

Tutorial 2: Questions

January 24, 2018

Review

- Consider a data set with n entries.
 - If n is odd, the median will be a value in the data set. Since Q_1 will be the median of the lower $\lceil n/2 \rceil$ values, and Q_3 will be the median of the upper $\lceil n/2 \rceil$ values, the median is included in the determination of Q_1 and Q_3 .
 - If n is even, the median is the average of the two centre values which may or may not be in the data set. Regardless, the median when n is even divides the data precisely into two groups. Q_1 and Q_3 are simply the medians of the lower and upper halves, respectively.

Question 1.S.70, Page 48-49

- (a) Construct a comparative boxplot of the weight and treadmill observations, and comment on what you see. For your convenience the sorted x (Weights) and y (Treadmill) values are as follows:

x	14.4	14.6	15.9	16.3	17.0	18.5	18.7	19.0	19.1	19.5	19.6	22.1	23.0	23.2	24.3
y	2.6	4.4	5.3	9.1	10.1	10.3	10.3	11.3	12.6	15.2	16.6	19.6	20.8	22.4	23.6

- (b) The data is in the form of (x, y) pairs, with x and y measurements on the same variable under two different conditions, so it is natural to focus on the differences within pairs:

$$d_1 = x_1 - y_1, \dots, d_n = x_n - y_n.$$

Construct a boxplot of the sample differences. What does it suggest? Below are the sorted differences.

Obs		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
d_i		-2.8	-0.4	2.2	2.5	2.5	3.3	5.9	6.2	8.4	8.7	9.1	9.1	10.4	11.5	14.4

Question 5.3.38, Page 229

There are two traffic lights on a commuter's route to and from work. Let X_1 be the number of lights at which the commuter must stop on his way to work, and X_2 be the number of lights at which he must stop when returning from work. Suppose these two variables are independent, each with pmf given in the accompanying table (so X_1, X_2 is a random sample of size $n = 2$).

x_i	0	1	2
$p(x_i)$	0.2	0.5	0.3

 $\mu = 1.1, \sigma^2 = 0.49$

- (a) Determine the pmf of $T = X_1 + X_2$.
- (b) Calculate μ_T . How does it relate to μ , the population mean?
- (c) Calculate σ_T^2 . How does it relate to σ^2 , the population variance?
- (d) Let X_3 and X_4 be the number of lights at which a stop is required when driving to and from work on a second day assumed independent of the first day. With $T = X_1 + \dots + X_4$, what now are the values of $E(T)$ and $\text{Var}(T)$?
- (e) Referring back to (d), what are the values of $P(T = 8)$ and $P(T \geq 7)$ [Hint: Don't even think of listing all possible outcomes!]