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STAT F300 Statistics, Dr. Short
Homework 2, Due Friday, January 27, 23:59

1.

Done.

2. Use R to construct a stem-and-leaf plot of this data set:

{66, 66, 69, 74, 74, 75, 75, 76, 76, 76, 76, 78, 79, 79, 81, 81, 82, 83, 83, 84, 86, 87, 87, 92, 98}

R code:

```
> x <- c(66, 66, 69, 74, 74, 75, 75, 76, 76, 76, 76,
78, 79, 79, 81, 81, 82, 83, 83, 84, 86, 87, 87, 92, 98)
> x <- sort(x)
> stem(x)

   The decimal point is 1 digit(s) to the right of the |

   6 | 669
   7 | 44556666899
   8 | 112334677
   9 | 28
```

Also, what is a fairly typical value, based on the stem-and-leaf plot?

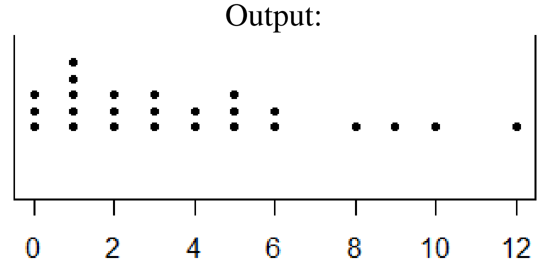
It looks like 7 is a typical value, followed closely by 8.

3 Construct a dot plot of this data set: {2,3,3,0,12, 0,1,4,6,2, 0,6,5,9,8, 1,1,1,2,3, 10,4,5,5,1}

R code:

```
> x <- c(2,3,3,0,12, 0,1,4,6,2,
0,6,5,9,8,1,1,1,2,3,10,4,5,5,1)
> stripchart(x, method="stack",
  offset=0.5, at=0.15, pch=20)
```

Output:



4. This is a modified version of Devore (8th ed) §1.4: # 45 (p.44) The article "Oxygen Consumption During Fire Suppression: Error of Heart Rate Estimation" (Ergonomics, 1991: 1469-1474) reported the following data on oxygen consumption (mL/kg/min) for a sample of ten firefighters performing a fire-suppression simulation:

29.5, 49.3, 30.6, 28.2, 28.0, 26.3, 33.9, 29.4, 23.5, 31.6

(a) Find the sample range

The sample range is $49.3 - 23.5 = \boxed{25.8}$

(b) Find the sample variance s^2 from the definition (i.e., by first computing deviations, then squaring them, etc.)

$$S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$$

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i = 31.03$$

$$S^2 = \frac{1}{10-1}\sum_{i=1}^{n}(x_i - 31.03)^2 = \frac{1}{9}((23.5-31.03)^2 + \cdots + (49.3-31.03)^2)$$

$$\approx \frac{49.31}{9} = \boxed{5.479}$$

(c) Find the sample standard deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{N-1}}$$

$$\sum_{i=1}^{n}(x_i - \bar{x})^2 = 49.31 = S^2; \quad N = 10$$

$$\sigma = \sqrt{\frac{S^2}{N-1}} = \sqrt{\frac{49.31}{10-1}} = \boxed{5.48}$$

(d) Find s^2 using the shortcut method. (Your answer should match part (b).)

$$S^2 = \frac{1}{n-1}\left[\left(\sum_{i=1}^{n} x_i^2\right) - n\bar{x}^2\right] \quad \text{where} \quad \bar{x} = 31.03, n = 10$$

$$\sum_{i=1}^{n} x_i^2 = (29.5^2 + 49.3^2 + \cdots + 23.5^2 + 31.6^2) = 10{,}072.41$$

$$S^2 = \frac{1}{9}\left(10{,}072.41 - 9(31.03)^2\right) = \frac{1}{9}(10{,}072.41 - 8{,}665.7481) = \frac{1406.6619}{9} \approx \boxed{156.2958}$$

(e) By how much could the observation 23.5 be increased without affecting the value of the sample median? Explain.

Yeah okay

(f) Create a box plot for these data.

Yeah okay

5. Devore §1.4 # 50, modified. In 1997 a woman sued a computer keyboard manufacturer, charging that her repetitive stress injuries were caused by the keyboard (Genessy v. Digital Equipment Corp.). The injury awarded about \$3.5 million for pain and suffering, but the court then set aside that award as being unreasonable compensation. In making this determination, the court identified a "normative" group of 27 similar cases and specified a reasonable award as one within two standard deviations of the mean of the awards in the 27 cases. The 27 awards were (in \$1000s)

37, 60, 75, 115, 135, 140, 149, 150, 238, 290, 340, 410, 600, 750, 750, 750, 1050, 1100, 1139, 1150, 1200, 1200, 1250, 1576, 1700, 1825, 2000

Here is summary information:

$\sum x_i = 20{,}179$ and $\sum x_i^2 = 24{,}657{,}511$

What is the maximum possible amount that could be awarded under the two-standard deviation rule?

Yeah okay