Mat-181 Exam 1 Spring 2020

Instructions

This test is to be taken as an individual without outside assistance or notes. If you are suspected of cheating, you will fail this exam and your transgression will be reported.

You can either use a scientific calculator or (with a smartphone) GeoGebra Scientific Calculator.

To use GeoGebra, you must first put your smartphone on **Airplane Mode**. Then, in GeoGebra, turn on **Exam Mode**. You must leave exam mode on for the entire exam. You won't be able to use your smartphone for anything else. After you are done, you will show me how long exam mode has been running, and if that time is not how long you've been sitting, you will fail this exam.

If you accidentally leave exam mode (the green bar will turn red), please bring your phone to me (the professor), so I can see how long you were in exam mode and reset the exam mode timer.

Read each question carefully and show your work. You can get partial credit by showing work even if your final answer is wrong.

Grade Table

(do not write in this table)

question	available points	earned points
1	5	
2	5	
3	10	
4	10	
5	10	
6	10	
Total	50	

Question 1 (5 points)

Determine whether the following measurements represent quantitative or categorical variables.

a. The length of a caterpillar (quantitative/categorical)

b. Whether a caterpillar is fuzzy (quantitative/categorical)

c. The color of a caterpillar (quantitative/categorical)

d. The weight of a caterpillar (quantitative/categorical)

e. The age of a caterpillar (quantitative/categorical)

Question 2 (5 points)

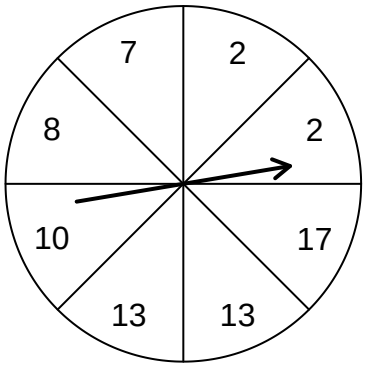
The means and standard deviations for adult human females and males living in the US are given (in centimeters).

sex	mean	standard deviation
female	162.56	8.89
male	177.80	10.16

We will define the interval of typical measurements as $(\mu - 2\sigma, \mu + 2\sigma)$. For each sex, determine the interval of typical measurements. (You need to show two intervals, and each interval has two numbers.)

Question 3 (10 points)

The following spinner was spun 6 times, resulting in the following sample:



Sample: 7
10
17
7
2
17

Determine the spinner's mean (μ), the spinner's standard deviation (σ), the sample mean ($\bar{x}$), and the sample standard deviation (s). You can do this by hand or with a calculator. For doing the calculations by hand, tables are provided on the next page. If you use a calculator, please write the commands you used (so I can give partial credit if you make a typo).

Formulas:

$$\mu = \frac{\sum X}{N} \qquad \sigma = \sqrt{\frac{\sum (X-\mu)^2}{N}} \qquad \bar{x} = \frac{\sum x}{n} \qquad s = \sqrt{\frac{\sum (x-\bar{x})^2}{n-1}}$$

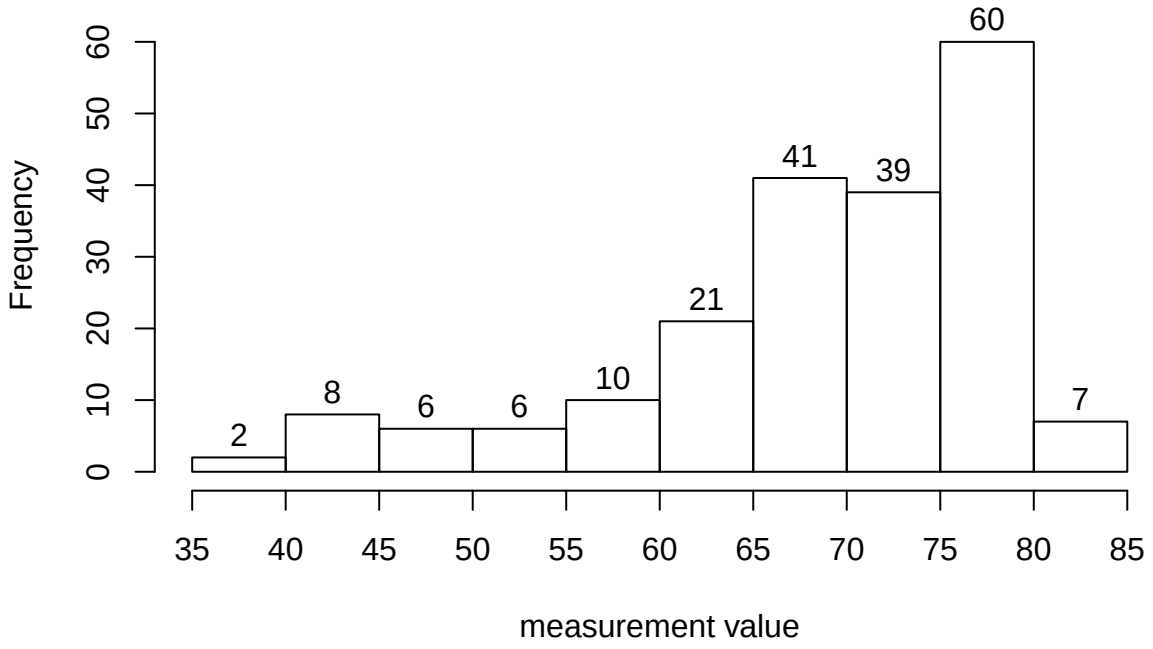
You can use these tables to help you answer question 3.

X	$X-\mu$	$(X-\mu)^2$
$\sum X =$		$\sum (X-\mu)^2 =$
$\mu =$		$\sigma =$

x	$x-\bar{x}$	$(x-\bar{x})^2$
$\sum x =$		$\sum (x-\bar{x})^2 =$
$\bar{x} =$		$s =$

Question 4 (10 points)

A continuous random variable was measured 200 times. The resulting histogram is shown below.



a. Describe the overall shape of the distribution. (symmetric mound, skew left, skew right, uniform, or bimodal)

b. Estimate the range of the distribution (range = max-min).

c. What percent of the measurements are **greater** than 65?

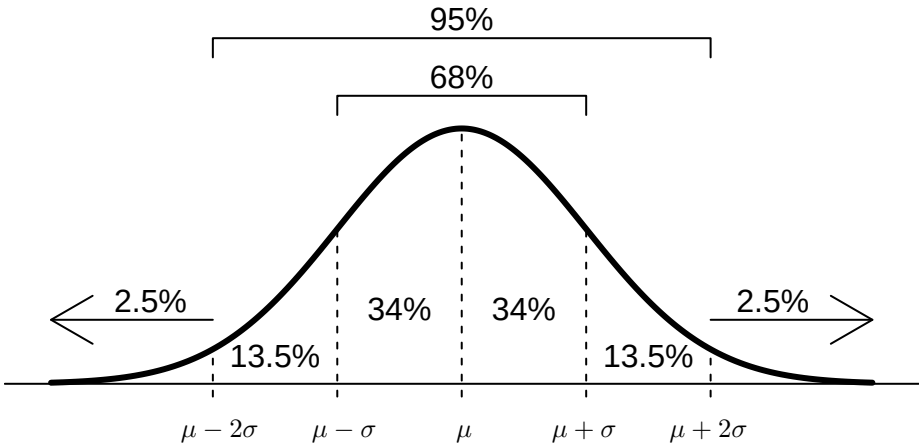
d. What percent of the measurements are **less** than 80?

e. Of the measurements greater than 65, what percent are less than 80?

f. Estimate the value of the 1th percentile. In other words, determine a value (x) such that 1% of values are less than x and 99% of values are greater than x.

Question 5 (10 points)

The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, μ is the mean and σ is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\mu = 650$ and standard deviation $\sigma = 20$.

a. What percent of the measurements are greater than 650?

b. What percent of the measurements are less than 670?

c. What measurement is greater than 16% of the measurements (and less than 84% of measurements)?

d. What measurement is less than 2.5% of the measurements (and greater than 97.5% of measurements)?

e. What percent of the measurements are between 610 and 690?

Question 6 (10 points)

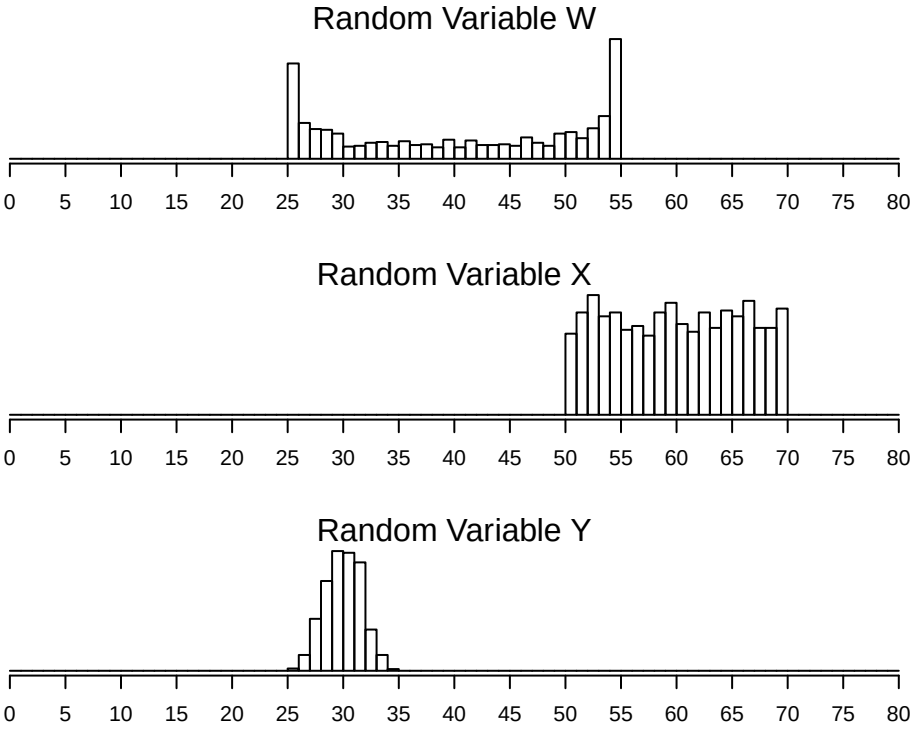
We can estimate the mean of **symmetric** distributions.

$$\bar{x} \approx \frac{\max(x) + \min(x)}{2}$$

We can **roughly** estimate the standard deviation of certain distributions.

Shape	SD estimate
bell	range$/6$
uniform	range$/4$
bimodal	range$/2$

Three continuous random variables (W, X, and Y) were measured 1000 times each. The resulting histograms show the three distributions.



a. Estimate the mean of W.

b. Estimate the mean of X.

c. Estimate the mean of Y.

d. Estimate the standard deviation of W.

e. Estimate the standard deviation of X.

f. Estimate the standard deviation of Y.