

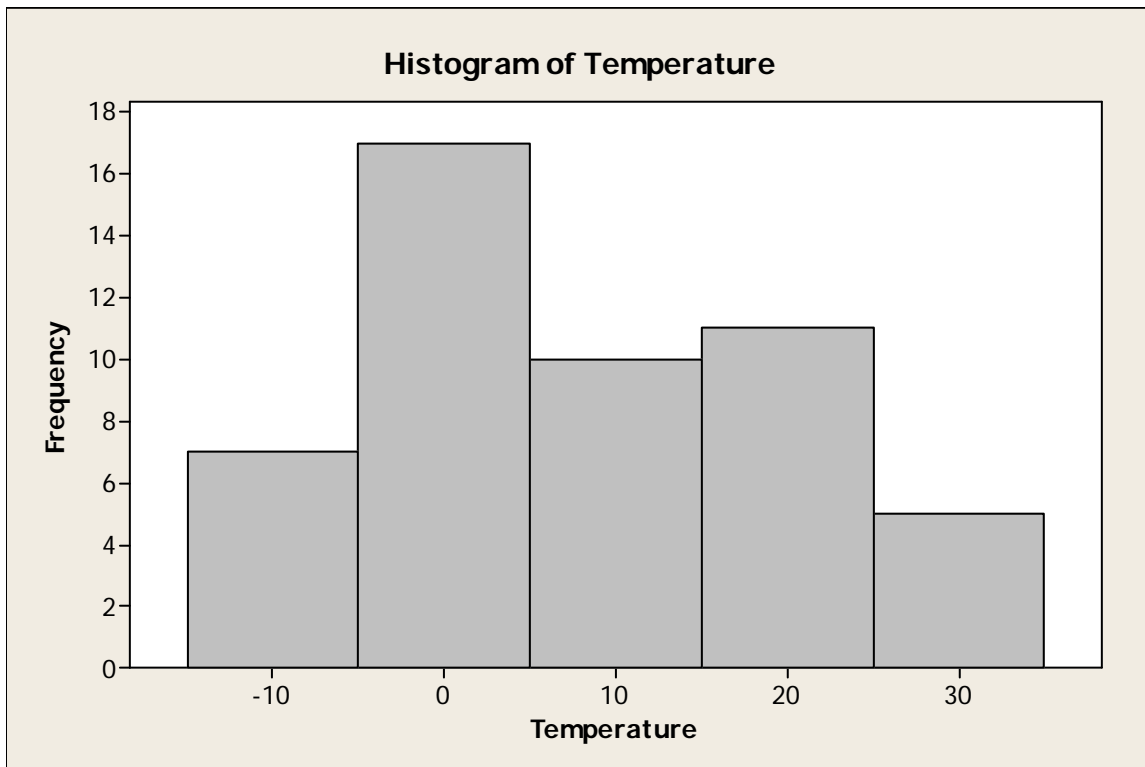
Assignment 1 Solutions

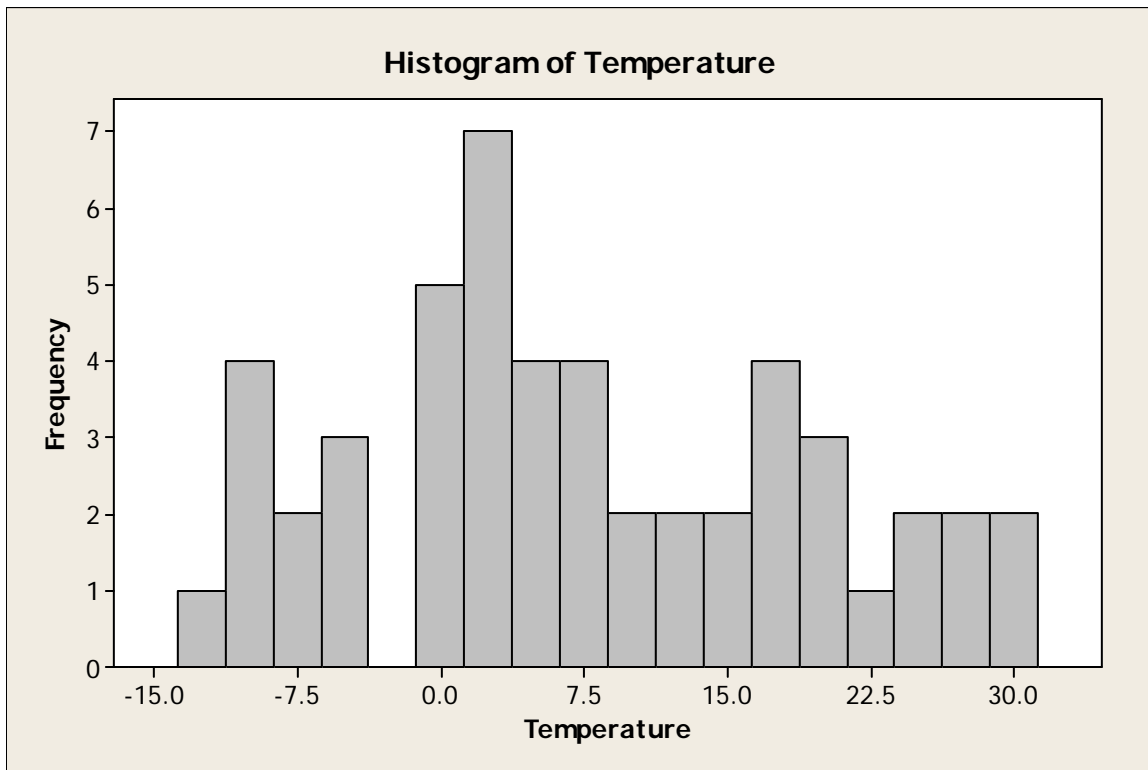
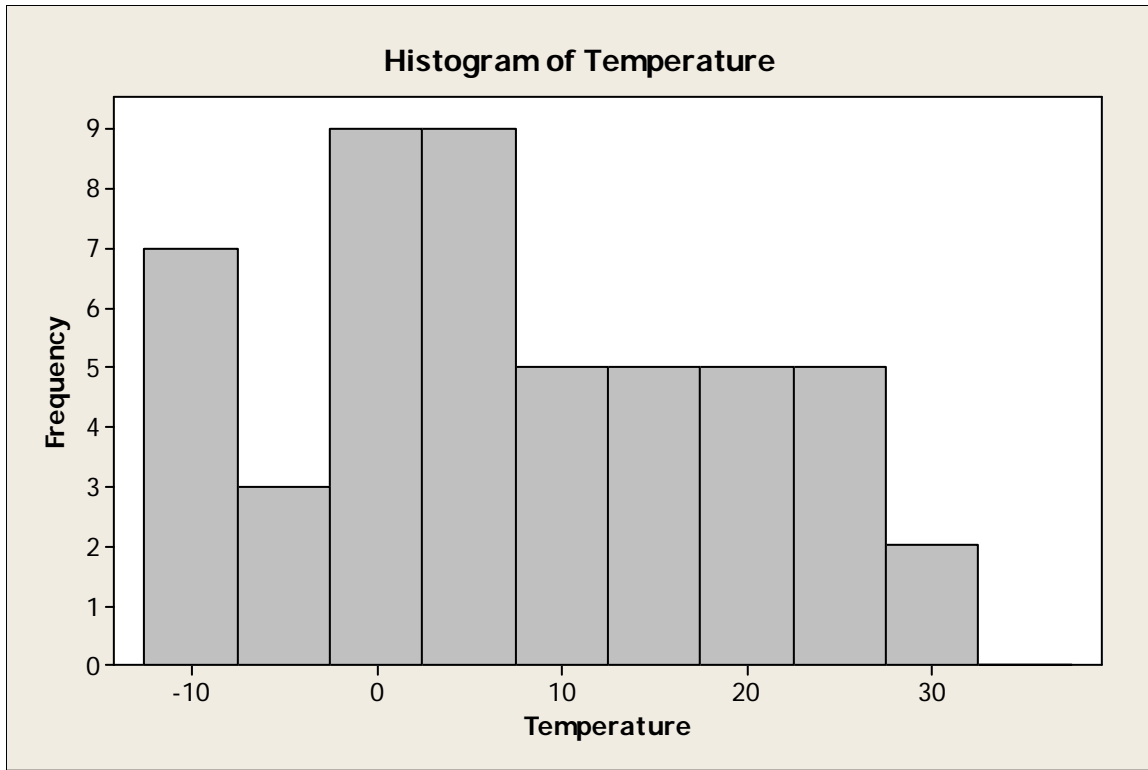
Out of 60

Part A

1. [8 marks divided as below]

A. [3]





B. [2] Both the first and second histograms are similar and both show that the distribution is right skewed. The third histogram, however, is a bit different. It still shows some right skewness but could be interpreted as bell shaped as well. Since the data ranges from -12 to 29 and based on the

$2^k = n$ formula, I would use 5 or 10. These would give intervals of length 5 or 10 which is suitable for this range. More or less intervals would give the wrong idea about the distribution of the data.

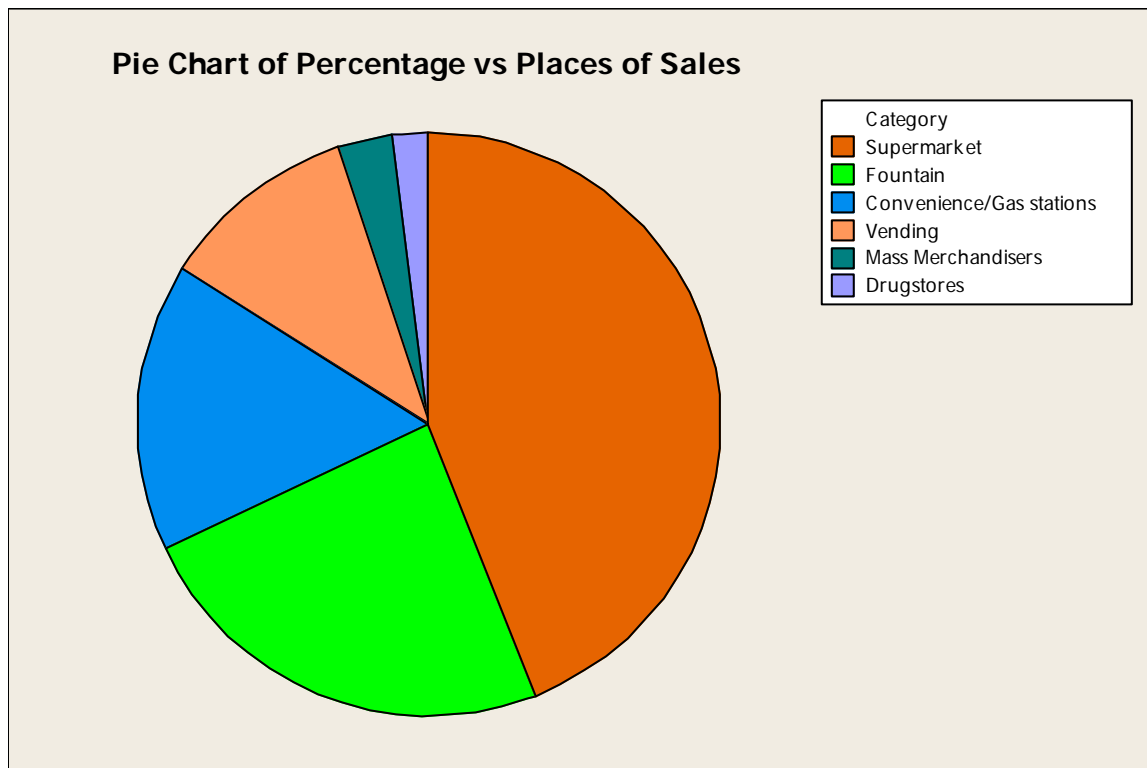
C. [3]

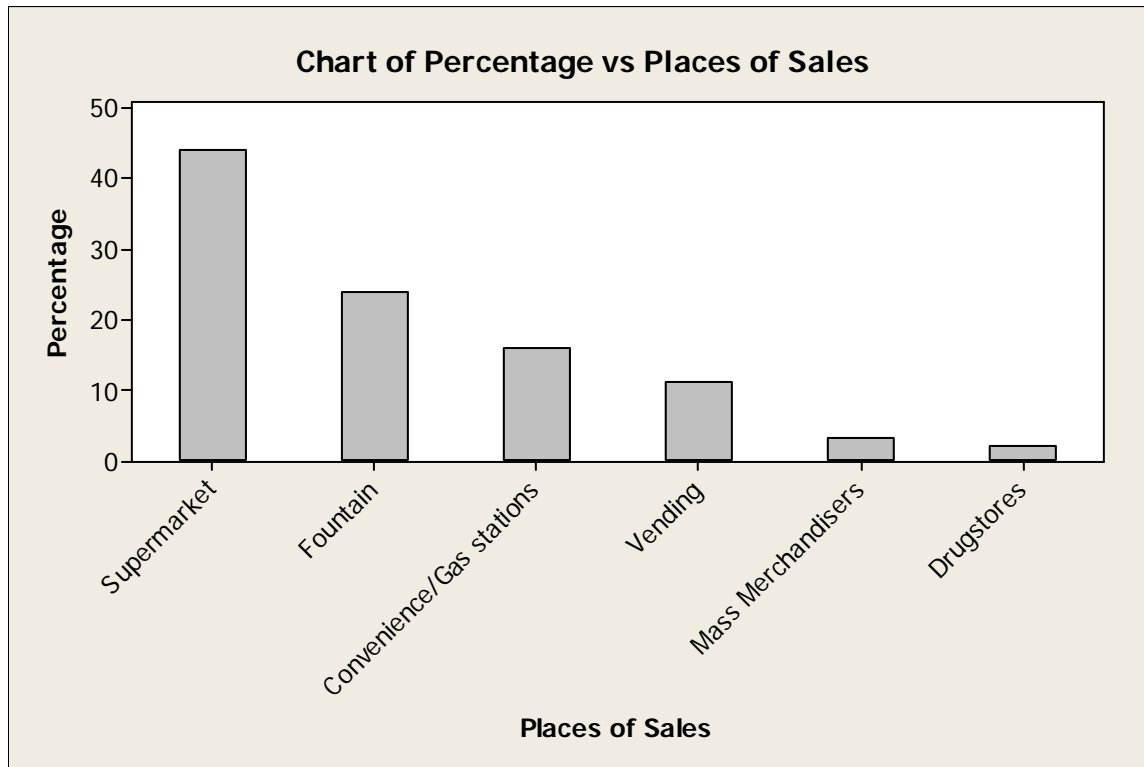
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2   -1   21
8   -0   999885
14  -0   441111
24  0    1222233344
(7) 0    6677889
19  1    123
16  1    6677889
9   2    1134
5   2    67799
    
```

The stem-and-leaf diagram shows that the data is slightly skewed to the right, which agrees with part b.

2. [3; 1.5 for each graph]





3. [3 divided as follows]

A. [1]

Variable	Mean	StDev
Generic	26.214	1.251
Sunmaid	26.143	2.413

B. [2]

[1]

Variable	Mean	StDev	Variance	Median
Generic	26.214	1.251	1.566	26.000
Sunmaid	26.143	2.413	5.824	26.000

[1] The sample means are very close and the medians are equal. The variance of the sunmaid sample is higher than that of the generic sample.

Part B

1. [8 marks; 0.5×2 each]

- A. Qualitative, Ordinal
- B. Quantitative, ratio
- C. Qualitative, nominal

- D. Qualitative, Ordinal
- E. Quantitative, ratio
- F. Quantitative, ratio
- G. Quantitative, ratio
- H. Quantitative, interval

2. [13 divided as below]

A. [2] These measurements represent a sample as there are a lot more than just 16 of these walking sneakers.

B. [9]

i.[2] $\bar{x} = \frac{\sum_{i=1}^{16} x_i}{16} = \frac{9.72+9.74+\dots+9.77}{16} = \frac{157.42}{16} = 9.839$

ii.[6]

96	7 9	Leaf Unit = 0.01
97	0 1 1 2 2 4	
97	7	
98	0 0 1 2	
98	7 8	
99		
100		
100		
101		
⋮		
110	1	

iii.[1]The median is the average of the 8th and 9th observation. Therefore, the median is $(9.74+9.77)/2 = 9.755$.

C.[2]Based on the stem-and-leaf plot, the distribution is skewed to the right, with the observation 11.01 possibly an outlier.

3. [10 divided as below]

[1] $\bar{x}_1 = \frac{\sum_{i=1}^{10} x_i}{n} = \frac{0.011 + 0.013 + \dots + 0.012}{10} = \frac{0.125}{10} = 0.0125$

[2] $s_1^2 = \frac{1}{n-1} \left[\sum_{i=1}^{10} x_i^2 - \frac{(\sum_{i=1}^{10} x_i)^2}{n} \right] = \frac{1}{9} \left[(0.011^2 + 0.013^2 + \dots + 0.012^2) - \frac{0.125^2}{10} \right]$
 $= 0.00000228$

[1] $s_1 = \sqrt{0.00000228} = 0.00151$

$$[1] \bar{x}_2 = \frac{\sum_{i=1}^{10} x_i}{n} = \frac{0.011 + 0.016 + \dots + 0.015}{10} = \frac{0.138}{10} = 0.0138$$

$$[2] s_2^2 = \frac{1}{n-1} \left[\sum_{i=1}^{10} x_i^2 - \frac{(\sum_{i=1}^{10} x_i)^2}{n} \right] = \frac{1}{9} \left[(0.011^2 + 0.016^2 + \dots + 0.015^2) - \frac{0.138^2}{10} \right]$$

$$= 0.00000373$$

$$[1] s_2 = \sqrt{0.00000373} = 0.00193$$

[2] From the results it looks like Method 2 gave a higher average ($0.0138 > 0.0125$). Also, the measurements obtained using method 2 are more variable with variance 0.00000373 and standard deviation 0.00193 as compared to 0.00000228 and 0.00151 for Method 1.

4. [15 marks divided as follows]

A. [4; one mark each]

$$i=31(0.10) = 3.1, \text{ so } 10^{\text{th}} \text{ percentile} = 3^{\text{rd}} + (4^{\text{th}} - 3^{\text{rd}})(.1) = 9.14 + (9.18 - 9.14)(.1) = 9.144$$

$$i=31(0.20) = 6.2, \text{ so } 20^{\text{th}} \text{ percentile} = 6^{\text{th}} + (7^{\text{th}} - 6^{\text{th}})(.2) = 9.2 + (9.21 - 9.2)(.2) = 9.202$$

$$i=31(0.35) = 10.85, \text{ so } 35^{\text{th}} \text{ percentile} = 9.32 + (9.35 - 9.32)(.85) = 9.3455.$$

$$i=31(0.70) = 21.7, \text{ so } 70^{\text{th}} \text{ percentile} = 21^{\text{st}} + (22^{\text{nd}} - 21^{\text{st}})(.7) = 9.52 + (9.53 - 9.52)(.7) = 9.527.$$

B. [3; one mark each]

$$i=31(0.50) = 15.5, \text{ so Median} = (15^{\text{th}} + 16^{\text{th}})/2 = (9.41 + 9.43)/2 = 9.42$$

$$i=31(0.25) = 7.75, \text{ so } Q1 = 9.21 + (9.23 - 9.21)(.75) = 9.225.$$

$$i=31(0.75) = 23.25, \text{ so } Q3 = 9.54 + (9.55 - 9.54)(.25) = 9.5425.$$

C. [8 marks divided as follows]

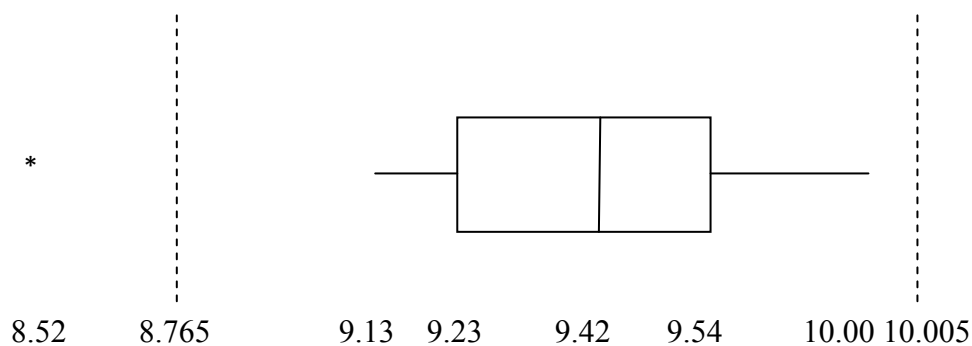
No need to show the calculations of the following three quantities if the students indicated their correct values on the box plot.

$$[1] \text{IQR} = 9.5425 - 9.225 = 0.3175$$

$$[1] 9.23 - 1.5(0.31) = 8.765$$

$$[1] 9.54 + 1.5(0.31) = 10.005$$

[4]



[1] The observation 8.52 is a potential outlier since it is smaller than 8.765.