

M3070 – FALL 2003 – Quiz 1

NAME: _____

PROBLEM 1. (10 points) In Figure 1 is given a stem-and-leaf plot of the number of homeruns hit by Barry Bonds over the past 17 baseball seasons. Some other useful information is

$$\sum_{i=1}^{17} x_i = 613 \quad \text{and} \quad \sum_{i=1}^{17} x_i^2 = 24997.$$

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

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1 | 69
2 | 455
3 | 334477
4 | 02669
5 |
6 |
7 | 3
    
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FIGURE 1. Homeruns hit by Barry bonds, 1986-2002

Compute each of the following:

(1) sample mean, \bar{x} _____ .

SOLUTION.

The same mean is given by

$$\frac{1}{17} \sum_{i=1}^{17} x_i = \frac{613}{17} \approx 36.06.$$

(2) sample median, \tilde{x} _____ .

SOLUTION.

There are 17 observations, so the median is the $\frac{17+1}{2}$ th largest observation, that is, the 9th largest observation. This has the value 34.

(3) sample standard deviation s _____ .

SOLUTION.

The sample variance is given by

$$\begin{aligned} s^2 &= \frac{1}{17-1} \left[\sum_{i=1}^{17} x_i^2 - \frac{1}{17} \left(\sum_{i=1}^{17} x_i \right)^2 \right] \\ &= \frac{1}{16} \left[24997 - \frac{613^2}{17} \right] \\ &= 180.81. \end{aligned}$$

Thus $s = \sqrt{s^2} = 13.45$.

(4) fourth spread f_s _____ .

SOLUTION.

We need to find the lower and upper fourths. Since the 9th observation divides the data in half, to find the lower fourth we take the median of the lower half, and to find the upper fourth we take the median of the upper half. Thus the lower fourth is the 5th value, here 25, and the upper fourth is the 13th value, here 42. Thus $f_s = 42 - 25 = 17$.

PROBLEM 2. (4 points) Suppose that a set of sample data has mean 23.8 and a standard deviation of 4.2. If 6 is added to each of the data values, what will be the mean and standard deviation of the new data set?

SOLUTION.

Recall that if $y_i = x_i + c$, then $\bar{y} = \bar{x} + c$. Thus if we add 6 to each data value, we shift the sample mean by 6, and the new sample mean is 29.8.

Also recall that the standard deviation of the new data values $y_i = x_i + c$ is the same as the standard deviation of the old data values x_i . Thus the new s.d. is 4.2. \square

PROBLEM 3. (6 points) If a fair die is tossed twice, what is the chance that the dice sum to 7? What is the chance that the dice sum to 2?

SOLUTION.

Since all outcomes are equally likely, and there are 36 ways to roll a die twice, for any event A we have $P(A) = N(A)/36$, where $N(A)$ is the number of ways that A can occur.

The first event is $A = \{\text{dice sum to } 7\}$. We can list all the outcomes in A :

$$A = \{(1, 6), (6, 1), (2, 5), (5, 2), (3, 4), (4, 3)\}.$$

There are 6 outcomes in A , so $P(A) = 6/36 = 1/6$.

The second event is $B = \{\text{dice sum to } 2\}$. There is only one outcome where B occurs, namely the outcome $(1, 1)$. Thus $P(B) = 1/36$. \square