

# Solutions Manual for Essentials of Business Statistics 3rd Jaggia

SOLUTIONS MANUAL SAMPLE PREVIEW

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**Solutions Manual**

# Chapter 2. Data Visualization

## Solutions

1.

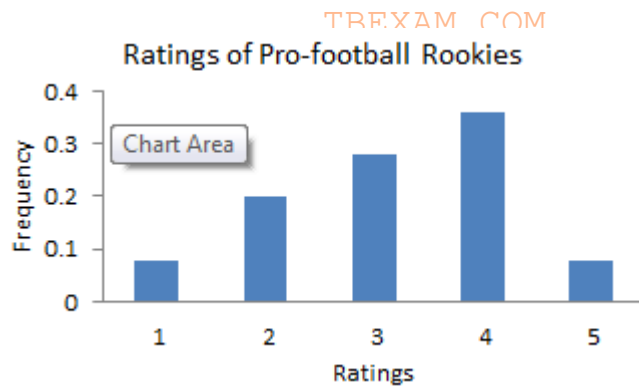
- a. 22 (18 + 4) out of 50 rookies received a rating of 4 or better; 14 (10 + 4) out of 50 rookies received a rating of 2 or worse.

b.

| Rating | Frequency | Relative Frequency |
|--------|-----------|--------------------|
| 1      | 4         | $4/50 = 0.08$      |
| 2      | 10        | 0.20               |
| 3      | 14        | 0.28               |
| 4      | 18        | 0.36               |
| 5      | 4         | 0.08               |

8% of the rookies received a rating of 5.

c.



The rating of 4 has the highest frequency; the distribution is not symmetric, rather it is negatively skewed.

2.

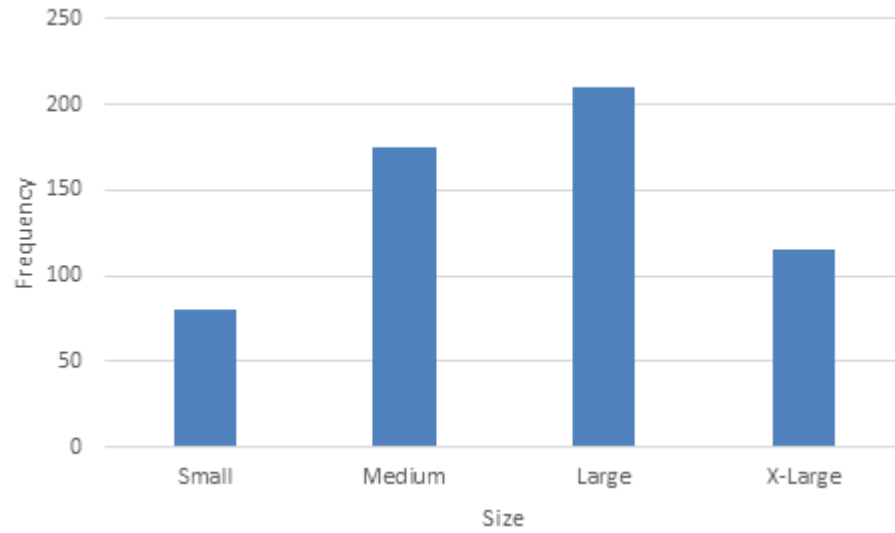
a.

| Size    | Frequency | Relative Frequency |
|---------|-----------|--------------------|
| Small   | 80        | $80/580 = 0.138$   |
| Medium  | 175       | 0.302              |
| Large   | 210       | 0.362              |
| X-Large | 115       | 0.198              |

The proportion of the sales for medium-sized shirts was 0.302.

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b.



Sales of large-sized shirts had the highest frequency and sales of small-sized shirts had the lowest frequency.

3.

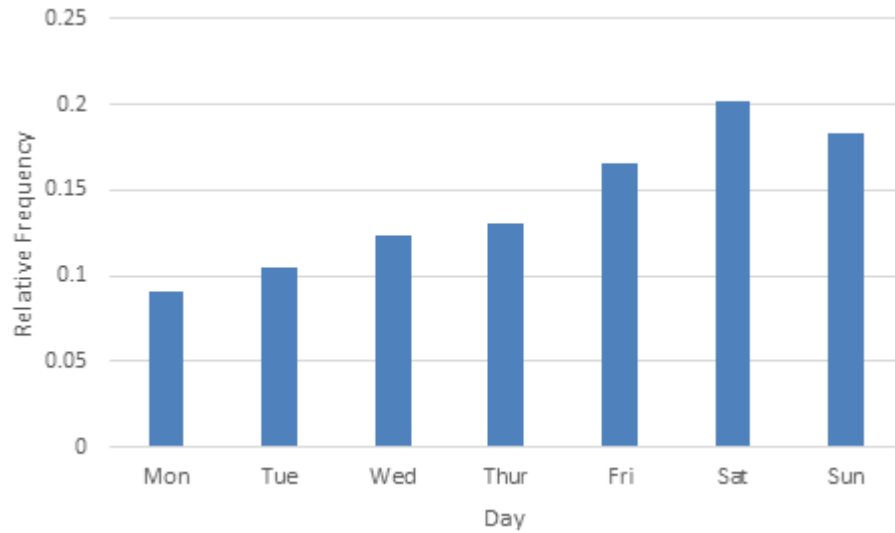
a.

| Day  | Frequency | Relative Frequency     |
|------|-----------|------------------------|
| Mon  | 2504      | $2504 / 27500 = 0.091$ |
| Tue  | 2880      | 0.105                  |
| Wed  | 3402      | 0.124                  |
| Thur | 3566      | 0.130                  |
| Fri  | 4576      | 0.166                  |
| Sat  | 5550      | 0.202                  |
| Sun  | 5022      | 0.183                  |

The proportion of purchases that occurred on Wednesday was 0.124.

b.

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The retailer saw the highest proportion of sales on the weekend. The lowest proportion of sales occurred on Monday.

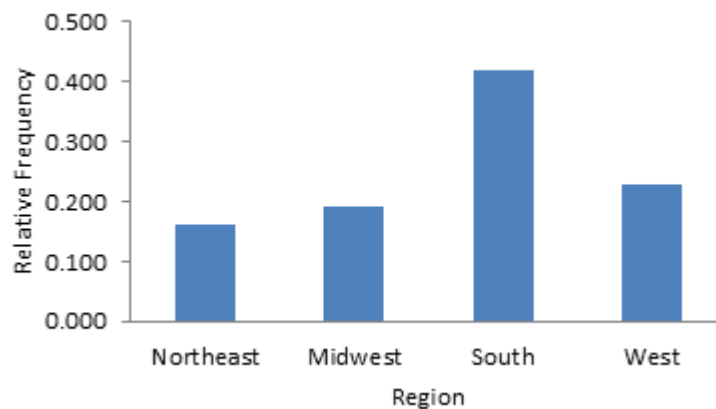
4.

a.

| Region    | Number of People | Relative Frequency       |
|-----------|------------------|--------------------------|
| Northeast | 6,373            | $6,373 / 39,698 = 0.161$ |
| Midwest   | 7,647            | 0.193                    |
| South     | 16,609           | 0.418                    |
| West      | 9,069            | 0.228                    |

19.3% of people in the Midwest are living below the poverty level.

b.



The South has the highest relative frequency as compared to the other three regions, which are roughly equal.

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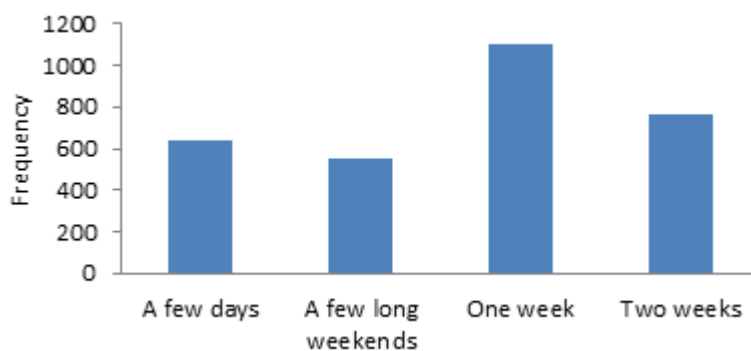
5.

a.

| Response            | Relative Frequency | Frequency            |
|---------------------|--------------------|----------------------|
| A few days          | 0.21               | $0.21(3057) = 642$   |
| A few long weekends | 0.18               | $0.18(3057) = 550$   |
| One week            | 0.36               | $0.36(3057) = 1,101$ |
| Two weeks           | 0.25               | $0.25(3057) = 764$   |

Approximately 1,101 people are going to take a one-week vacation.

b.



“One week” has the highest frequency as compared to the other categories, which are roughly equal.

6.

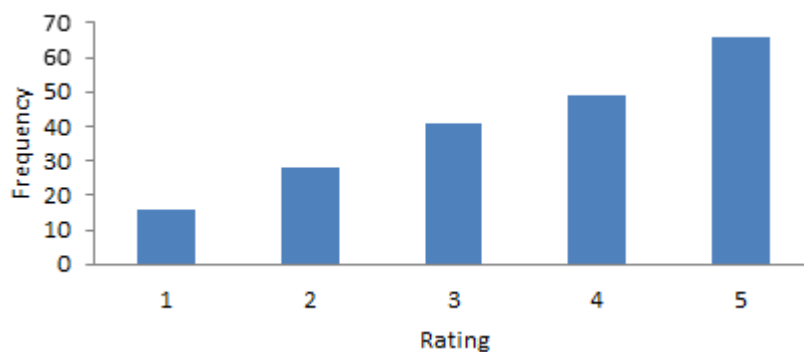
a.

| Rating | Frequency |
|--------|-----------|
| 1      | 16        |
| 2      | 28        |
| 3      | 41        |
| 4      | 49        |
| 5      | 66        |

A rating of 5 has the highest frequency

b.

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The higher ratings have the higher frequencies.

7.

a.

| Quality of Health | Frequency |
|-------------------|-----------|
| Poor              | 18        |
| Fair              | 26        |
| Good              | 75        |
| Excellent         | 31        |

Good is the most common response.

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b.



Patients seem to be healthy, with the majority rated Good or Excellent.

8.

a.

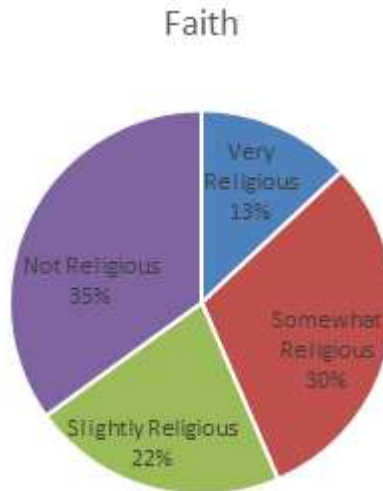
| Faith              | Frequency |
|--------------------|-----------|
| Very Religious     | 78        |
| Somewhat Religious | 183       |
| Slightly Religious | 129       |

## Chapter 02 – Data Visualization

| Faith         | Frequency |
|---------------|-----------|
| Not Religious | 210       |

Not Religious is the most common response.

b.



$210/600 = 0.35$ ; about 35% responded “Not Religious” which is consistent with the earlier study. [TBEXAM.COM](http://TBEXAM.COM)

9.

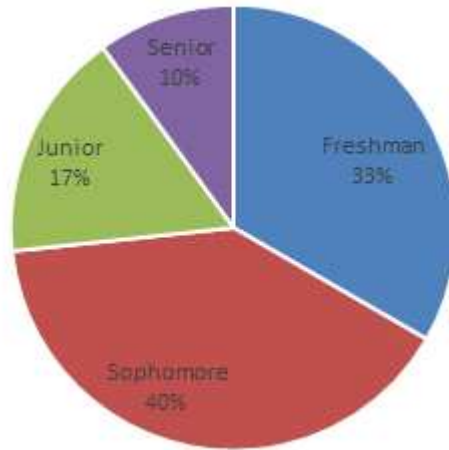
a.

| Status    | Frequency | Relative Frequency |
|-----------|-----------|--------------------|
| Freshman  | 20        | 0.33               |
| Sophomore | 24        | 0.40               |
| Junior    | 10        | 0.17               |
| Senior    | 6         | 0.10               |

There are 20 freshmen in her class; 40% of the class are sophomores.

b.

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Freshmen and sophomores make up the majority of the class, 33% and 40%, respectively; 17% of the class are juniors and the remaining 10% are seniors.

10.

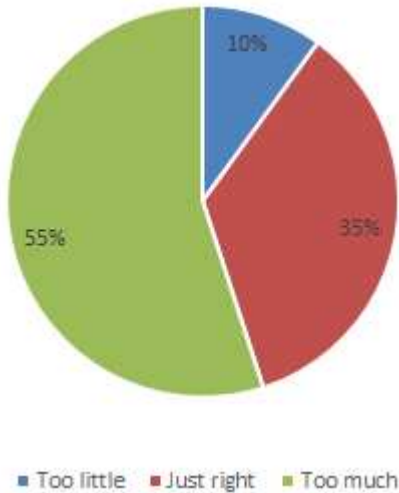
a.

| Response   | Frequency | Relative Frequency |
|------------|-----------|--------------------|
| Too little | 40        | 0.10               |
| Just right | 140       | 0.35               |
| Too much   | 220       | 0.55               |

220 – number of respondents who felt that parents do too much for adult children;  
 0.10 – proportion of respondents who felt that parents do too little for adult children

b.

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The majority of respondents, 55%, felt that parents do too much for their adult children; only 10% of respondents felt that parents do too little for their adult children.

11.

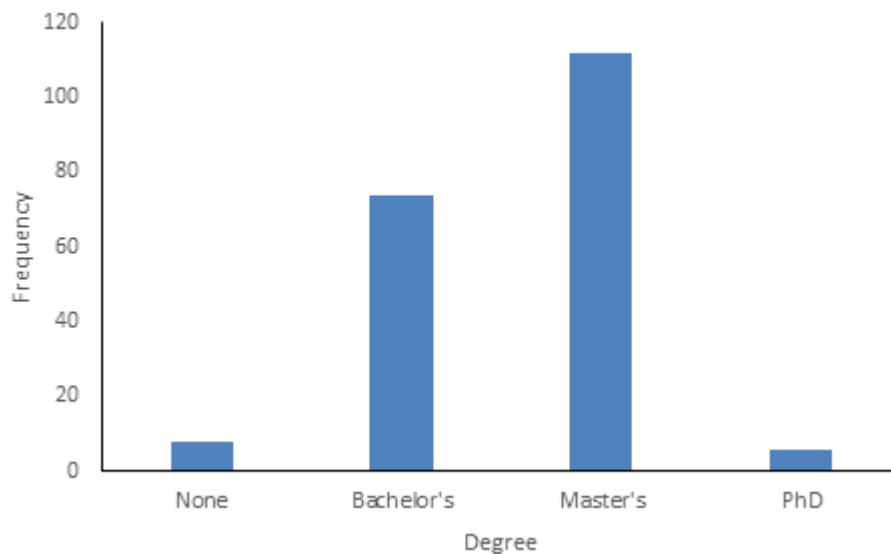
a.

| Degree     | Frequency | Relative Frequency |
|------------|-----------|--------------------|
| None       | 8         | 0.04               |
| Bachelor's | 74        | 0.37               |
| Master's   | 112       | 0.56               |
| PhD        | 6         | 0.03               |

Yes, out of 200 CEOs more than half have advance degrees ( $112 + 6 = 118$ ); only 4% of CEOs do not have at least a Bachelor's degree.

b.

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The majority of CEOs have a Bachelor's or a Master's degree. Very few CEOs have no degree or a PhD.

12.

| Interval               | Frequency | Relative Frequency | Cumulative Frequency | Cumulative Relative Frequency |
|------------------------|-----------|--------------------|----------------------|-------------------------------|
| $1,000 < x \leq 1,100$ | 22        | $22 / 120 = 0.183$ | 22                   | $22 / 120 = 0.183$            |
| $1,100 < x \leq 1,200$ | 38        | 0.317              | $22 + 38 = 60$       | $60 / 120 = 0.500$            |
| $1,200 < x \leq 1,300$ | 44        | 0.367              | 104                  | 0.867                         |
| $1,300 < x \leq 1,400$ | 16        | 0.133              | 120                  | 1.000                         |

- a. 0.317
- b. 104
- c. 0.867; 0.133

13.

| Interval         | Frequency | Relative Frequency | Cumulative Frequency | Cumulative Relative Frequency |
|------------------|-----------|--------------------|----------------------|-------------------------------|
| $10 < x \leq 20$ | 12        | $12 / 56 = 0.214$  | 12                   | $12 / 56 = 0.214$             |
| $20 < x \leq 30$ | 15        | 0.268              | $12 + 15 = 27$       | $27 / 56 = 0.482$             |
| $30 < x \leq 40$ | 25        | 0.446              | 52                   | 0.928                         |
| $40 < x \leq 50$ | 4         | 0.071              | 56                   | 1.000                         |

- a. 0.268

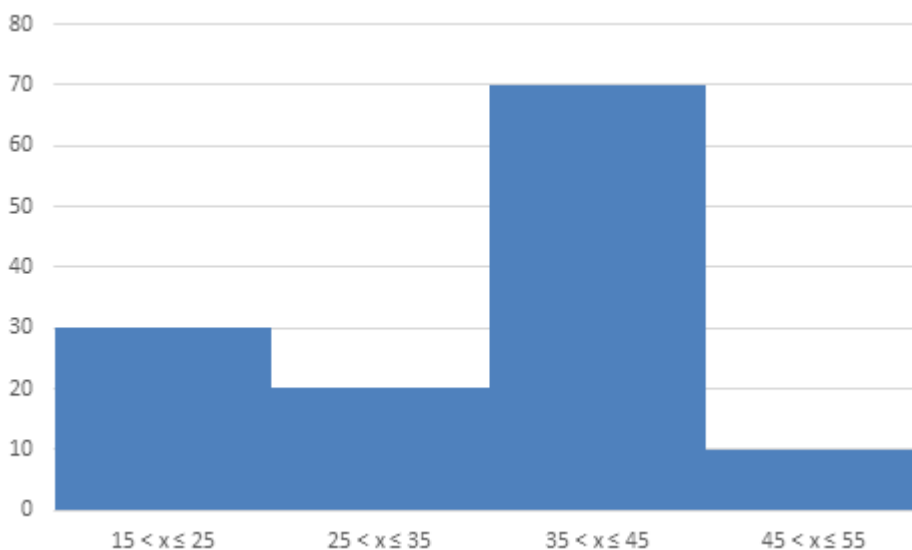
## Chapter 02 – Data Visualization

- b. 52  
c. 0.482

14.

| Interval         | Cumulative Frequency | Frequency        | Cumulative Relative Frequency |
|------------------|----------------------|------------------|-------------------------------|
| $15 < x \leq 25$ | 30                   | 30               | $30/130 = 0.231$              |
| $25 < x \leq 35$ | 50                   | $50 - 30 = 20$   | $50/130 = 0.385$              |
| $35 < x \leq 45$ | 120                  | $120 - 50 = 70$  | 0.923                         |
| $45 < x \leq 55$ | 130                  | $130 - 120 = 10$ | 1.000                         |

- a. 70  
b. 0.923  
c. The distribution is not symmetric.



15.

| Interval           | Relative Frequency | Frequency            | Cumulative Frequency | Cumulative Relative Frequency |
|--------------------|--------------------|----------------------|----------------------|-------------------------------|
| $-20 < x \leq -10$ | 0.04               | $0.04 \times 50 = 2$ | 2                    | 0.04                          |
| $-10 < x \leq 0$   | 0.28               | 14                   | $2 + 14 = 16$        | $0.04 + 0.28 = 0.32$          |
| $0 < x \leq 10$    | 0.26               | 13                   | 29                   | 0.58                          |
| $10 < x \leq 20$   | 0.22               | 11                   | 40                   | 0.80                          |
| $20 < x \leq 30$   | 0.20               | 10                   | 50                   | 1.00                          |

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- a. 14  
b. 40

16.

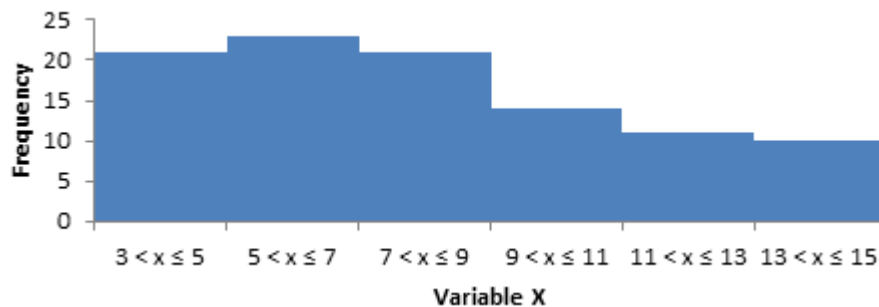
| Interval           | Cumulative Relative Frequency | Relative Frequency   |
|--------------------|-------------------------------|----------------------|
| $150 < x \leq 200$ | 0.10                          | 0.10                 |
| $200 < x \leq 250$ | 0.35                          | $0.35 - 0.10 = 0.25$ |
| $250 < x \leq 300$ | 0.70                          | 0.35                 |
| $300 < x \leq 350$ | 1.00                          | 0.30                 |

- a. 0.70  
b. 0.35

17.

| Interval         | Frequency | Relative Frequency |
|------------------|-----------|--------------------|
| $3 < x \leq 5$   | 21        | 0.21               |
| $5 < x \leq 7$   | 23        | 0.23               |
| $7 < x \leq 9$   | 21        | 0.21               |
| $9 < x \leq 11$  | 14        | 0.14               |
| $11 < x \leq 13$ | 11        | 0.11               |
| $13 < x \leq 15$ | 10        | 0.10               |

- a. 21  
b. 0.23  
c. The distribution is not symmetric.



18.

## Chapter 02 – Data Visualization

| Interval         | Frequency | Relative Frequency | Cumulative Relative Frequency |
|------------------|-----------|--------------------|-------------------------------|
| $-10 < x \leq 0$ | 9         | 0.09               | 0.09                          |
| $0 < x \leq 10$  | 47        | 0.47               | 0.56                          |
| $10 < x \leq 20$ | 31        | 0.31               | 0.87                          |
| $20 < x \leq 30$ | 8         | 0.08               | 0.95                          |
| $30 < x \leq 40$ | 5         | 0.05               | 1                             |

- a. 47  
b. 0.31; 0.13

19.

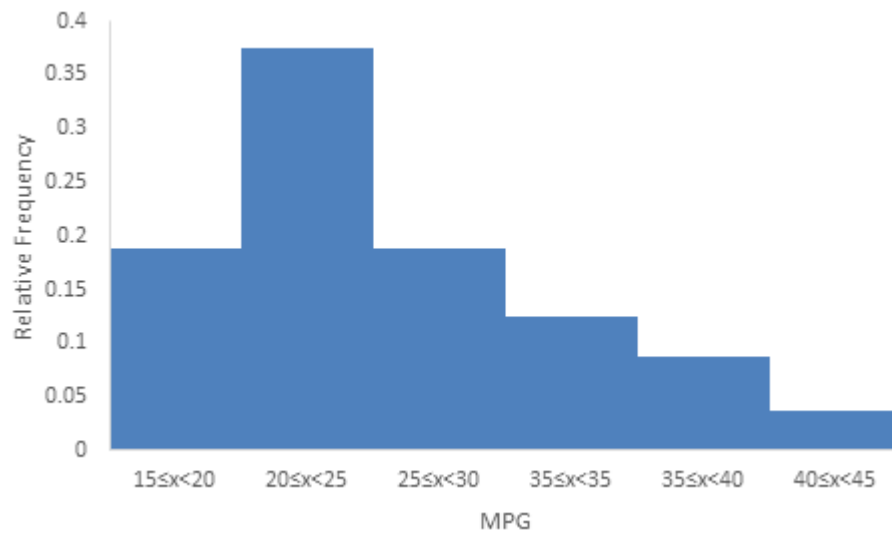
a.

| Average MPG      | Relative frequency |
|------------------|--------------------|
| $15 \leq x < 20$ | $15/80 = 0.1875$   |
| $20 \leq x < 25$ | 0.3750             |
| $25 \leq x < 30$ | 0.1875             |
| $30 \leq x < 35$ | 0.1250             |
| $35 \leq x < 40$ | 0.0875             |
| $40 \leq x < 45$ | 0.0375             |

0.375 of the cars got at least 20 but less than 25 mpg; 0.875 of the cars got less than 35 mpg. Since 0.875 got less than 35 mpg, 0.125 of the cars got 35 mpg or more.

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b.



The distribution is not symmetric; it is positively skewed.

20.

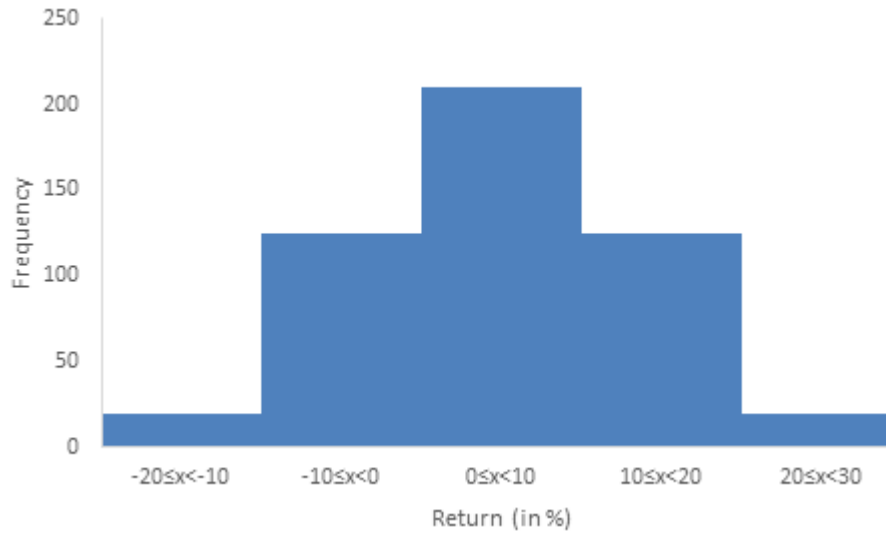
a.

| Return (%)         | Frequency        |
|--------------------|------------------|
| $-20 \leq x < -10$ | $0.04(500) = 20$ |
| $-10 \leq x < 0$   | 125              |
| $0 \leq x < 10$    | 210              |
| $10 \leq x < 20$   | 125              |
| $20 \leq x < 0$    | 20               |

125 stocks had returns of at least 10% but less than 20%.

b.

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The distribution is symmetric.

21.

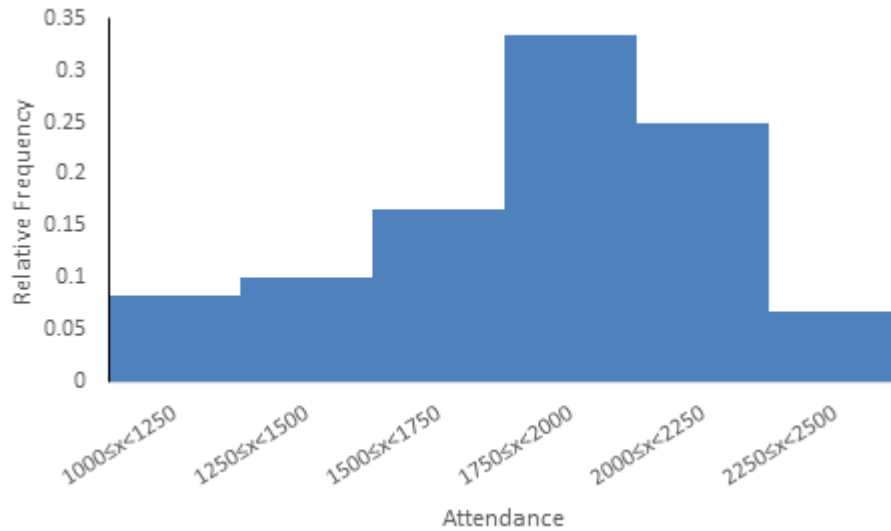
a.

| Attendance             | Relative Frequency |
|------------------------|--------------------|
| $1,000 \leq x < 1,250$ | $5/60 = 0.083$     |
| $1,250 \leq x < 1,500$ | 0.100              |
| $1,500 \leq x < 1,750$ | 0.167              |
| $1,750 \leq x < 2,000$ | 0.333              |
| $2,000 \leq x < 2,250$ | 0.250              |
| $2,250 \leq x < 2,500$ | 0.067              |

The proportion of time that attendance was at least 1,750 but less than 2,000 was 0.33; the proportion of time that attendance was less than 1,750 was 0.35; therefore, the proportion of time that attendance was 1,750 or more was 0.65.

b.

## Chapter 02 – Data Visualization



The distribution is not symmetric; it is negatively skewed.

22.

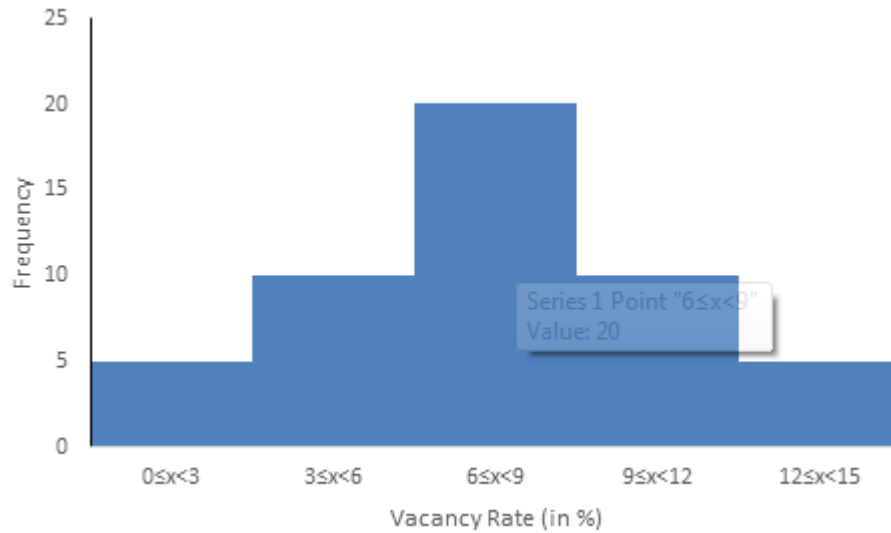
a.

| Vacancy Rate (%) | Frequency      |
|------------------|----------------|
| $0 \leq x < 3$   | $0.10(50) = 5$ |
| $3 \leq x < 6$   | 10             |
| $6 \leq x < 9$   | 20             |
| $9 \leq x < 12$  | 10             |
| $12 \leq x < 15$ | 5              |

Twenty cities had vacancy rates that were at least 6% but less than 9%. Fifteen cities had a vacancy rate of at least 9%.

b.

## Chapter 02 – Data Visualization



The distribution is symmetric.

23.

- No. The distribution is not symmetric. It is positively skewed.
- Forty-four percent of the states had median household income between \$45,000 and \$55,000.
- Sixty-six percent of the states had median household income between \$35,000 and \$55,000.

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24.

- No. The distribution is not symmetric. It is positively skewed.
- Over this time period, the stock price was between \$50 and \$250.
- The \$100 up to \$150 interval has the highest relative frequency, which is about 0.44.

25.

- No. The distribution is not symmetric. It is positively skewed.
- Three ( $0.10 \times 30$ ) of the portfolio managers earned between \$2,000,000 and \$2,400,000.
- About 26 ( $0.43 \times 30 + 0.43 \times 30 = 25.8$ ) of the portfolio managers earned between \$1,200,000 and \$2,000,000.

26.

a.

| Expenditures         | Frequency |
|----------------------|-----------|
| $400 < x \leq 700$   | 5         |
| $700 < x \leq 1000$  | 14        |
| $1000 < x \leq 1300$ | 33        |

## Chapter 02 – Data Visualization

| Expenditures         | Frequency |
|----------------------|-----------|
| $1300 < x \leq 1600$ | 25        |
| $1600 < x \leq 1900$ | 19        |
| $1900 < x \leq 2200$ | 4         |

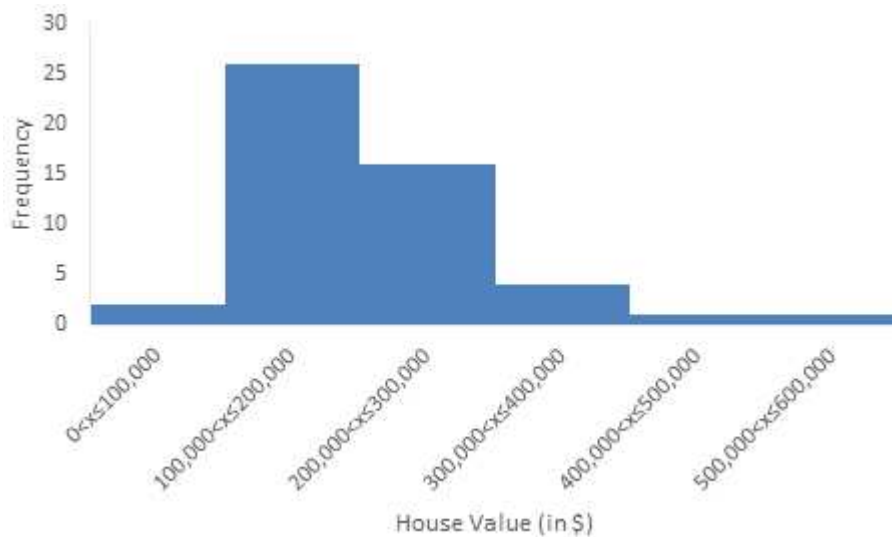
14 customers spent between \$701 and \$1,000.

- b. 52 customers spent \$1,300 or less; 48 customers spent more than \$1,300.

27.

a.

| House Value                | Frequency |
|----------------------------|-----------|
| $0 < x \leq 100,000$       | 2         |
| $100,000 < x \leq 200,000$ | 26        |
| $200,000 < x \leq 300,000$ | 16        |
| $300,000 < x \leq 400,000$ | 4         |
| $400,000 < x \leq 500,000$ | 1         |
| $500,000 < x \leq 600,000$ | 1         |



The interval  $100,000 < x \leq 200,000$  has the highest frequency. Forty-four states ( $2+26+16=44$ ) have median house values of \$300,000 or less.

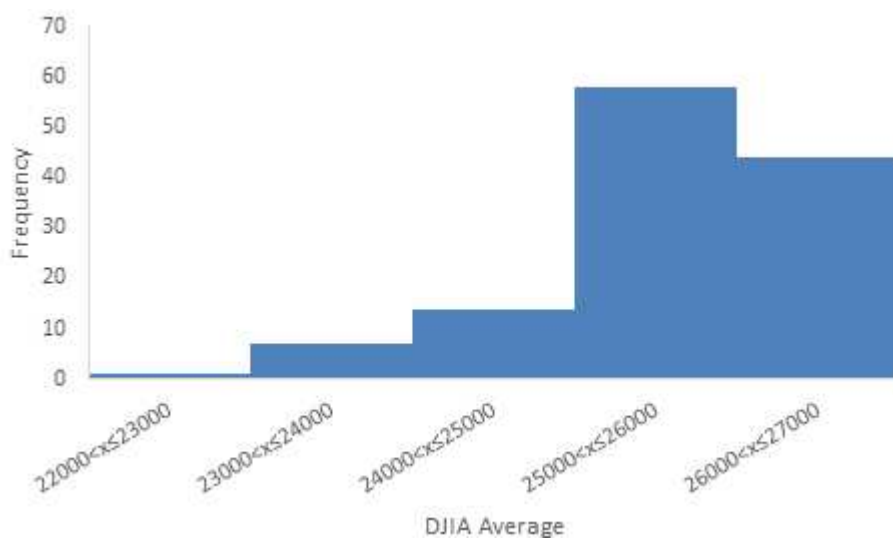
- b. No, the distribution is not symmetric. It is positively skewed.

28.

a.

## Chapter 02 – Data Visualization

| DJIA                   | Frequency |
|------------------------|-----------|
| $22000 < x \leq 23000$ | 1         |
| $23000 < x \leq 24000$ | 7         |
| $24000 < x \leq 25000$ | 14        |
| $25000 < x \leq 26000$ | 58        |
| $26000 < x \leq 27000$ | 44        |



The DJIA was more than 26,000 on 44 days in the first half of 2019.

b.

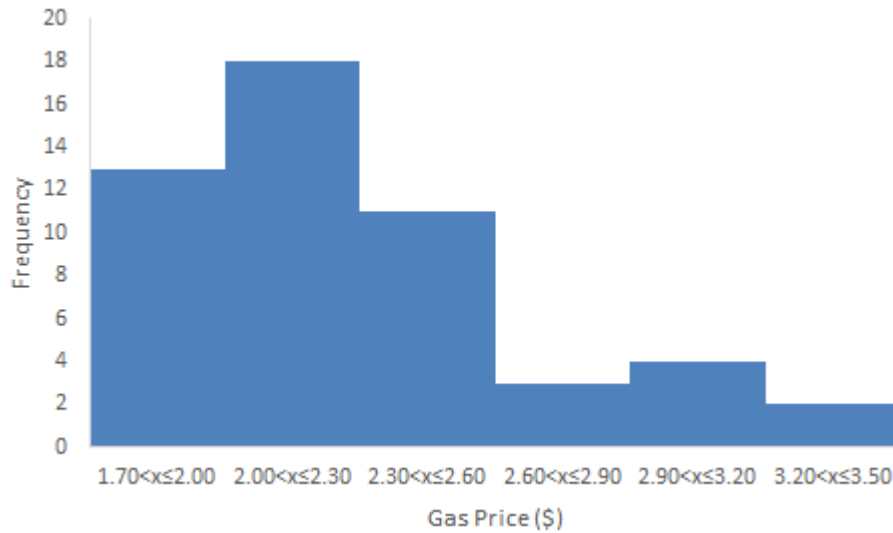
The distribution is not symmetric; it is negatively skewed.

29.

a.

| Gas Price            | Frequency |
|----------------------|-----------|
| $1.70 < x \leq 2.00$ | 13        |
| $2.00 < x \leq 2.30$ | 18        |
| $2.30 < x \leq 2.60$ | 11        |
| $2.60 < x \leq 2.90$ | 3         |
| $2.90 < x \leq 3.20$ | 4         |
| $3.20 < x \leq 3.50$ | 2         |

## Chapter 02 – Data Visualization



The interval  $2.00 < x \leq 2.30$  has the highest frequency. Nine states ( $3+4+2=9$ ) have average gas prices that are greater than \$2.60.

- b. No, the distribution is not symmetric. It is positively skewed.

30.

a.

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| Salary                     | Frequency | Relative Frequency |
|----------------------------|-----------|--------------------|
| $0 < x \leq 50,000$        | 29        | 0.29               |
| $50,000 < x \leq 100,000$  | 41        | 0.41               |
| $100,000 < x \leq 150,000$ | 18        | 0.18               |
| $150,000 < x \leq 200,000$ | 11        | 0.11               |
| $200,000 < x \leq 250,000$ | 1         | 0.01               |

18 employees earn between \$100,000 and \$150,000; the proportion that earns at most \$200,000 is 0.99.

b.

| Experience       | Frequency | Relative Frequency |
|------------------|-----------|--------------------|
| $0 < x \leq 6$   | 22        | 0.22               |
| $6 < x \leq 12$  | 19        | 0.19               |
| $12 < x \leq 18$ | 20        | 0.20               |
| $18 < x \leq 24$ | 16        | 0.16               |

## Chapter 02 – Data Visualization

| Experience       | Frequency | Relative Frequency |
|------------------|-----------|--------------------|
| $24 < x \leq 30$ | 23        | 0.23               |

19 employees have between 6 and 12 years of experience; the proportion of employees that has more than 24 years of experience is 0.23.

31.

- a. 542 units passed inspection; 88 units failed inspection
- b. 129 of the inspectors had high experience
- c. 0.2667
- d. 0.0730

32.

- a. There were 378 total shipments.
- b. 46 shipments were defective.
- c. 80 shipments were from Vendor II.
- d. 14 shipments were from Vendor I and were defective.

33.

|             | Sex        |            |              |
|-------------|------------|------------|--------------|
| Personality | Female     | Male       | Total        |
| Analyst     | 55         | 61         | <b>116</b>   |
| Diplomat    | 164        | 160        | <b>324</b>   |
| Explorer    | 194        | 210        | <b>404</b>   |
| Sentinel    | 79         | 77         | <b>156</b>   |
| Total       | <b>492</b> | <b>508</b> | <b>1,000</b> |

- a. 492; Explorers
- b. 0.194; 0.160

34.

a.

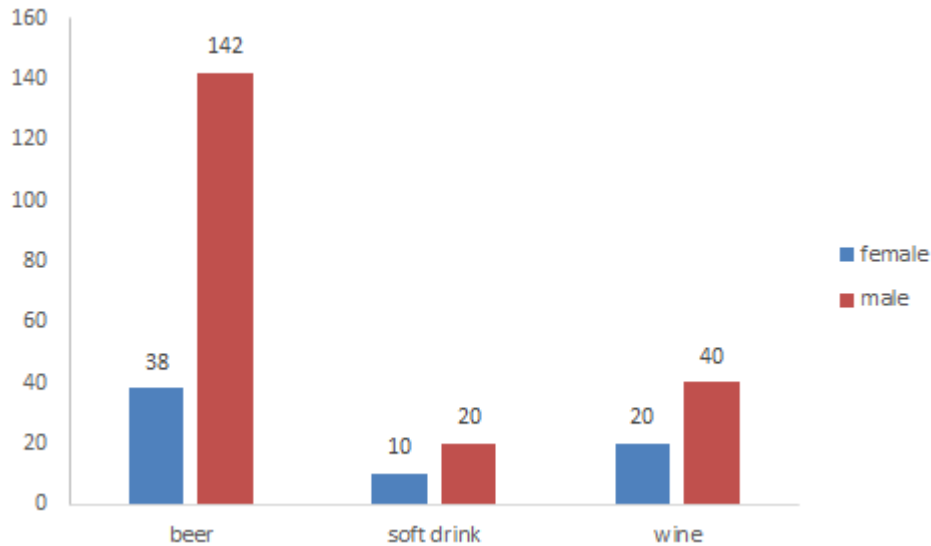
|              | Sex       |            |            |
|--------------|-----------|------------|------------|
| Drink Choice | female    | male       | Total      |
| beer         | 38        | 142        | <b>180</b> |
| soft drink   | 10        | 20         | <b>30</b>  |
| wine         | 20        | 40         | <b>60</b>  |
| Total        | <b>68</b> | <b>202</b> | <b>270</b> |

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202 of the customers were male; 60 of the customers drank wine.

b.  $142/202 = 0.7030$ ;  $38/68 = 0.5588$ .

c.



The clustered column chart shows that beer is the popular drink at this bar, followed by wine and then soft drinks. Both men and women are more likely to choose beer over the other two options.

35.

a.

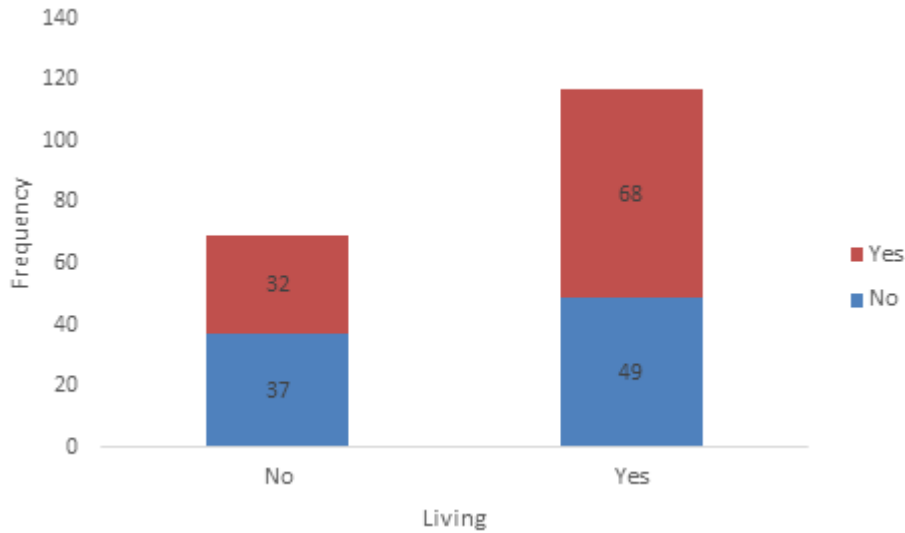
|        | Experimental_<br>Drug |     |       |
|--------|-----------------------|-----|-------|
| Living | No                    | Yes | Total |
| No     | 37                    | 32  | 69    |
| Yes    | 49                    | 68  | 117   |
| Total  | 86                    | 100 | 186   |

100 of the patients received the experimental drug; 117 of the patients were still alive after one year.

b.  $49/86 = 0.5698$ ;  $68/100 = 0.6800$ .

c.

## Chapter 02 – Data Visualization



The stacked column chart shows that, of the 186 terminally ill patients, more were living as opposed to dead. Also, it appears that those who received the experimental drug were more likely to survive than those who did not receive the experimental drug ( $0.68 > 0.57$ ).

36.

a.

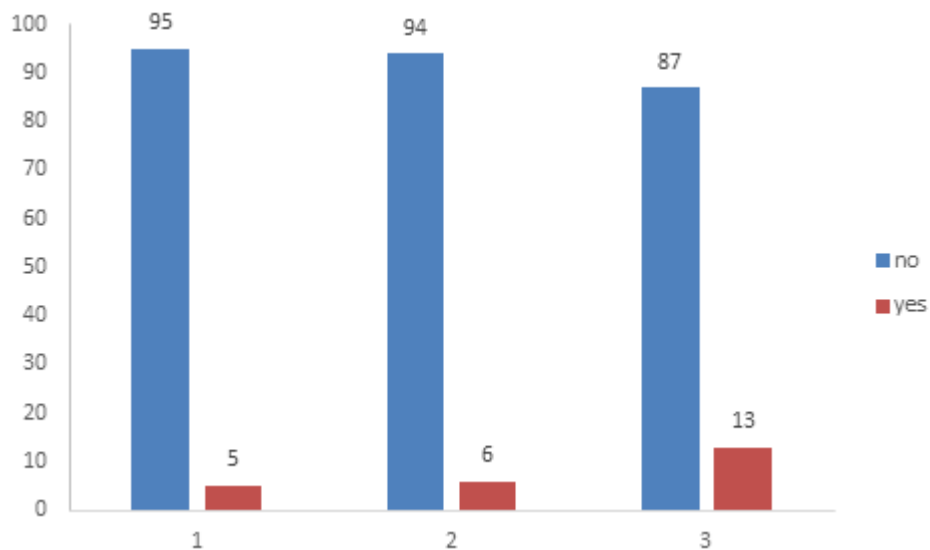
|           | Shift |     |     |       |
|-----------|-------|-----|-----|-------|
| Defective | 1     | 2   | 3   | Total |
| no        | 95    | 94  | 87  | 276   |
| Yes       | 5     | 6   | 13  | 24    |
| Total     | 100   | 100 | 100 | 300   |

Five components from shift 1 were defective; 94 components from shift 2 were not defective.

b.  $6/24 = 0.2500$ ;  $13/24 = 0.5417$ ; components constructed during shift 3 seem to be defective at a higher rate.

c.

## Chapter 02 – Data Visualization



Defect rates seem to be highest in shift 3.

37.

a.

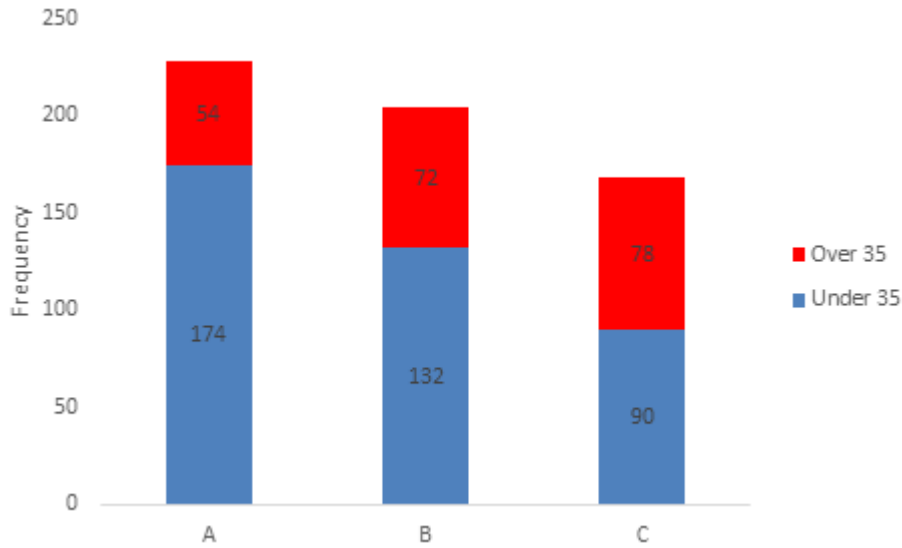
|       | Under 35 |     |       |
|-------|----------|-----|-------|
| Brand | no       | Yes | Total |
| A     | 54       | 174 | 228   |
| B     | 72       | 132 | 204   |
| C     | 78       | 90  | 168   |
| Total | 204      | 396 | 600   |

228 purchases were from brand A; 396 purchases were from customers under 35.

b.  $174/396=0.4394$ ;  $132/396=0.3333$ ;  $90/396=0.2273$ ; The data suggests that customers under 35 prefer brand A.

c.

## Chapter 02 – Data Visualization



Younger customers seem to prefer A over B, and B over C, while older Customers seem to prefer C over B, and B over A

38.

a.

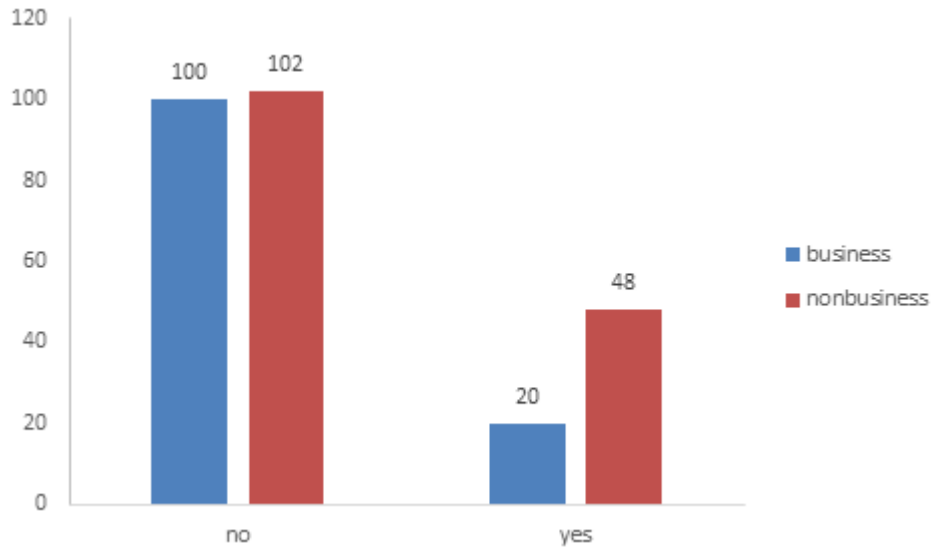
|            | Major    |             |       |
|------------|----------|-------------|-------|
| Study hard | business | nonbusiness | Total |
| no         | 100      | 102         | 202   |
| yes        | 20       | 48          | 68    |
| Total      | 120      | 150         | 270   |

120 students are business majors; 68 students study hard.

b.  $20/120 = 0.1667$ ;  $48/150 = 0.3200$ ; The data suggest that nonbusiness majors are more likely to study hard, which supports the report.

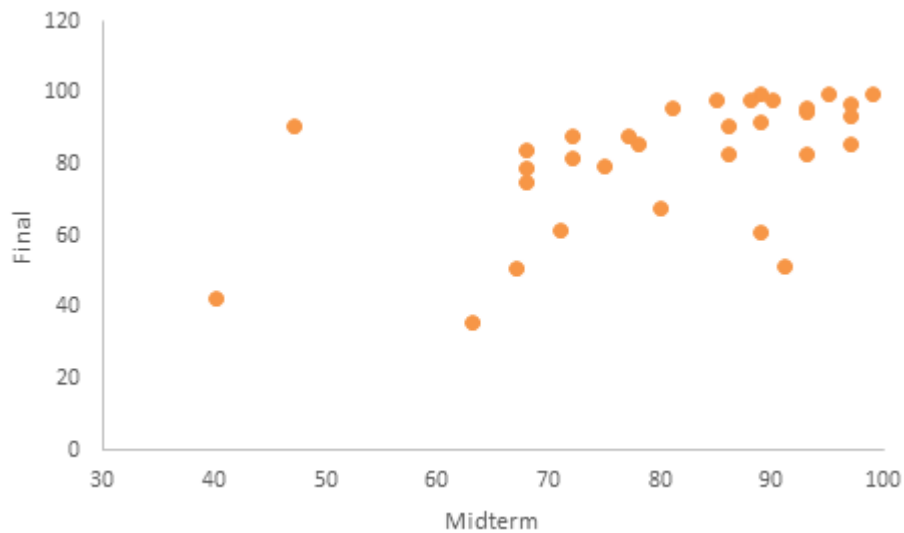
c.

## Chapter 02 – Data Visualization



The majority of both business and nonbusiness students do not study hard, but nonbusiness students are more likely to study hard.

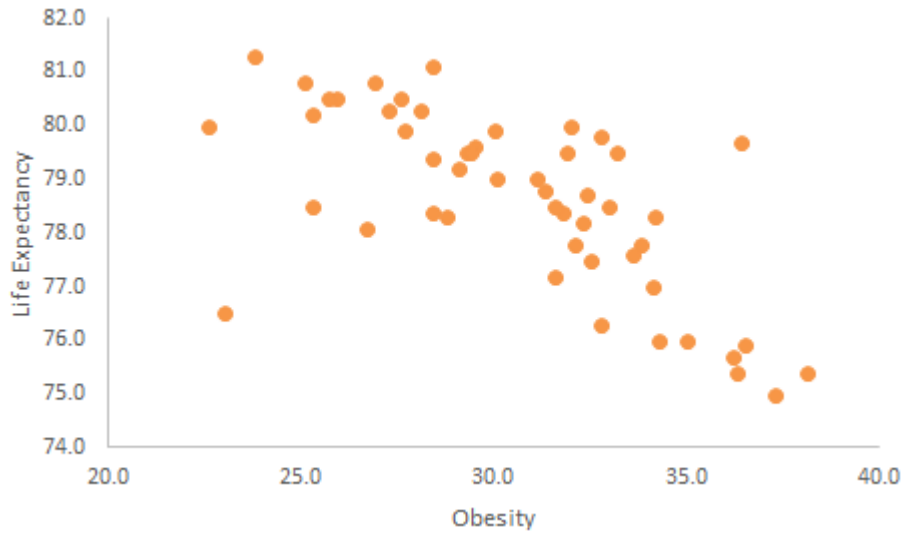
39.



There appears to be a positive relationship between a student's midterm score and a student's final score.

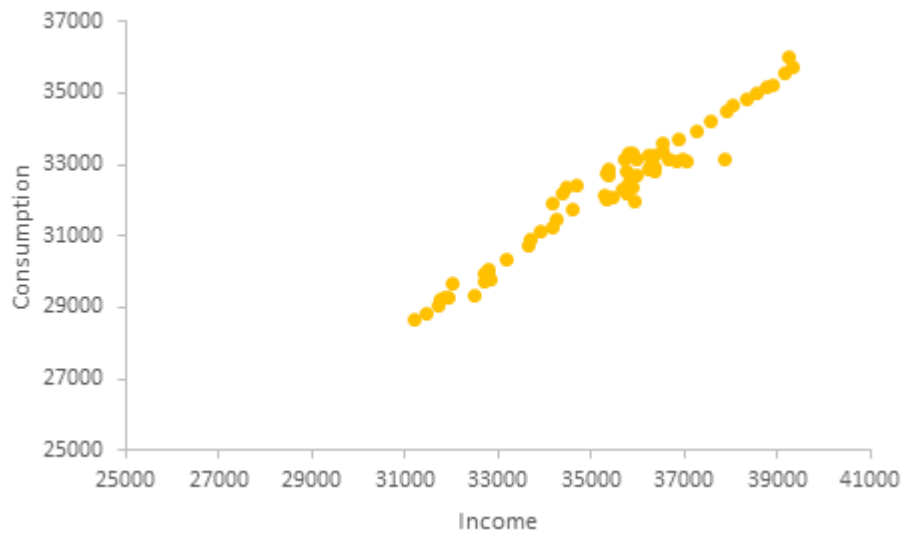
40.

## Chapter 02 – Data Visualization



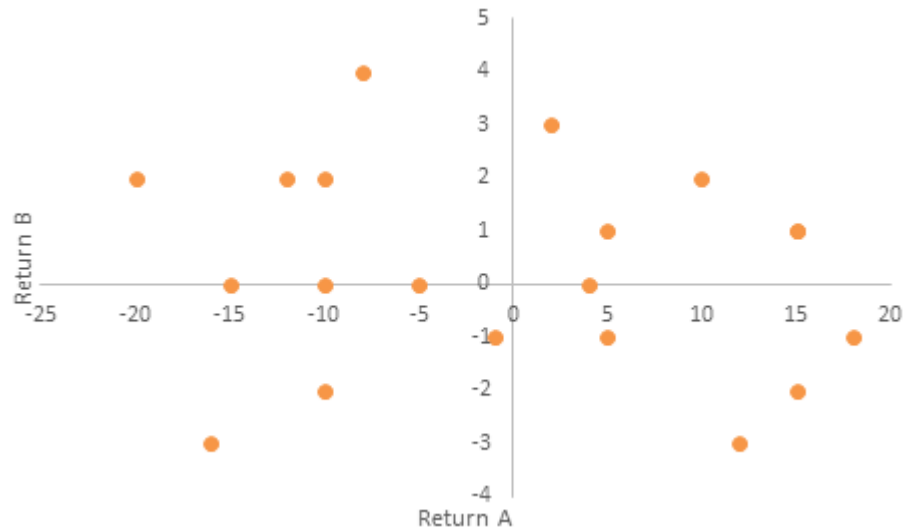
There appears to be a negative relationship between obesity and life expectancy.

41.



There appears to be a positive relationship between disposable income and consumption.

42.

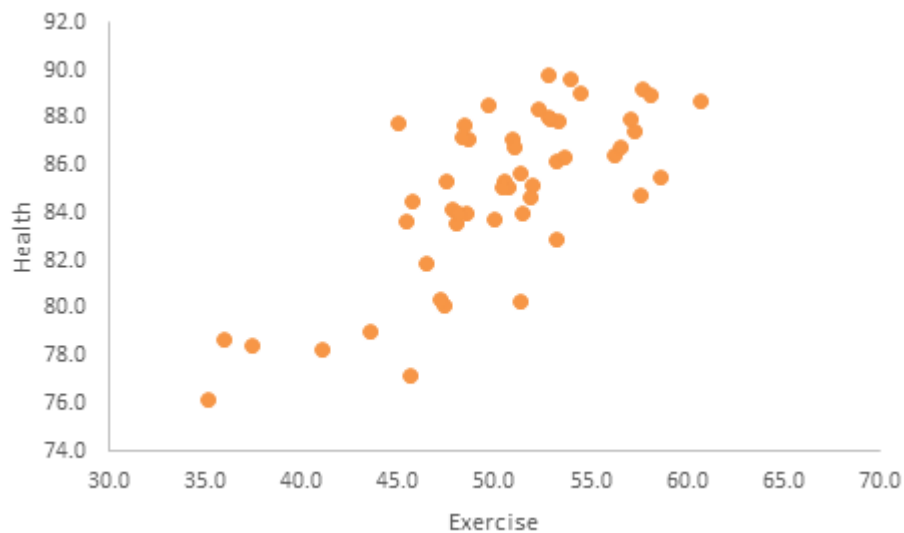


There appears to be no relationship between the returns of A and B, so investing in both would diversify risk.

43.

a.

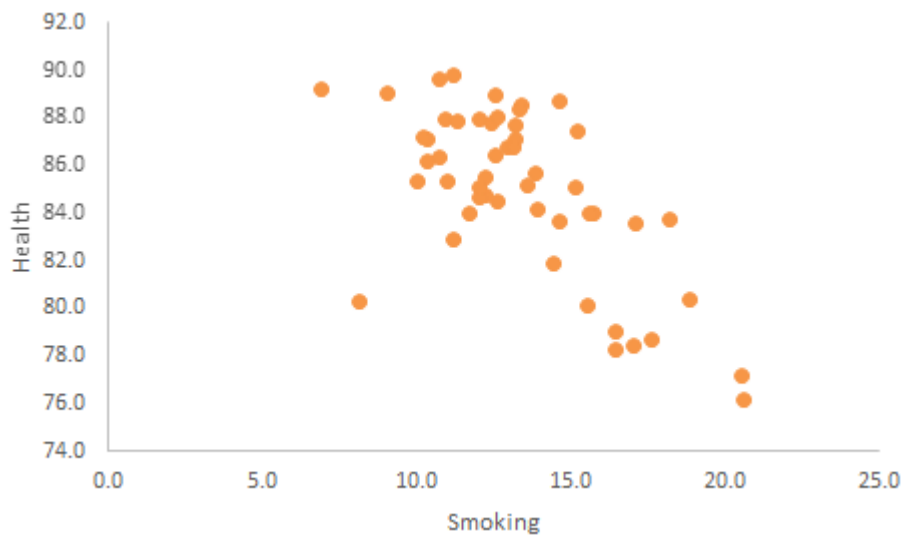
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There appears to be a positive relationship between health and exercise.

b.

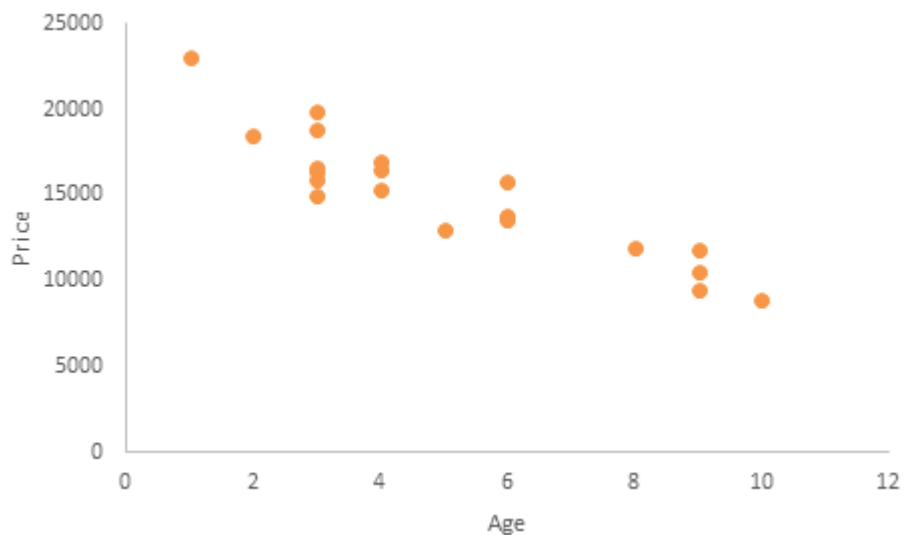
## Chapter 02 – Data Visualization



There appears to be a negative relationship between health and smoking.

44.

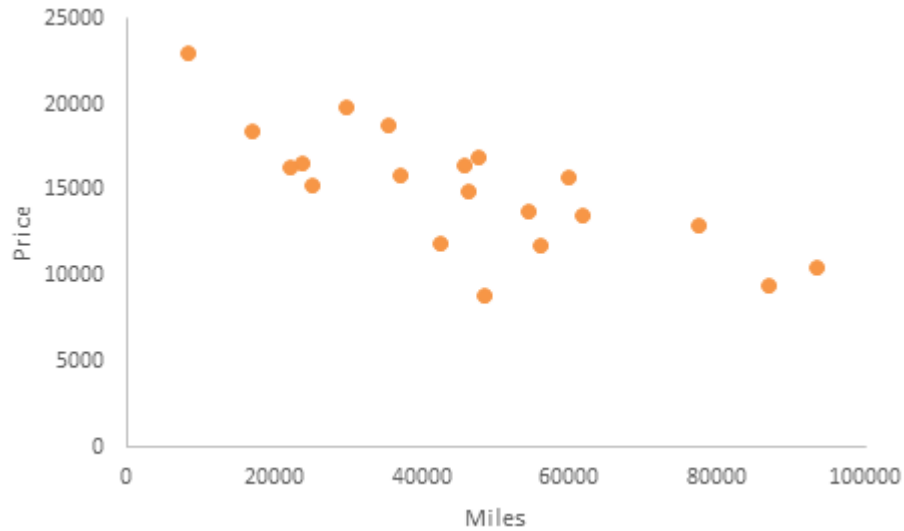
a.



There appears to be a negative relationship between the price of a car and its age.

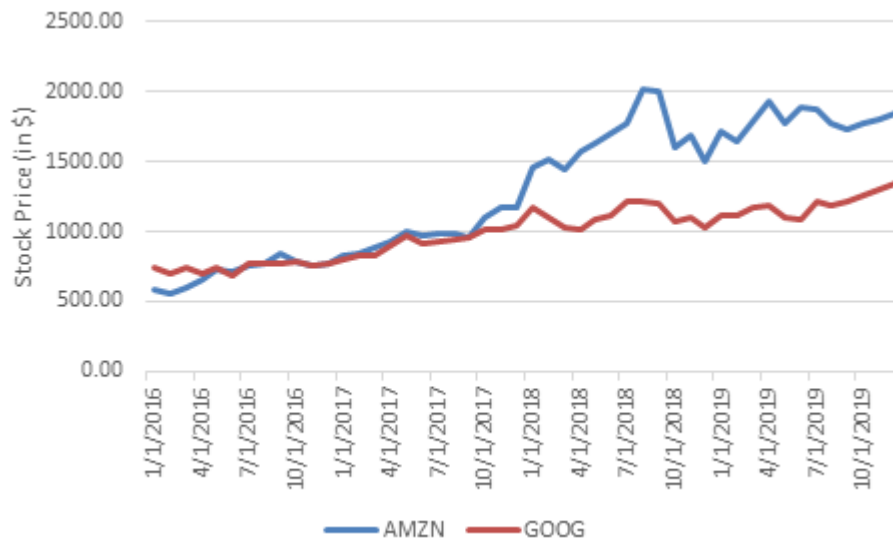
b.

## Chapter 02 – Data Visualization



There appears to be a negative relationship between the price of a car and its mileage.

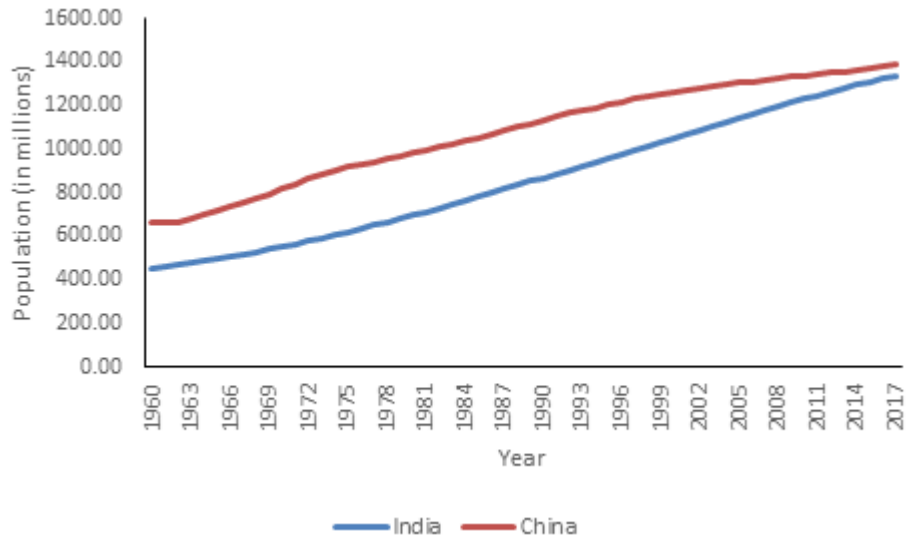
45.



GOOG has an upward trend. Amazon seems to have a greater trajectory, even though it had a steep drop in the latter half of 2018.

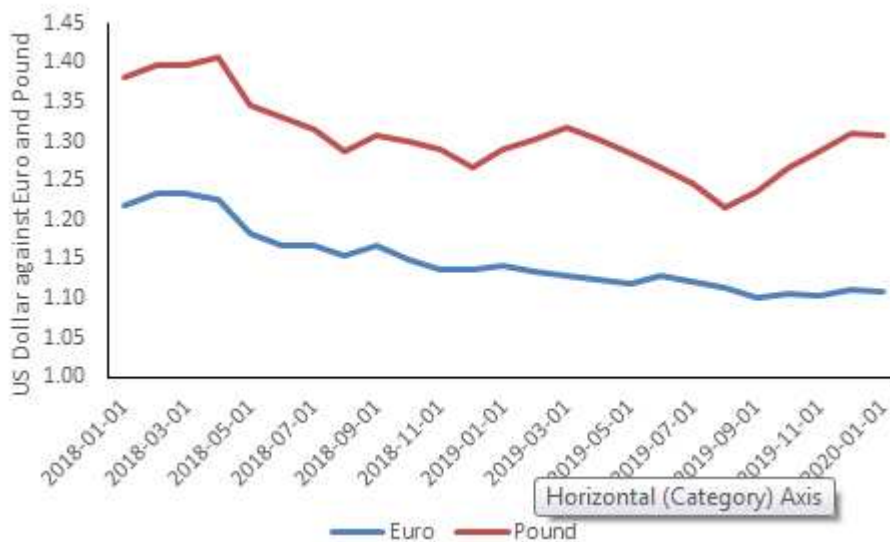
46.

## Chapter 02 – Data Visualization



Both countries have a clear and consistent upward trend, but China's begins to stall slightly around 2000. India has slightly higher population growth over the past 40 years.

47.



Over this time period, we see a steady decline in the USD against the Euro which means that the USD has been appreciating over this period. In January 2018, the USD against the Euro was 1.22 meaning that one euro could buy 22 cents more in goods and services than one dollar could; however, in January 2020, the USD against Euro was 1.11, meaning that one euro could buy 11 cents more in goods and services than one dollar could.

Over this time period, we see a volatile decline in the USD against the Pound until around August 2019 (again implying appreciation of the USD). This low point corresponded to

uncertainty surrounding Brexit. Since that time, the USD against the Pound has risen, almost reaching the same level as January 2018.

48. This graph does not correctly depict what has happened to company's stock price over this period. Because the vertical axis has been compressed by using an unreasonably high value as an upper limit (\$500), the rise in stock price appears dampened.
49. This graph does not correctly depict what has happened to sales over the most recent five-year period. The vertical axis has been stretched so that the increase in sales appears more pronounced than warranted.

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