

**Midterm**

The midterm is open-book, open-notes. There are 5 problems, 100 points total. The point values for each problem are listed below. Some problems have multiple parts. Give a calculation or an explanation (or both, as needed) to support your idea of the right answer in each problem. A right answer with no reasoning to support it, or a wrong answer with explanations that make some sense will get at least half credit. An incorrect answer with no reasoning to support it will get no credit. If you run out of space on the front of the following pages, use the back. DO NOT ATTACH EXTRA SHEETS OF PAPERS WITH ADDITIONAL WRITING ON THEM.

REMEMBER: THIS TEST IS TO BE ENTIRELY YOUR OWN EFFORTS. Cheating on this test will result in the severest disciplinary action possible under UCSC rules.

Problem	Possible Points	Your points
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

1. A group of college students were asked how many hours per week they exercise. The answers given by 12 men were as follows:

6 0 2 1 2 4.5 8 3 17 4.5 4 5

- (a) (10 points) Compute the median, quartiles and interquartile range for the sample.

Sort data :

0 1 2 2 3 4 4.5 4.5 5 6 8 17

Quartiles :

- $Q_1$  (25<sup>th</sup> percentile)

$$\frac{n \times 25}{100} = \frac{12 \times 25}{100} = 3 \quad \Rightarrow$$

$$Q_1 = \left( \frac{X_{[3]} + X_{[4]}}{2} \right) = \frac{2 + 2}{2} = \boxed{2}$$

- $Q_2$  (50<sup>th</sup> percentile) Median

$$\frac{n \times 50}{100} = \frac{12 \times 50}{100} = 6$$

$$Q_2 = \left( \frac{X_{[6]} + X_{[7]}}{2} \right) = \frac{4 + 4.5}{2} = \boxed{4.25}$$

- $Q_3$  (75<sup>th</sup> percentile)

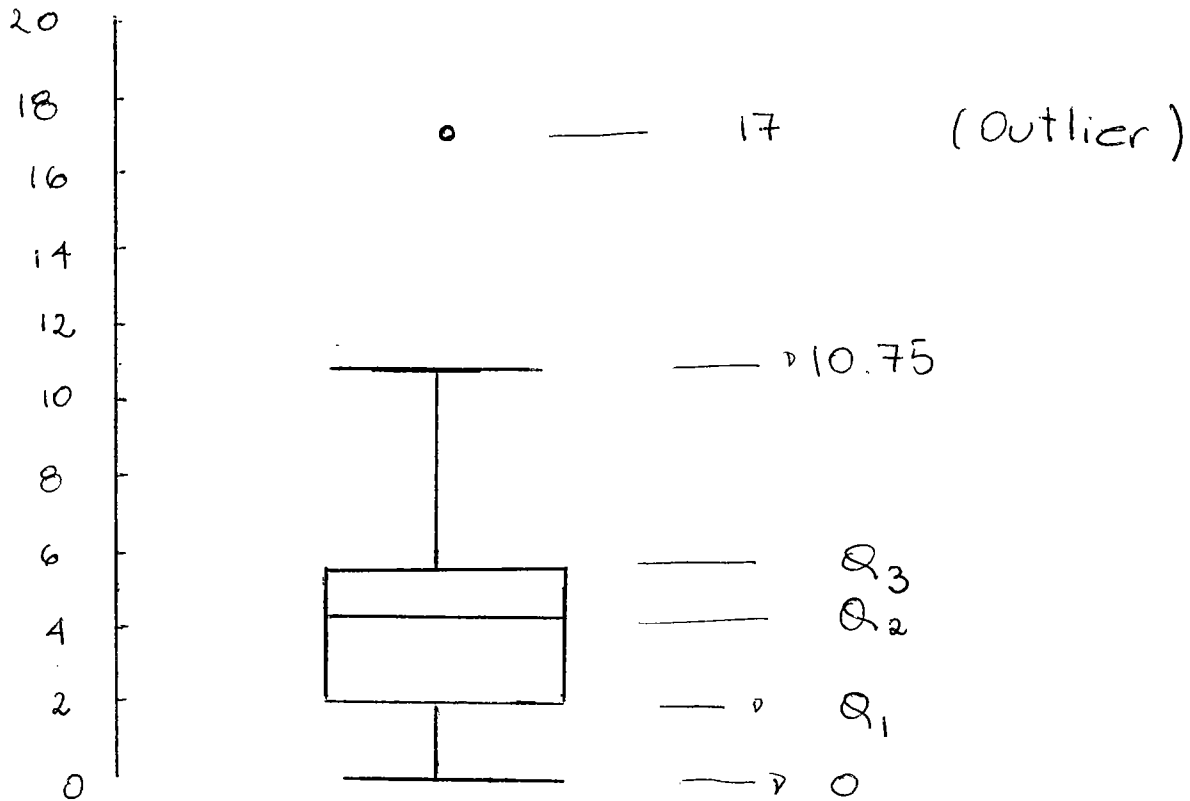
$$\frac{n \times 75}{100} = \frac{12 \times 75}{100} = 9 \quad \Rightarrow$$

$$Q_3 = \left( \frac{X_{[9]} + X_{[10]}}{2} \right) = \frac{5 + 6}{2} = \boxed{5.5}$$

$$IQR = Q_3 - Q_1 = 5.5 - 2 = \boxed{3.5}$$

- (b) (10 points) Construct a boxplot and describe the distribution of the sample taking into account measures of central tendency, measures of dispersion and skewness. Note: it is not necessary to compute the standard deviation.

Boxplot :



$$Q_1 - 1.5 * IQR = 2 - 1.5 * 3.5 = -3.25 \Rightarrow 0$$

$$Q_3 + 1.5 * IQR = 5.5 + 1.5 * 3.5 = 10.75$$

$$\text{Range} = 17 \quad IQR = 3.5$$

Skewed to the right

50% of students exercise between 2 and 5.5 hours

75% of the students exercise less than 5.5 hours

About 92% of the students exercise less than 10.75 hours

75% of the students exercise more than 2 hours

## Midterm ENG-7.

2. Consider choosing someone at random from a population that is 60% female and 40% male. Suppose that for the women, the probability of having a hand size smaller than  $100 \text{ cm}^2$  is .3. Suppose that for the men, the probability of having a hand size smaller than  $100 \text{ cm}^2$  is .08.

- (a) (10 points) What is the probability that the randomly chosen person will have hand size smaller than  $100 \text{ cm}^2$ ?

$$P(\text{female}) = 0.6 \quad P(\text{male}) = 0.4$$

$$P(< 100 \mid \text{female}) = 0.3$$

$$P(< 100 \mid \text{male}) = 0.08$$

$$\begin{aligned} P(< 100) &= P(< 100 \mid \text{female}) \times P(\text{female}) \\ &\quad + P(< 100 \mid \text{male}) \times P(\text{male}) \\ &= 0.3 \times 0.6 + 0.08 \times 0.4 \\ &= \underline{\underline{0.212}} \end{aligned}$$

- (b) (10 points) Assume that a randomly chosen person has a hand size of  $90 \text{ cm}^2$ . What is the probability that this person is a man?

$$\begin{aligned} P(\text{male} \mid < 100) &= \frac{P(\text{male}) P(< 100 \mid \text{male})}{P(< 100)} \\ &= \frac{0.4 \times 0.08}{0.212} \\ &= \underline{\underline{0.151}} \end{aligned}$$

