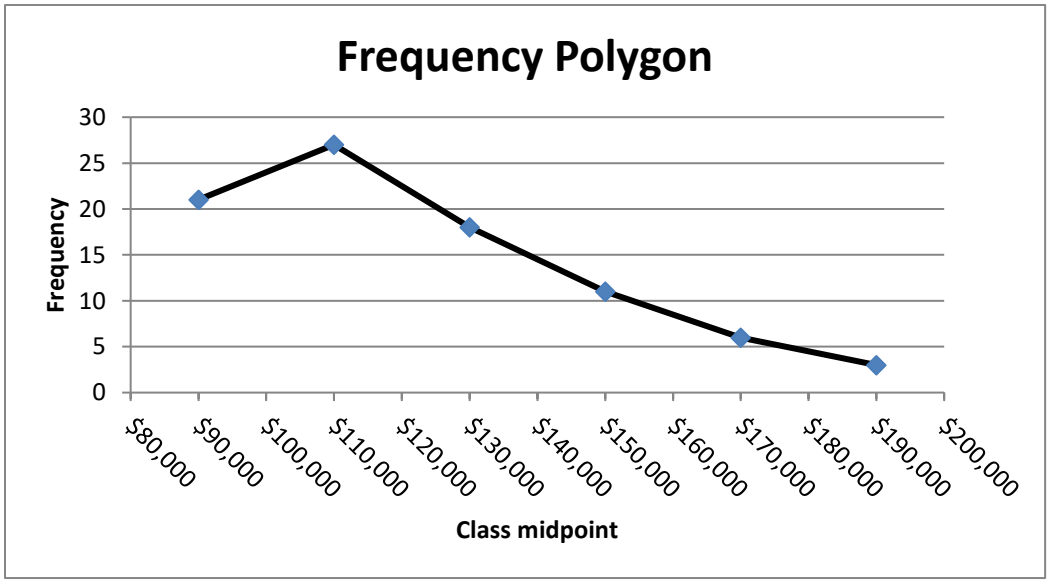
2.32

Asking Price	Class midpoint	Frequency
$80,000 –under $100,000	$90,000	21
$100,000–under $120,000	$110,000	27
$120,000–under $140,000	$130,000	18
$140,000–under $160,000	$150,000	11
$160,000–under $180,000	$170,000	6
$180,000–under $200,000	$190,000	3

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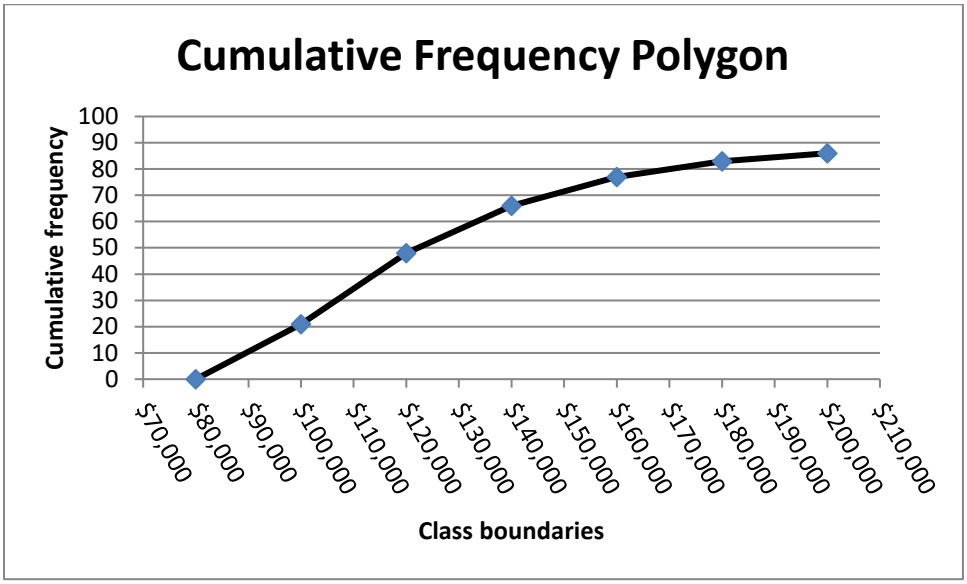




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Class boundaries	Cumulative Frequency
$80,000	0
$100,000	21
$120,000	48
$140,000	66
$160,000	77
$180,000	83
$200,000	86

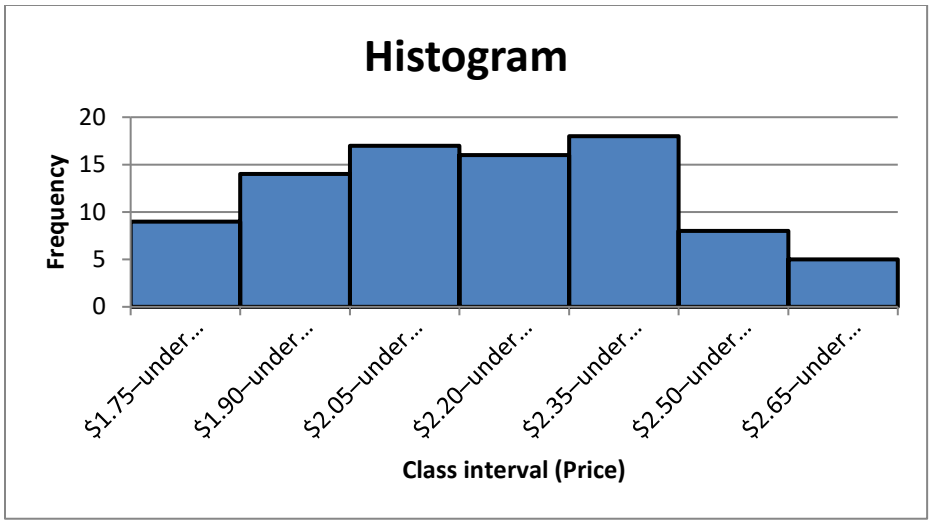


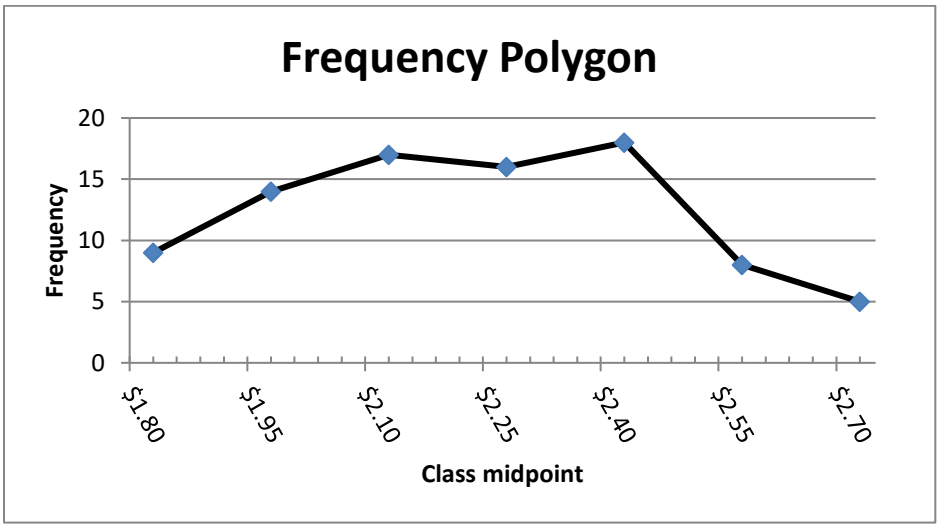
2.33

Class interval (Price)	Class Midpoint	Frequency
$1.75–under $1.90	$1.83	9
$1.90–under $2.05	$1.98	14
$2.05–under $2.20	$2.13	17
$2.20–under $2.35	$2.28	16
$2.35–under $2.50	$2.43	18
$2.50–under $2.65	$2.58	8
$2.65–under $2.80	$2.73	5

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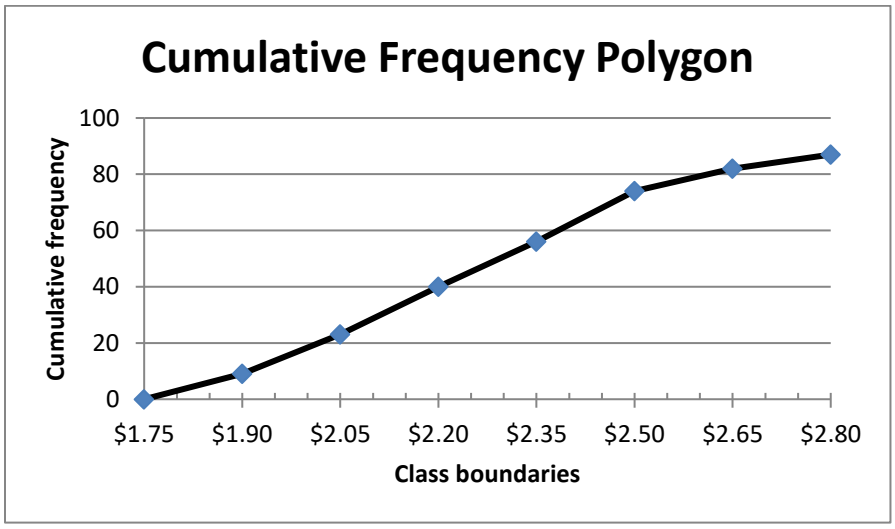




Class boundaries	Cumulative Frequency
$1.75	0
$1.90	9
$2.05	23
$2.20	40
$2.35	56
$2.50	74
$2.65	82
$2.80	87

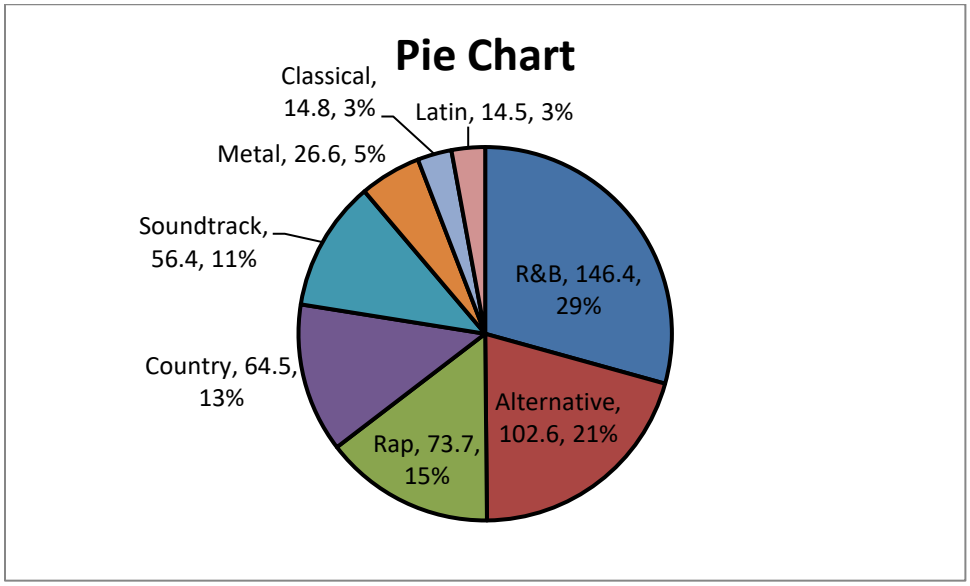
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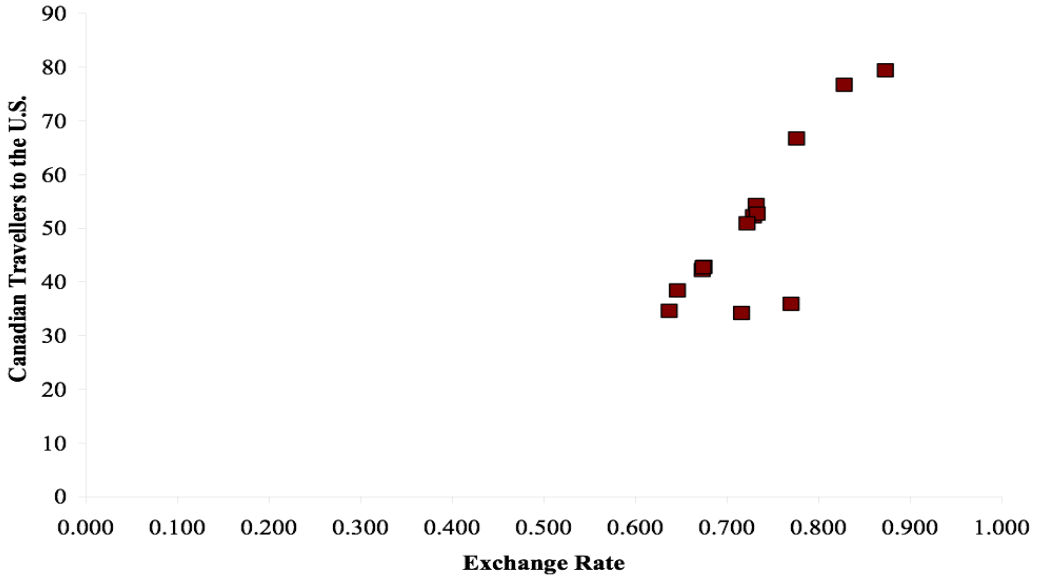
Genre	Albums Sold	Proportion
R&B	146.4	.29
Alternative	102.6	.21
Rap	73.7	.15
Country	64.5	.13
Soundtrack	56.4	.11
Metal	26.6	.05
Classical	14.8	.03
Latin	14.5	.03
TOTAL	499.5	1.00

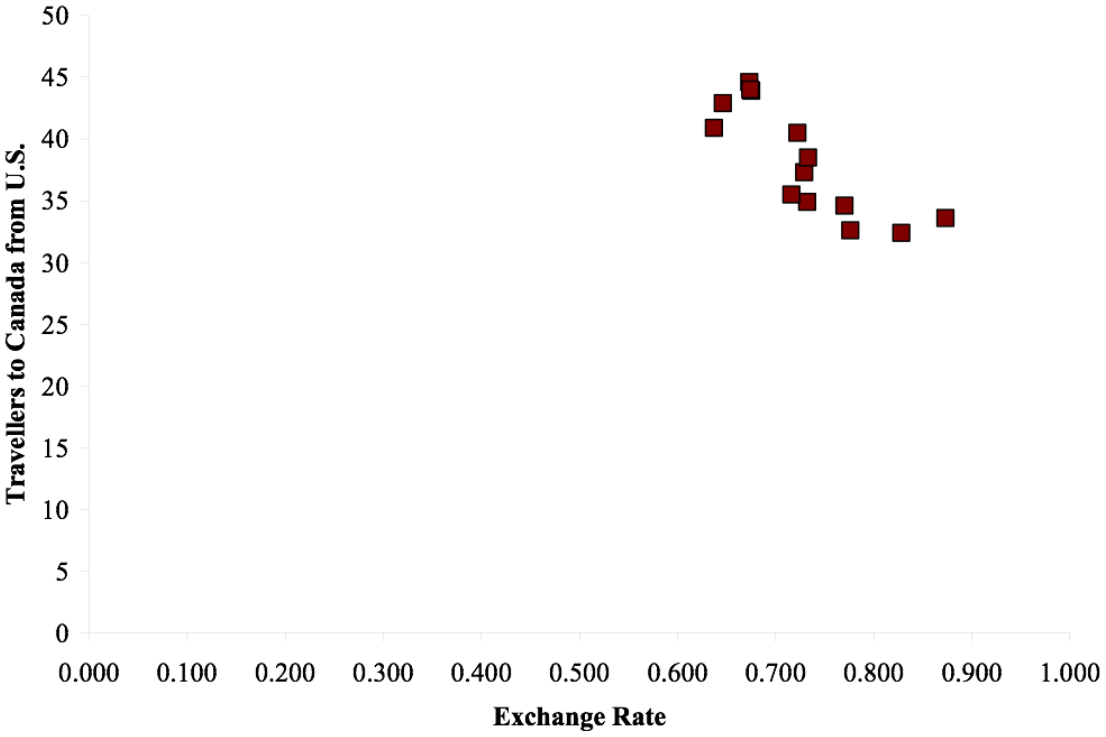


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2.35





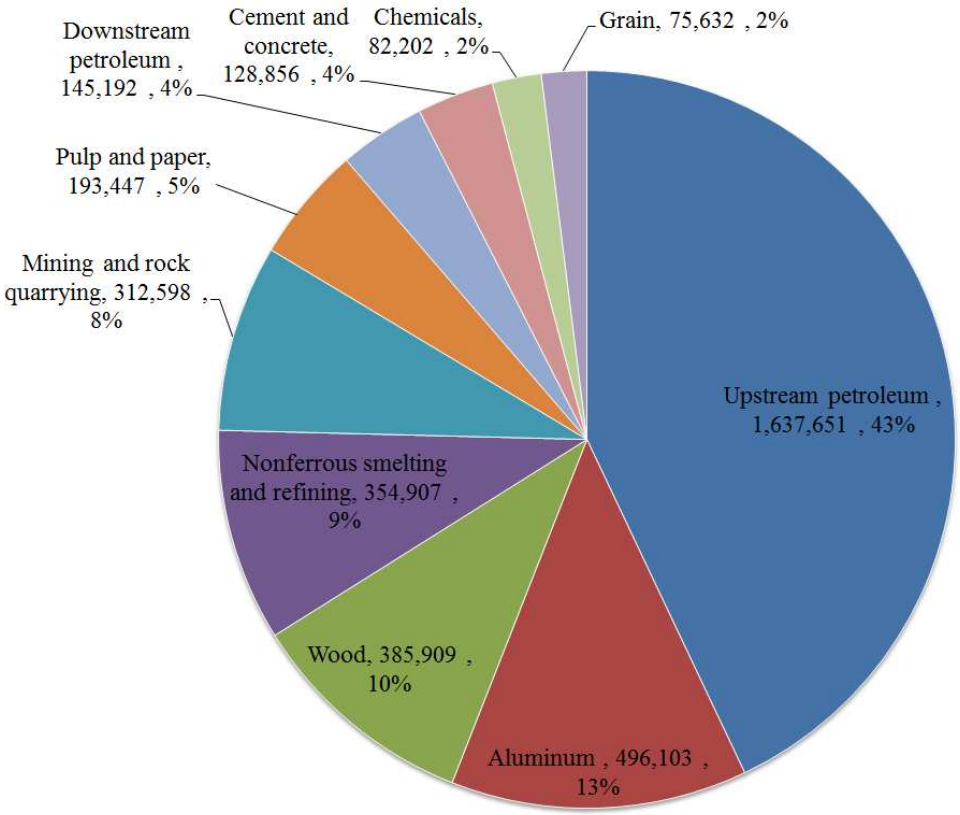
The higher is the exchange rate more Canadian travellers go to the U.S. and less the U.S. travellers do to Canada.

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2.36

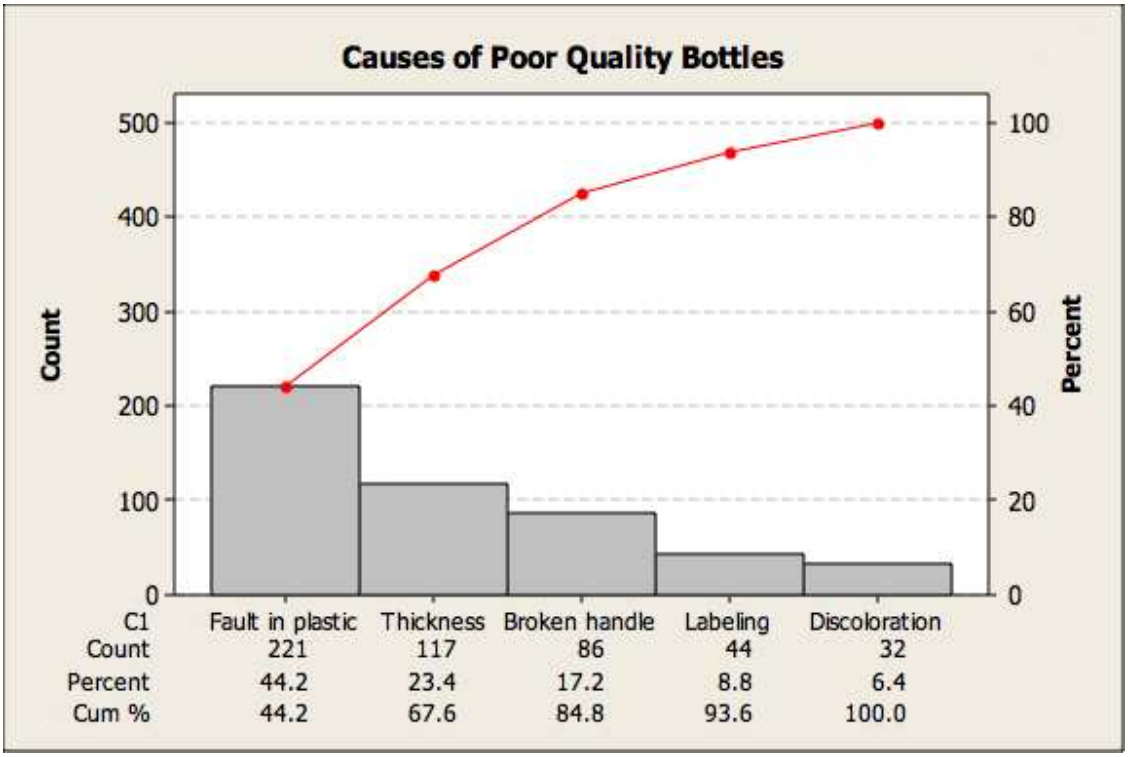
Industrial Source	Total Emissions (tonnes)	Proportion
Upstream petroleum	1,637,651	0.430
Aluminum	496,103	0.130
Wood	385,909	0.101
Nonferrous smelting and refining	354,907	0.093
Mining and rock quarrying	312,598	0.082
Pulp and paper	193,447	0.051
Downstream petroleum	145,192	0.038
Cement and concrete	128,856	0.034
Chemicals	82,202	0.022
Grain	75,632	0.020
Totals	3,812,497	1.0000



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2.37 The Pareto chart indicates that faulty plastic causes 44.2% of the defects and becomes the major problem. According to the chart, 23.4% of the plastic bottles were rejected because of incorrect thickness which can be identified as the second severe problem. The steepest slopes correspond to "fault in plastic", "thickness", and "broken handle" categories. They represent 84.8% causes of poor-quality bottles.



2.38 The histogram shows that all household incomes fall between $30,000 and 140,000.
Since the distribution is almost bell-shaped, the data are approximately normally distributed. The centre of the histogram is located left of $100,000 and indicates that the average household income of mall shoppers is about $90,000. The heights of the tallest three rectangles (around 30 observations each) show most of the mall shoppers have household income between $75,000 and $105,000. There are no outliers.

2.39 Family practice is most prevalent with about 20% with pediatrics next at slight less. A virtual tie exists between ob/gyn, general surgery, anesthesiology, and psychiatry at about 14% each.

2.40 There were relatively constant sales from January through October (about $6 million on average). In November and December sales dramatically increased with December having the sharpest increase ($30 million in sales).

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Chapter 2

Organizing and Visualizing Data

LEARNING OBJECTIVES

The overall objective of chapter 2 is for you to master several techniques for summarizing and visualizing data, thereby enabling you toc:

1. Organize categorical data into frequency tables, percent frequency tables, and cumulative frequency tables. Understand how two variable data sets can be organized using a cross-tabulation chart.
2. Describe and construct different types of categorical data graphs, including pie charts, bar charts, and Pareto charts. Explain when these graphs should be used.
3. Construct a frequency distribution from a set of data and explain what the distribution represents.
4. Describe and construct different types of quantitative data graphs, including histograms, cumulative frequency histograms, and frequency polygons. Explain when these graphs should be used.

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CHAPTER OUTLINE

2.1 Organizing Categorical Data
- Frequency Tables
- Cross Tabulation
- Using the Computer

2.2 Visualizing Categorical Data
- Pie Charts
- Bar Charts
- Pareto Charts
- Two Variable Bar Charts
- Using the Computer

2.3 Organizing Quantitative Data
- Frequency Distribution
- Using the Computer

2.4 Visualizing Quantitative Data
- Histograms
- Frequency Polygons
- Scatter Plot
- Using the Computer

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KEY TERMS

Bar Chart or Graph
Cross Tabulation
Cumulative Frequency
Frequency Distribution
Frequency Polygon
Histogram
Pareto Chart
Pie Chart
Range
Relative Frequency
Scatter Plot

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STUDY QUESTIONS

1. Below is a frequency distribution of ages of managers with a large retail firm. This is an example of _____.

Age	f
20-29	11
30-39	32
40-49	57
50-59	43
over 60	18

2. The difference between the largest and smallest numbers is called the _____.

3. Consider the values below. In constructing a frequency distribution, the beginning point of the lowest class should be at least as small as _____ and the endpoint of the highest class should be at least as large as _____.

   27 21 8 10 9 16 11 12 21 11 29 19 17 22 28 28 29 19 18 26 17 34 19 16 20

4. The class midpoint can be determined by _____.

5-7 Examine the frequency distribution below:

class	frequency
5-under 10	56
10-under 15	43
15-under 20	21
20-under 25	11
25-under 30	12
30-under 35	8

5. The relative frequency for the class 15-under 20 is _____.

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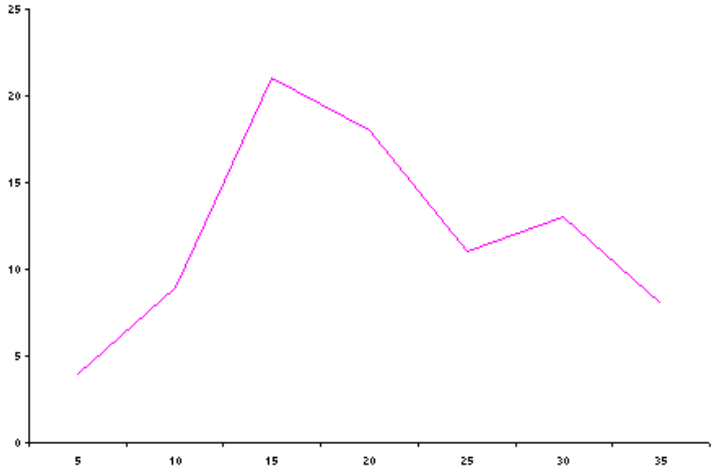
6. The cumulative frequency for the class 20-under 25 is _____.

7. The midpoint for the class 25-under 30 is _____.

8. The graphical depiction that is a type of vertical bar chart and is used to depict a frequency distribution is a _____.

9. The graphical depiction that utilizes cumulative frequencies is a _____.

10. The graph shown below is an example of a _____.



11. Consider the categories below and their relative amounts:

Category	Amount
A	112
B	319
C	57
D	148
E	202

If you were to construct a Pie Chart to depict these categories, then you would allot _____ degrees to category D.

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12. A vertical bar chart that displays the most common types of defects that occur with a product, ranked in order from left to right, is called a _____.

13. A two-dimensional plot of pairs of points often used to examine the relationship of two numerical variables is called a _____.

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ANSWERS TO STUDY QUESTIONS

1. Frequency Table
2. Range
3. 8, 34
4. Averaging the two class endpoints
5. 21/151 = .1391
6. 131
7. 27.5
8. Histogram
9. Ogive
10. Frequency Polygon
11. 148/838 of $360^o = 63.6^o$
12. Pareto Chart
13. Scatter Plot

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SOLUTIONS TO ODD-NUMBERED PROBLEMS IN CHAPTER 2: ORGANIZING AND VISUALIZING DATA

2.1

Airlines	Number of passengers (in millions)	Percentage	Cumulative
Delta	164.6	20.9%	20.9%
United	140.4	17.8%	38.7%
Southwest	134.0	17.0%	55.7%
American	107.9	13.7%	69.4%
China Southern	86.5	11.0%	80.4%
Ryanair	79.6	10.1%	90.5%
Lufthansa	74.7	9.5%	100.0%
TOTAL	*787.7*	100.0%	

2.3

		One-Way Commute Distance (in km)			
		0 - 3	4 - 10	More than 10	Total
Number of Annual	0 - 2	95	184	117	396
Non-vacation -Day	3 - 5	21	40	53	114
Absences	More than 5	3	7	12	22
	Total	119	231	182	532

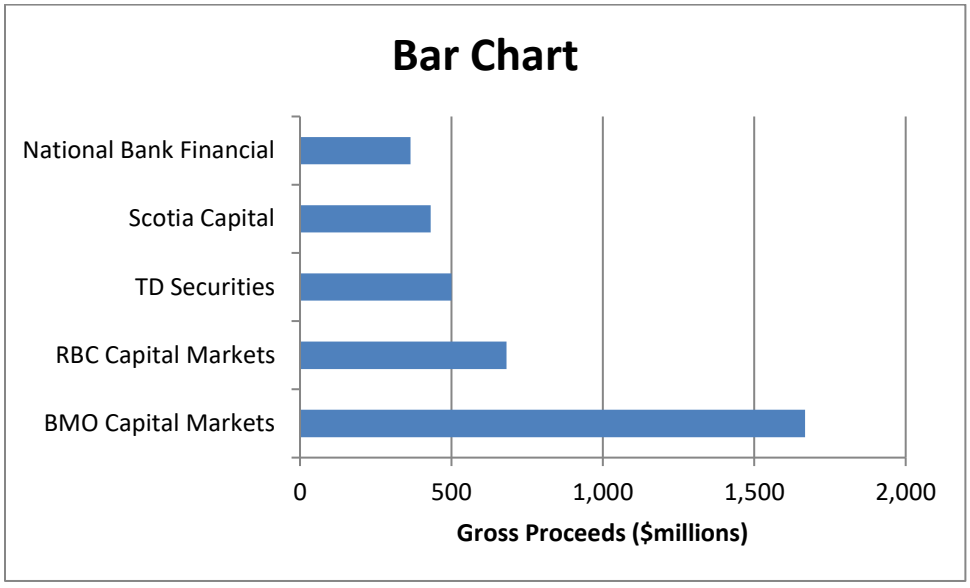
There is a slight tendency for there to be a few more absences as plant workers commute further distances. Say, 6.6% of those who commute more than 10 km had more than 5 non-vacation absent days, as compared to 2.5% and 3% for those who commute 0-3 km and 4-10 km respectively. Comparing workers who travel 4-10 km to those who travel 0-3 km, there is about a 2:1 ratio in all three cells (0-2, 3-5, more than 5 non-vacation day absences) indicating that for these two categories (0-3 and 4-10), number of absences is essentially independent of commute distance.

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2.5

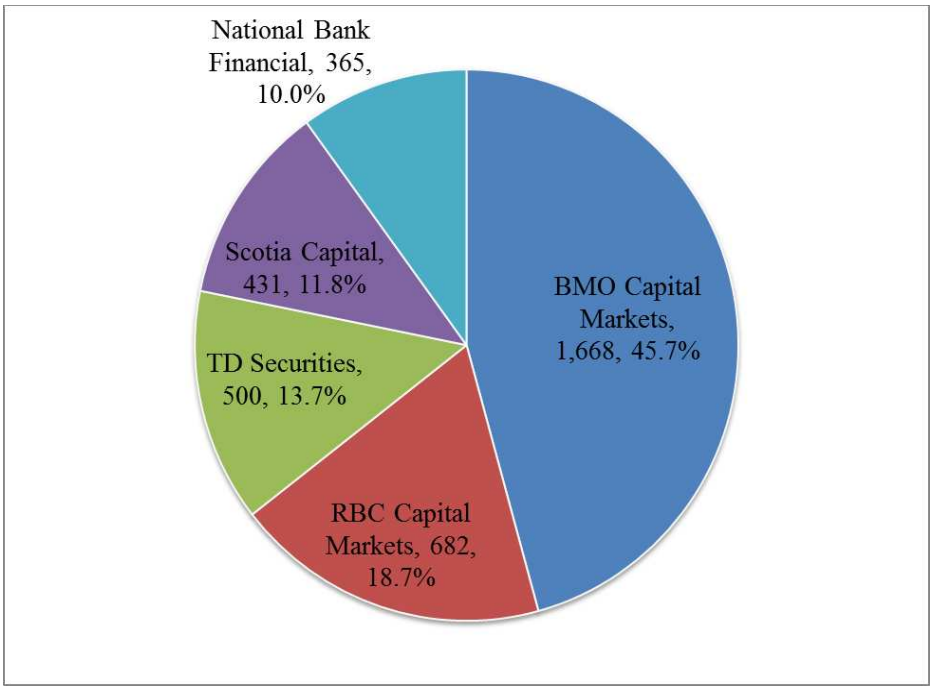
Underwriting Firm	Gross Proceeds ($ millions)	Proportion
BMO Capital Markets	1,668	1,668/3,646=0.457
RBC Capital Markets	682	0.187
TD Securities	500	0.137
Scotia Capital	431	0.118
National Bank Financial	365	0.100
Totals	3,646	1.000



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Pie chart:



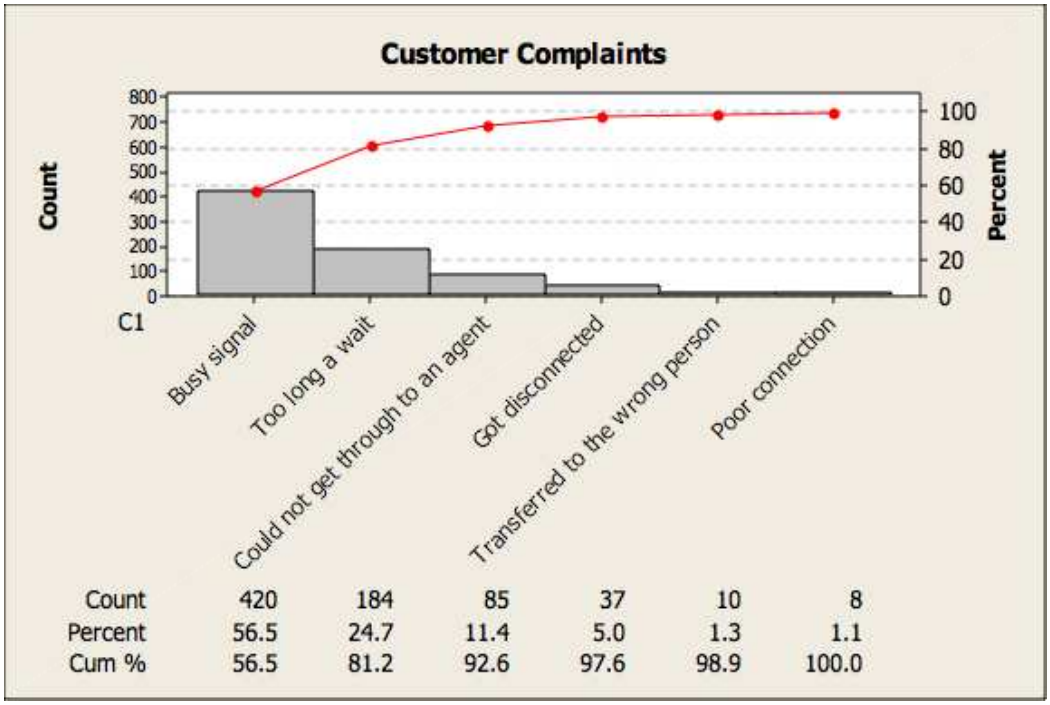
The proportion, sizes and color of the pie slices clearly shows that BMO Capital Markets has the highest revenue ($1,668 million, 45.7%) and National Bank Financial has the lowest revenue ($365 million, 10.0%).

2.7

Complaint	Number	% of Total
Busy Signal	420	56.45
Too long a Wait	184	24.73
Could not get through	85	11.42
Got Disconnected	37	4.97
Transferred to the Wrong Person	10	1.34
Poor Connection	8	1.08
Total	744	99.99

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2.9 One possible frequency distribution is the one below with 12 classes and class width of 2.

Class Interval	Frequency
39 - under 41	2
41 - under 43	1
43 - under 45	5
45 - under 47	10
47 - under 49	18
49 - under 51	13
51 - under 53	15
53 - under 55	15
55 - under 57	7
57 - under 59	9
59 - under 61	4
61 - under 63	1
Totals	100

The distribution reveals that only 13 of the 100 boxes of raisins contain 50 ± 1 raisin (49 - under 51). However, 71 of the 100 boxes of raisins contain 45 - under 55 raisins. It shows that there are five boxes that have 9 or more extra raisins (59 - under 61 and 61 - under 63) and two boxes that have 9-11 less raisins (39 – under 41) than the boxes are supposed to contain.

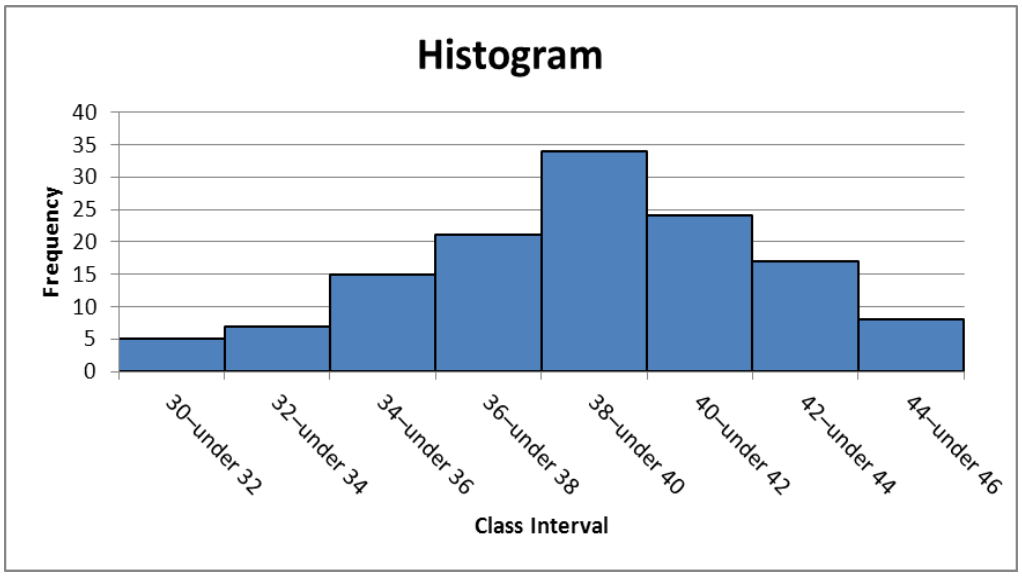
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2.11

Class Interval	Frequency	Relative Frequency	Cumulative Frequency
0- under 2	218	.436	218
2- under 4	207	.414	425
4- under 6	56	.112	481
6- under 8	11	.022	492
8- under 10	8	.016	500
TOTAL	500	1.000	

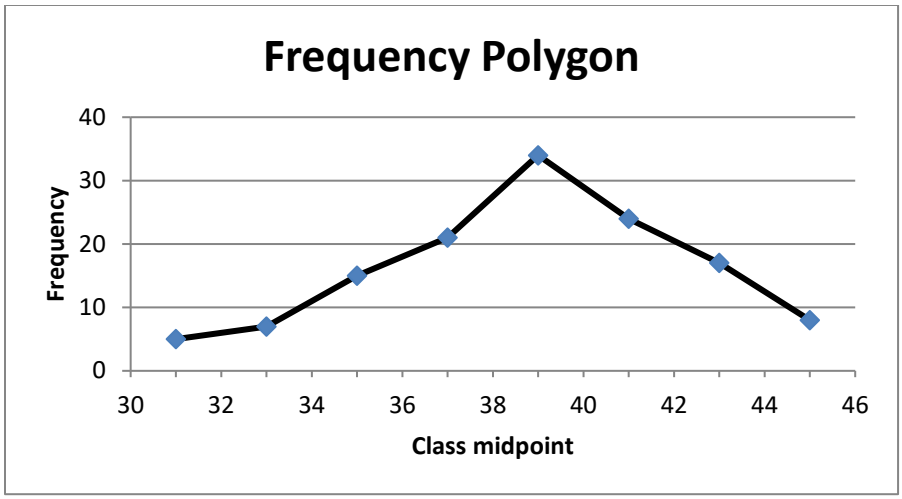
2.13



Class Interval	Class midpoint	Frequency
30–under 32	31	5
32–under 34	33	7
34–under 36	35	15
36–under 38	37	21
38–under 40	39	34
40–under 42	41	24
42–under 44	43	17
44–under 46	45	8

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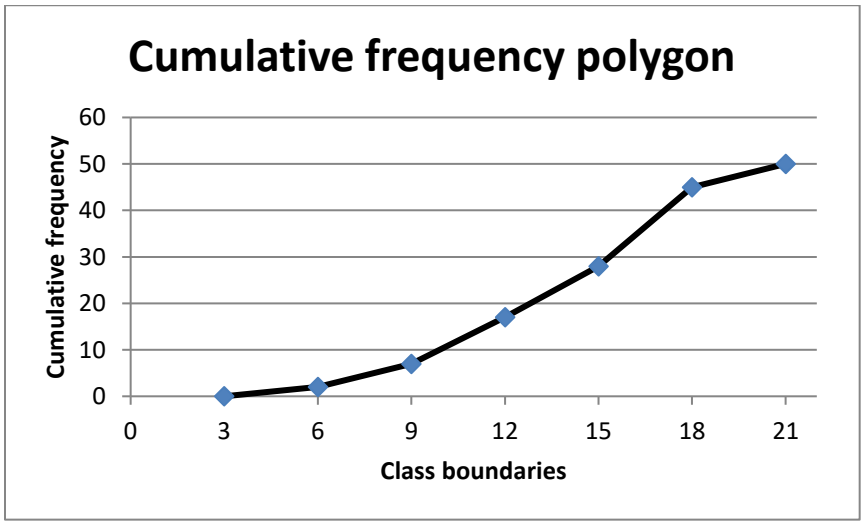
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Comment: The assembly times "pile up" near the middle of the graphs indicating that many of the assembly times are between 36 and 42 minutes.

2.15

Class boundaries	Cumulative frequency
3	0
6	2
9	7
12	17
15	28
18	45
21	50

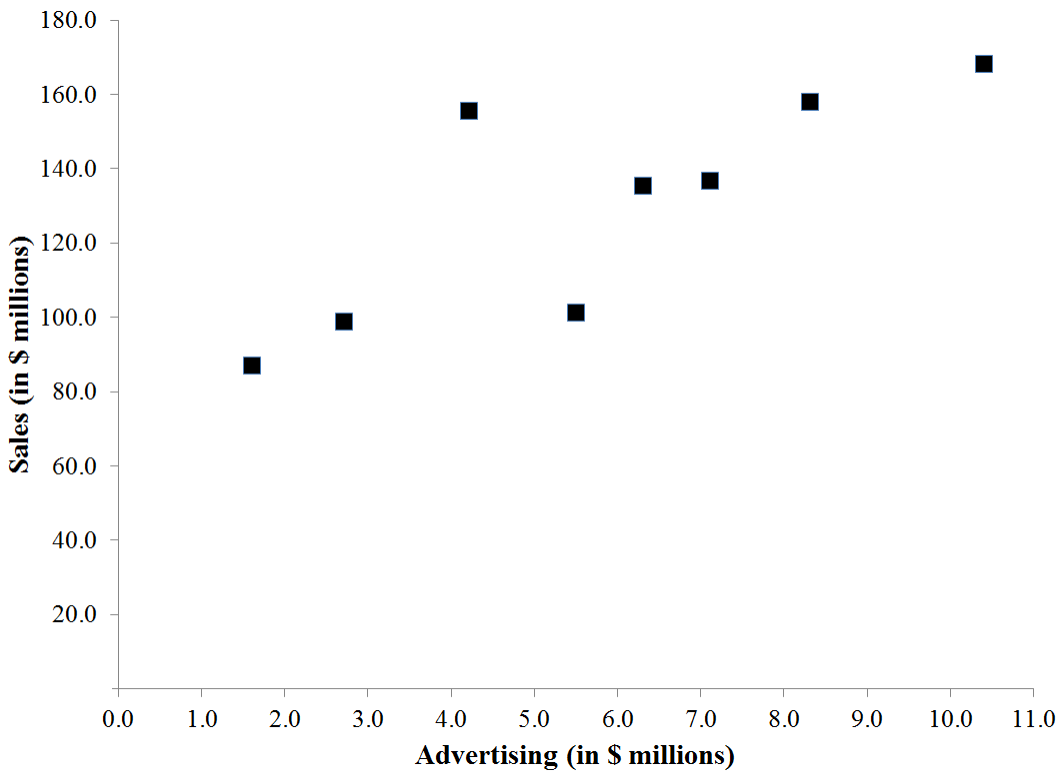


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2.17 We assume that the class endpoints (10, 20, 30, …) are indicated on the horizontal axis and the marks between them represent the class midpoints; the cumulative frequencies are marked on the vertical axis. The graph shows that out of 200, 50 pots contain less than 10 legal king crabs. About 90 selected pots (45%) have fewer than 20 legal king crabs, and about 120 (60%) contain less than 30 legal king crabs. However, 180 pots (90%) have less than 80 legal king crabs.

2.19



Generally speaking, the tendency is that sales are higher when more money is spent on advertising.

2.21

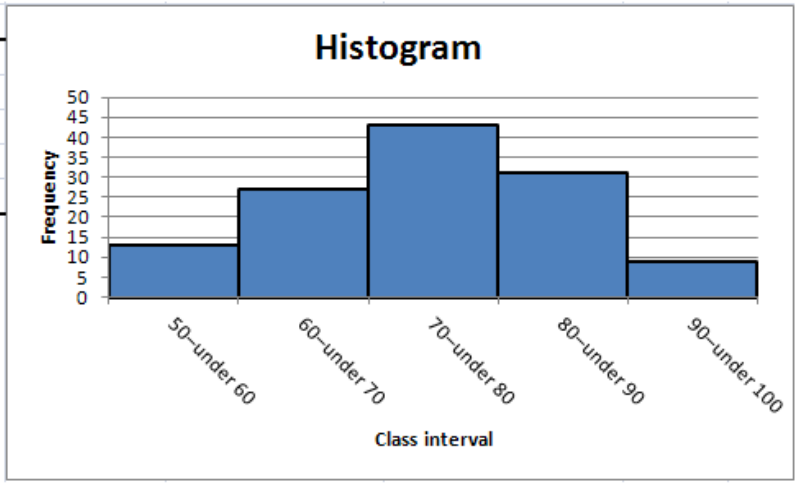
Class Interval	Frequency
16 - under 23	6
23 - under 30	9
30 - under 37	4
37 - under 44	4
44 - under 51	4
51 - under 58	3
TOTAL	30

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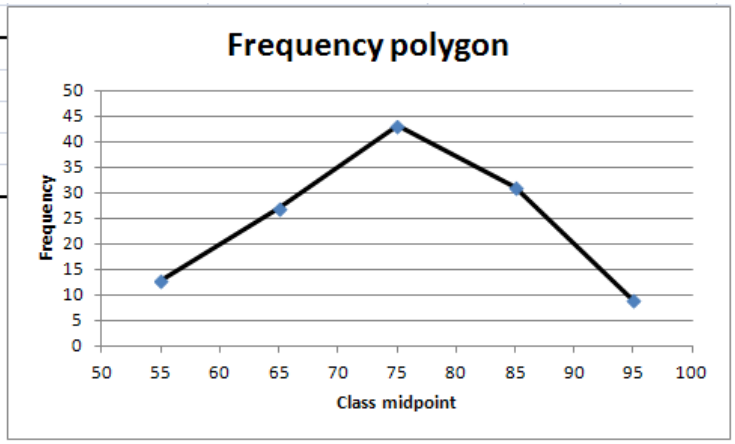
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2.23

Class Interval	Frequency
50–under 60	13
60–under 70	27
70–under 80	43
80–under 90	31
90–under 100	9



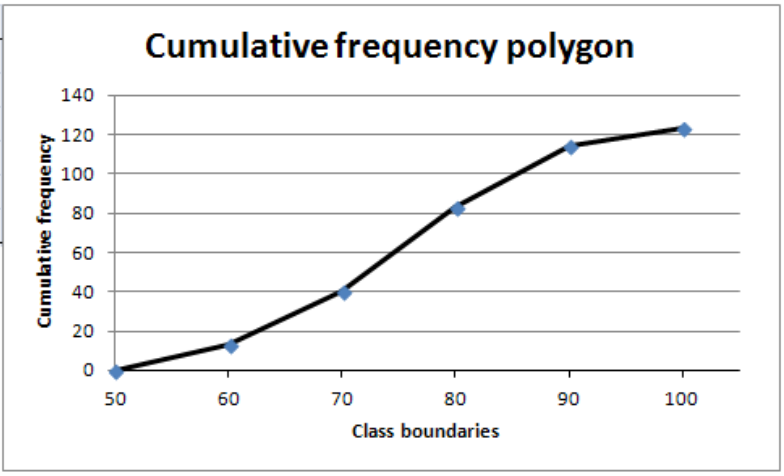
Class Interval	Class midpoint	Frequency
50–under 60	55	13
60–under 70	65	27
70–under 80	75	43
80–under 90	85	31
90–under 100	95	9



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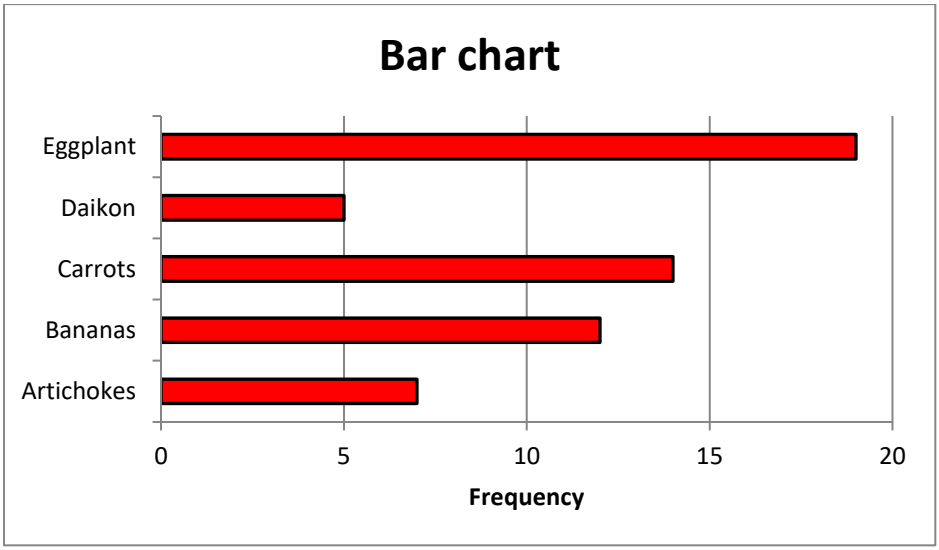
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Class boundaries	Cumulative frequency
50	0
60	13
70	40
80	83
90	114
100	123



2.25

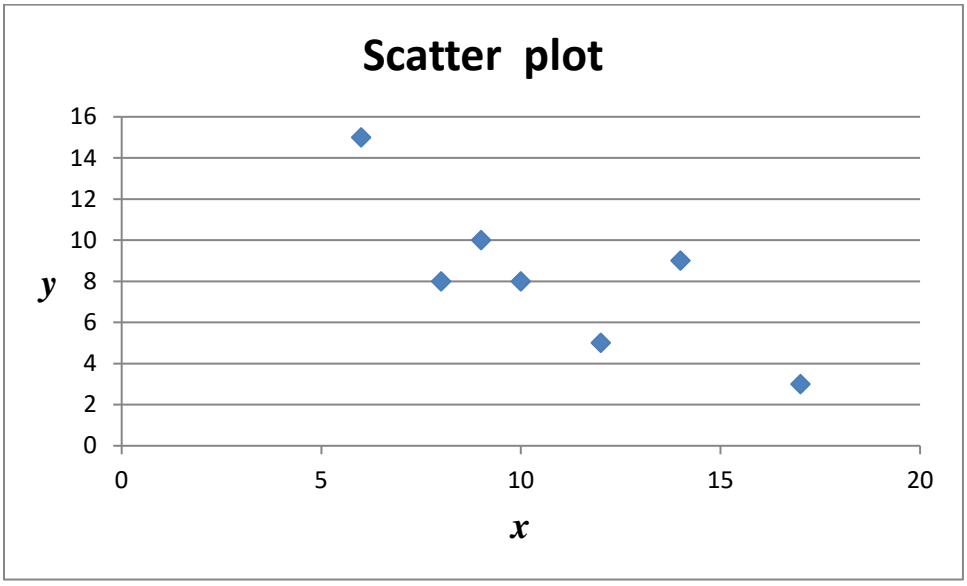
Category	Frequency
Artichokes	7
Bananas	12
Carrots	14
Daikon	5
Eggplant	19



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2.27



2.29

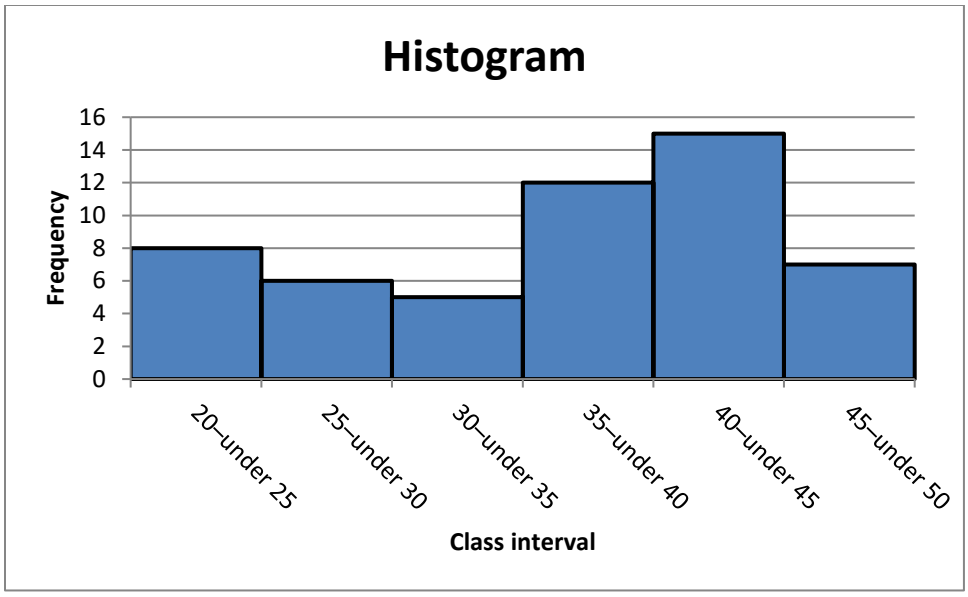
Class Interval	Frequency	Relative Frequency	Cumulative Frequency
20 – 25	8	8/53 = .1509	8
25 – 30	6	.1132	14
30 – 35	5	.0943	19
35 – 40	12	.2264	31
40 – 45	15	.2830	46
45 – 50	7	.1321	53
TOTAL	53	.9999 ≈ 1	

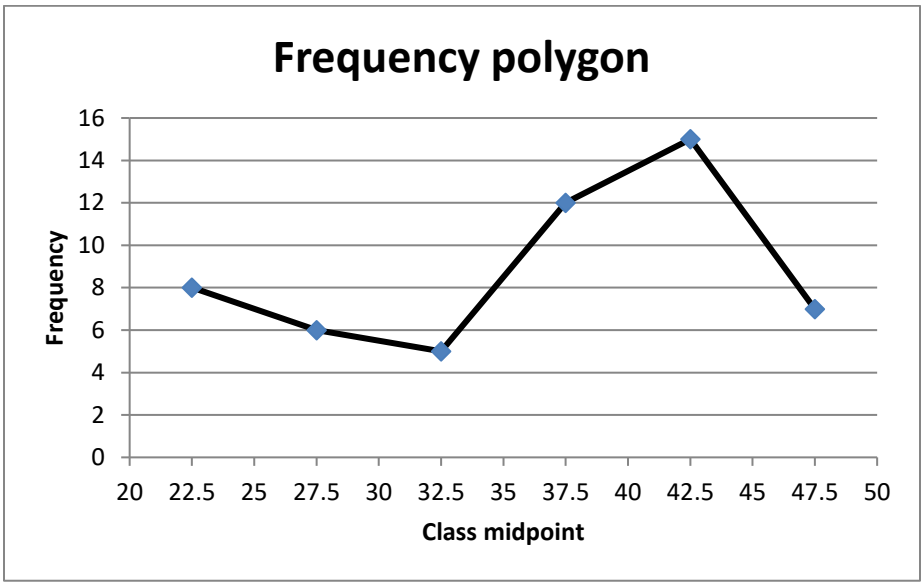
2.31 a.

Class Interval	Class midpoint	Frequency
20–under 25	22.5	8
25–under 30	27.5	6
30–under 35	32.5	5
35–under 40	37.5	12
40–under 45	42.5	15
45–under 50	47.5	7

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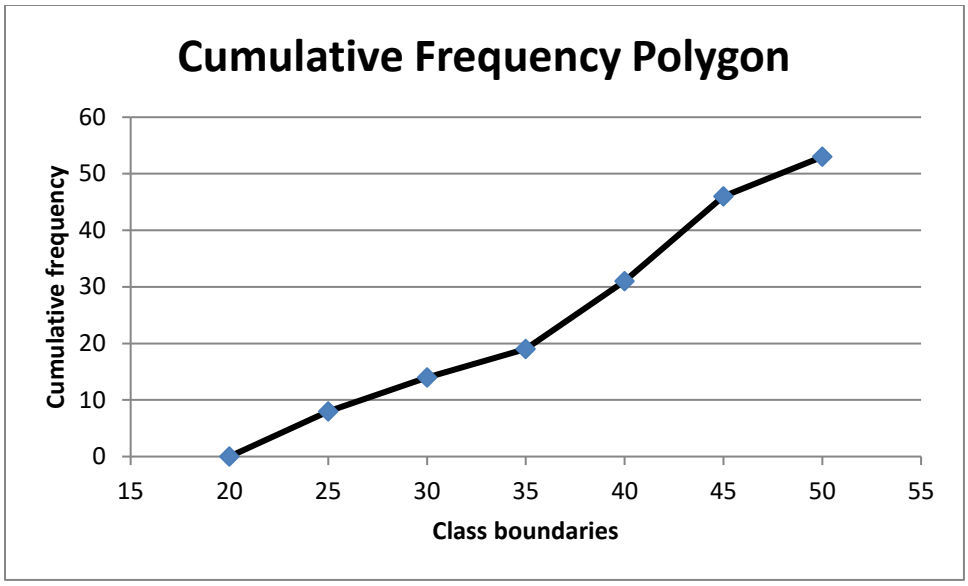


b.

Class boundaries	Cumulative Frequency
20	0
25	8
30	14
35	19
40	31
45	46
50	53

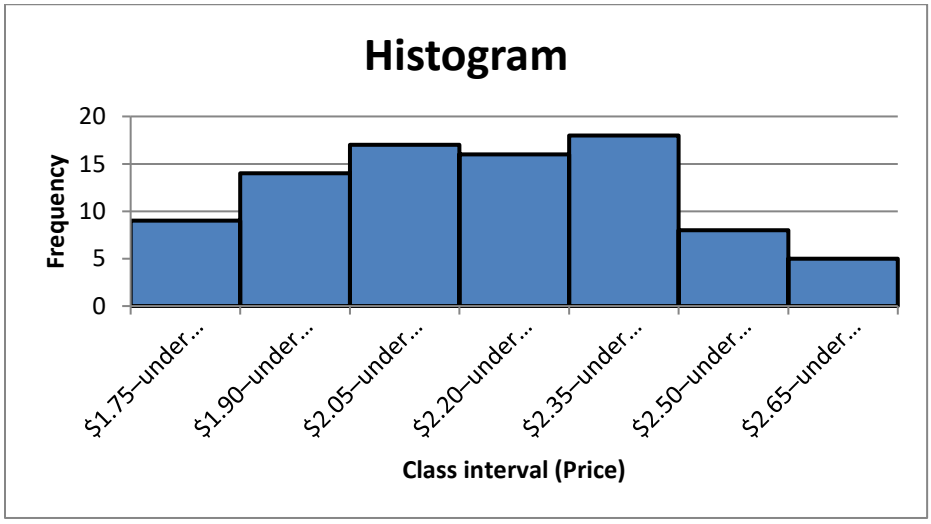
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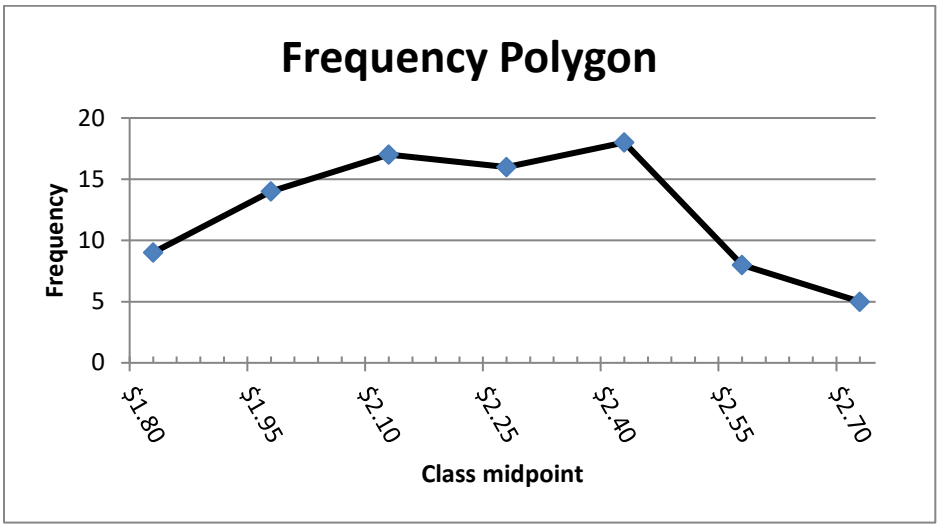
2.33

Class interval (Price)	Class Midpoint	Frequency
$1.75–under $1.90	$1.83	9
$1.90–under $2.05	$1.98	14
$2.05–under $2.20	$2.13	17
$2.20–under $2.35	$2.28	16
$2.35–under $2.50	$2.43	18
$2.50–under $2.65	$2.58	8
$2.65–under $2.80	$2.73	5

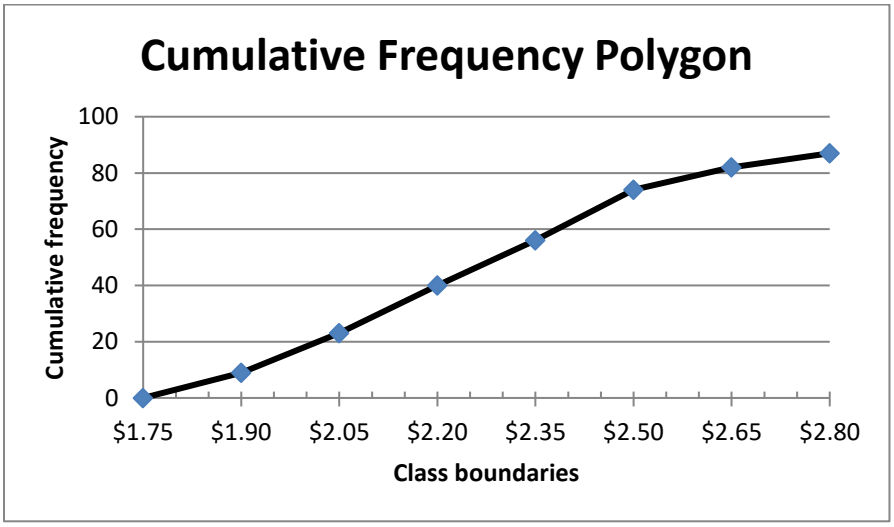


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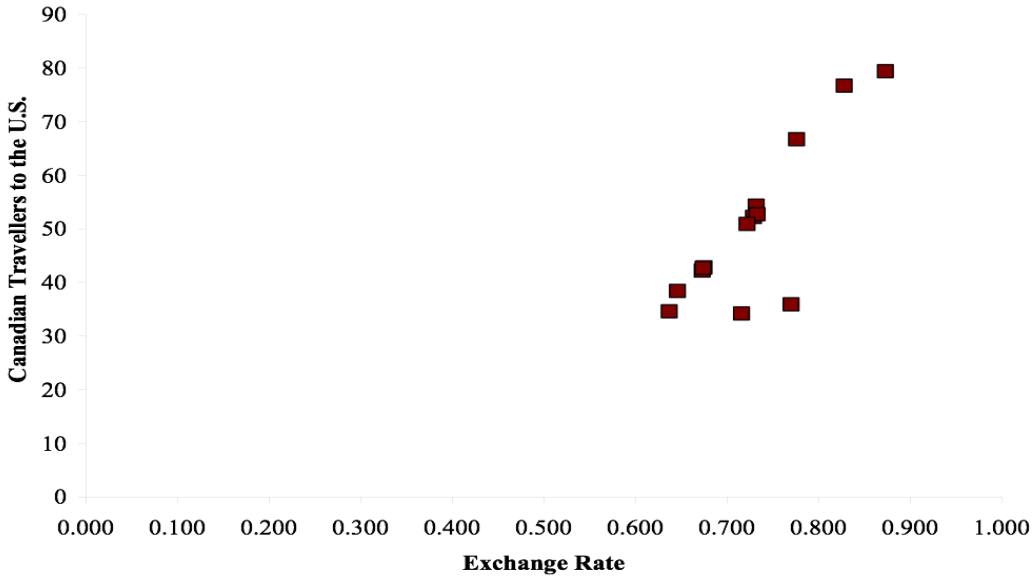
Class boundaries	Cumulative Frequency
$1.75	0
$1.90	9
$2.05	23
$2.20	40
$2.35	56
$2.50	74
$2.65	82
$2.80	87

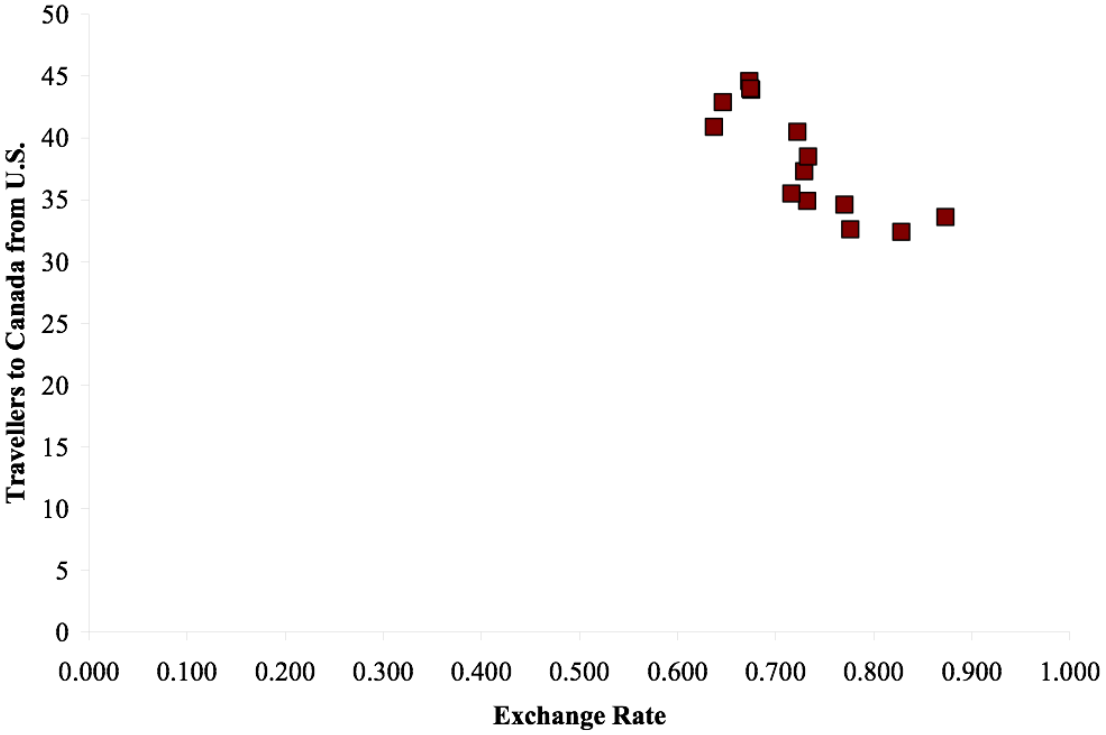


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2.35



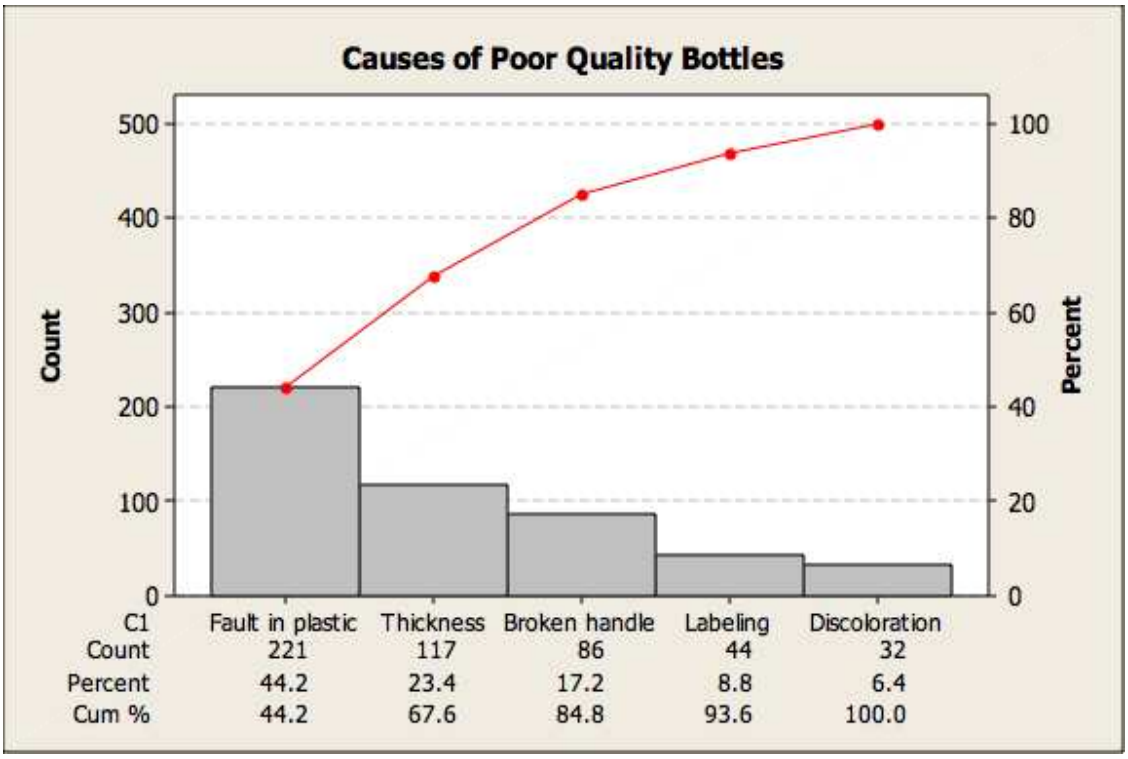


The higher is the exchange rate more Canadian travellers go to the U.S. and less the U.S. travellers do to Canada.

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2.37 The Pareto chart indicates that faulty plastic causes 44.2% of the defects and becomes the major problem. According to the chart, 23.4% of the plastic bottles were rejected because of incorrect thickness which can be identified as the second severe problem. The steepest slopes correspond to “fault in plastic”, “thickness”, and “broken handle” categories. They represent 84.8% causes of poor-quality bottles.



2.39 Family practice is most prevalent with about 20% with pediatrics next at slightly less. A virtual tie exists between ob/gyn, general surgery, anesthesiology, and psychiatry at about 14% each.

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