Mat-181 Exam 1 Spring 2020 Retake

Instructions

On each problem you missed points on the original test, you can get back half the points by doing the corresponding problem here perfectly.

Read each question carefully and show your work.

Grade Table

(do not write in this table)

question	available points	points original test	additional points earned
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 age of a caterpillar (quantitative/categorical)

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

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

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

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

Question 2 (5 points)

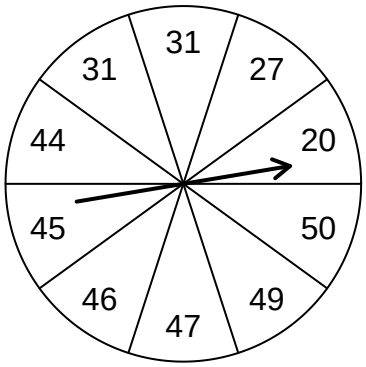
The means and standard deviations for adult human females and males living in the US are given (in centimeters).

sex	mean	standard deviation
female	163	9
male	178	10

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 7 times, resulting in the following sample:



Sample: 45
49
20
45
45
46
44

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:

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

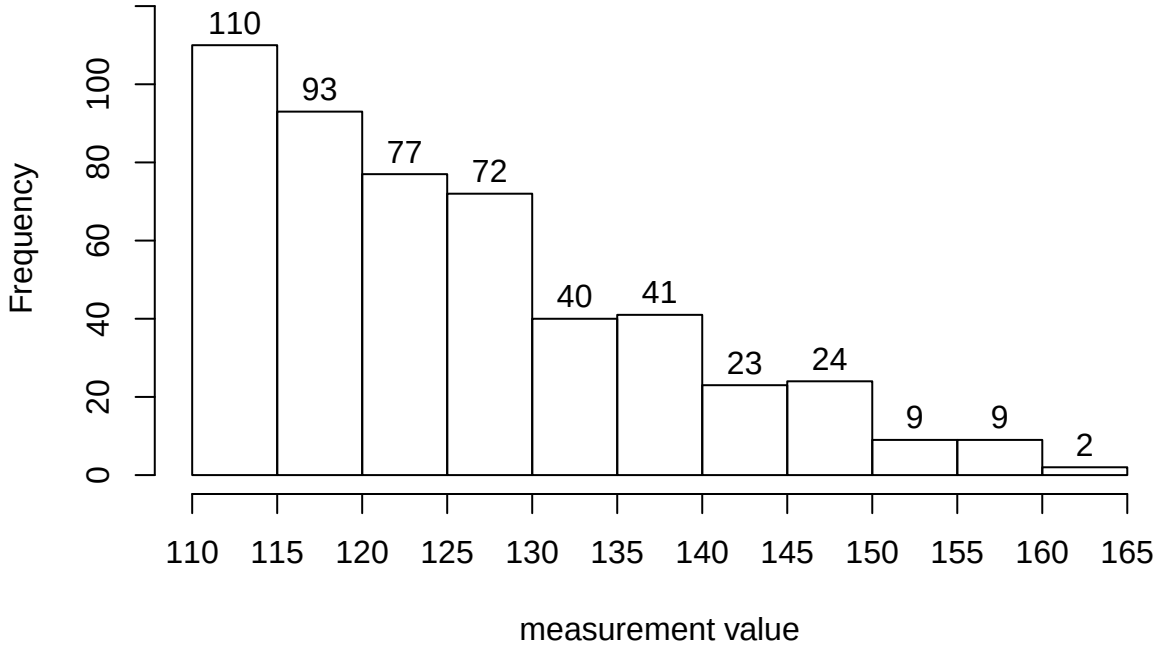
You can use these tables to help you answer question 3.

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 500 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 130?

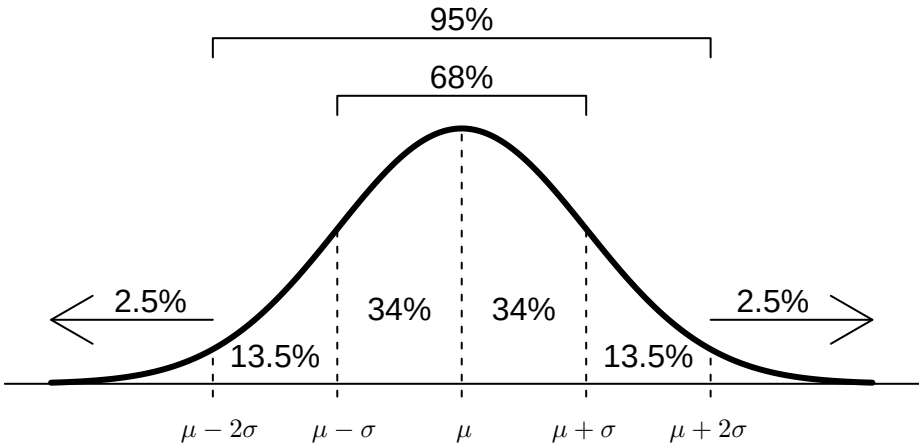
d. What percent of the measurements are **less** than 155?

e. Of the measurements greater than 130, what percent are less than 155?

f. Estimate the value of the 96th percentile. In other words, determine a value (x) such that 96% of values are less than x and 4% 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 $\mu = 333$ and standard deviation $\sigma = 111$.

a. What percent of the measurements are greater than 333?

b. What percent of the measurements are less than 222?

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

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

e. What percent of the measurements are between 111 and 555?

Question 6 (10 points)

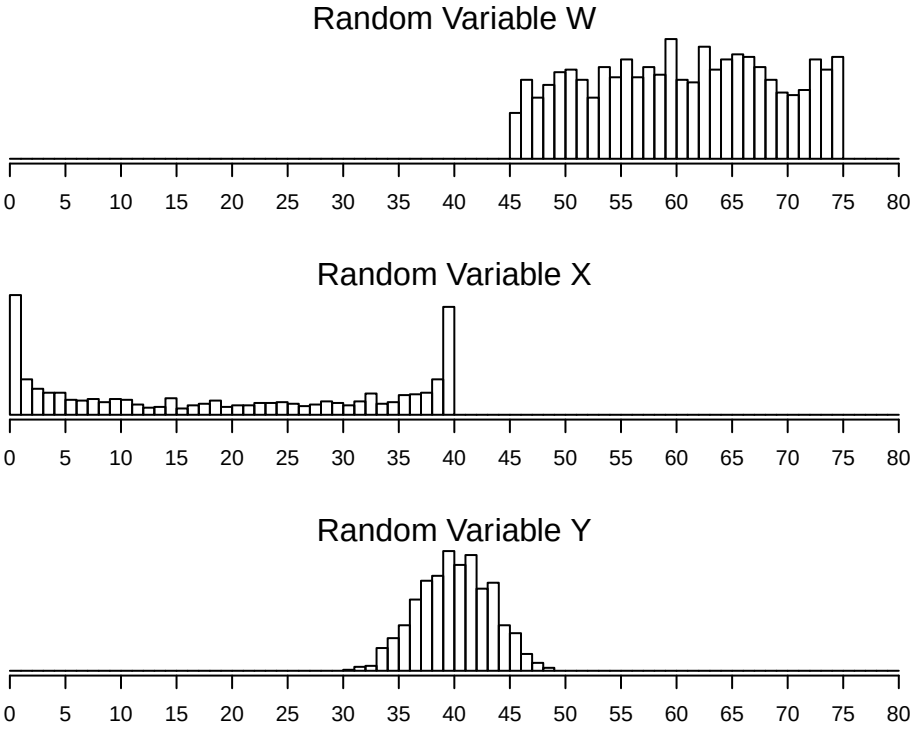
We can estimate the mean of **symmetric** distributions.

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

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.