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, you will use **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.

Read each question carefully and show your work.

Grade Table

(do not write in this table)

question	available points	earned points
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
EC1	3	
EC2	2	
Total	100	

Question 1 (10 pts)

Classify each of the following variables as **quantitative** or **categorical**.

a. years of education (quantitative/categorical)

b. a person's gender (quatitative/categorical)

c. grams of fiber ingested in a day (quatitative/categorical)

d. number of vending machines at BHCC (quantitative/categorical)

e. whether a student is prepared for class (quantitative/categorical)

Question 2 (10 pts)

A survey of 300 BHCC students was conducted, and they were asked to respond with the number of classes they were currently taking.

a. Identify the **individuals** in the study.

b. Identify the **variable** being collected.

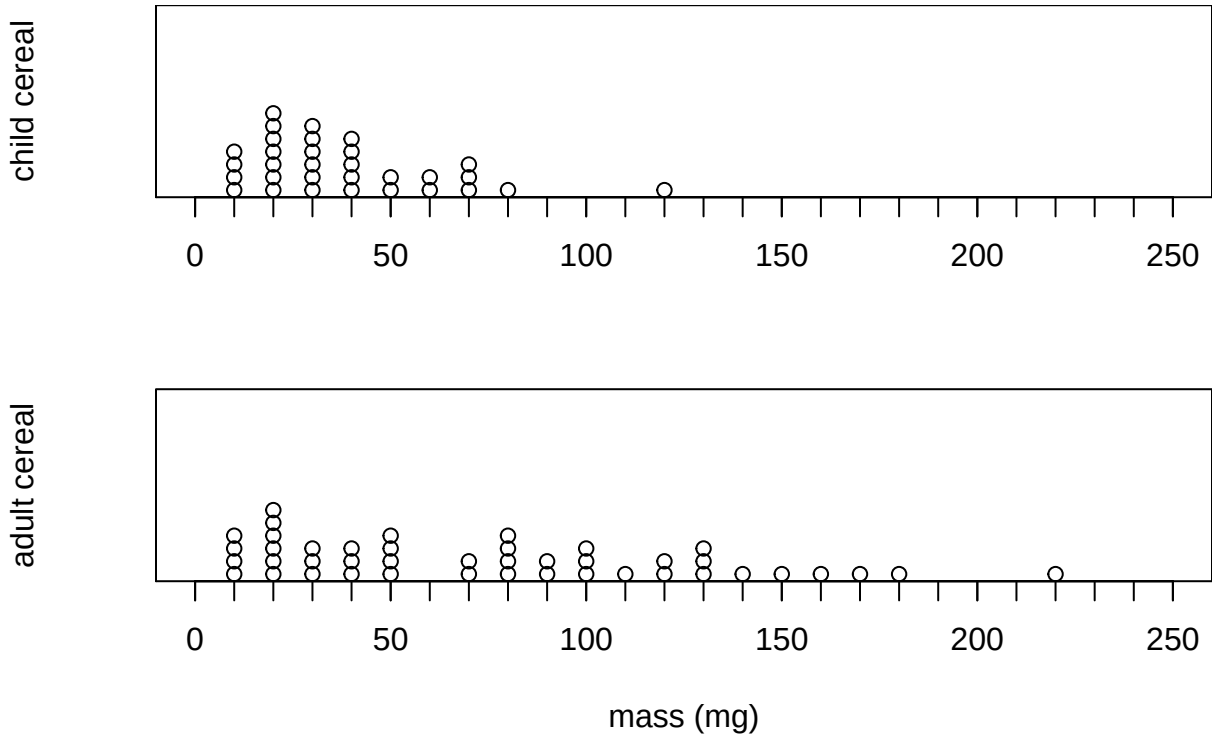
c. Is the variable **quantitative** or **categorical**?

d. What is the **sample size**?

e. What is the implied **population** of this study?

Question 3 (10 pts)

The potassium content in milligrams was measured in various cereals. The cereals were grouped by their intended consumer: child or adult. Compare the two distributions by comparing **shape**, **center**, and **spread**.



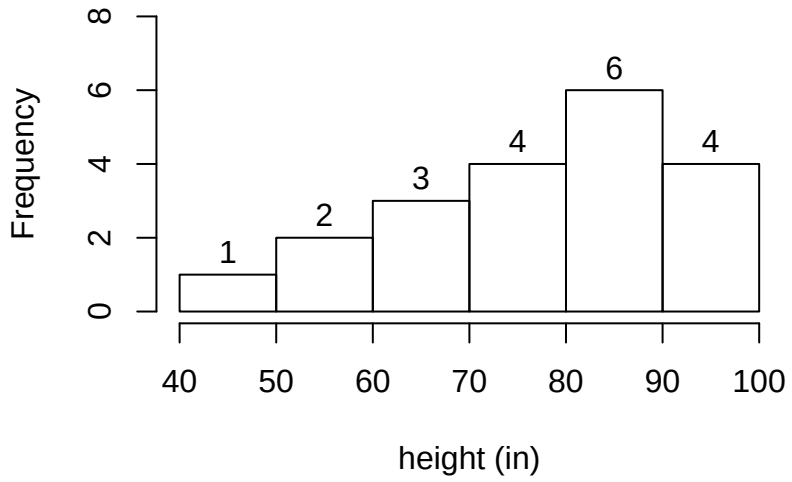
The sample sizes are 31 and 43 for child cereals and adult cereals respectively. Please compare the shape, center, and spread by completing the table below. Also, provide a statement that summarizes the table.

Characteristic	Child's cereal distribution	Adult's cereal distribution
shape		
center		
overall spread		
typical spread		

Statement:

Question 4 (10 pts)

The heights of 20 cacti were measured in inches. The results are shown below.



a. How would you describe the **shape** of this distribution of cacti heights?

b. Estimate the overall **range** of heights.

c. What percentage of the cacti had heights over 70 inches?

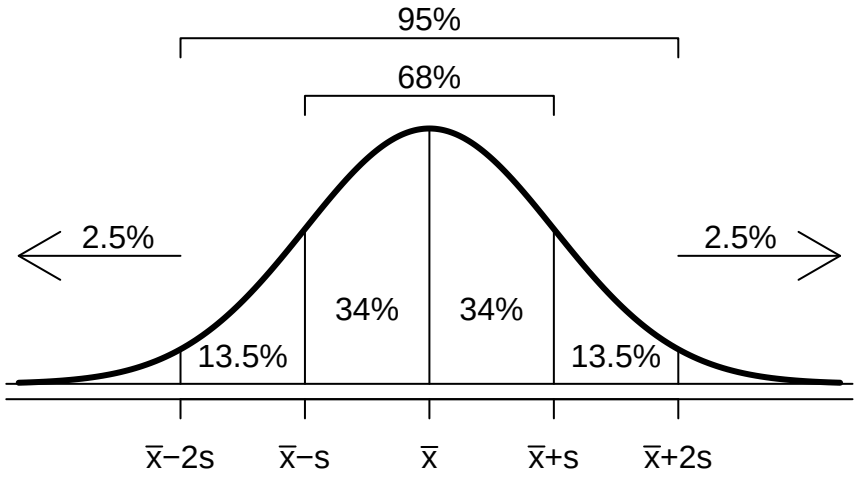
d. What percentage of the cacti had heights over 80 inches?

e. What percentage of the cacti with heights over 70 inches had heights over 80 inches?

f. What height is greater than 15% of the measured cacti's heights? In other words, determine the 15th percentile height.

Question 5 (10 pts)

The figure below summarizes the *standard deviation rule* for normal distributions. In the figure, $\bar{x}$ is the mean and s is the standard deviation. The percentages show the fraction of measurements that fall within various intervals.



A specific distribution is approximately normal with mean $\bar{x} = 400$ and standard deviation $s = 100$.

a. What percent of the measurements are greater than 500?

b. What percent of the measurements are less than 600?

c. What measurement is greater than 16% of the measurements?

d. What measurement is less than 50% of the measurements?

e. What percent of the measurements are between 300 and 500?

Question 6 (10 pts)

From a very large population, a small sample of measurements was taken.

121	133	141	134	134	130	131

Please calculate the (Bessel corrected) sample standard deviation using the following formula:

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

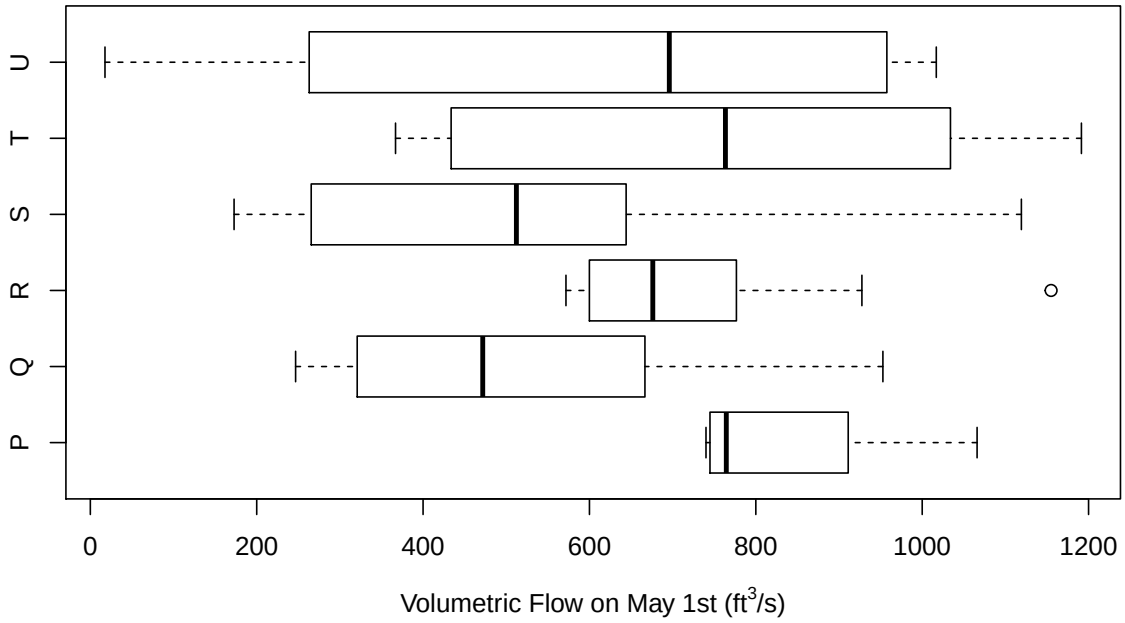
You must fill out the table and show your work.

x	$x - \bar{x}$	$(x - \bar{x})^2$
$\Sigma\, x =$		$\Sigma\,(x - \bar{x})^2 =$
$\bar{x} =$		

$$s =$$

Question 7 (10 pts)

The volumetric flow rate of 6 different rivers (labeled P through U) was measured on May 1st every year for 25 years. The results are shown below. Answer the questions about the distributions of flows.



a. Which river had the smallest measured flow?

b. Which **two** rivers had the largest measured flows?

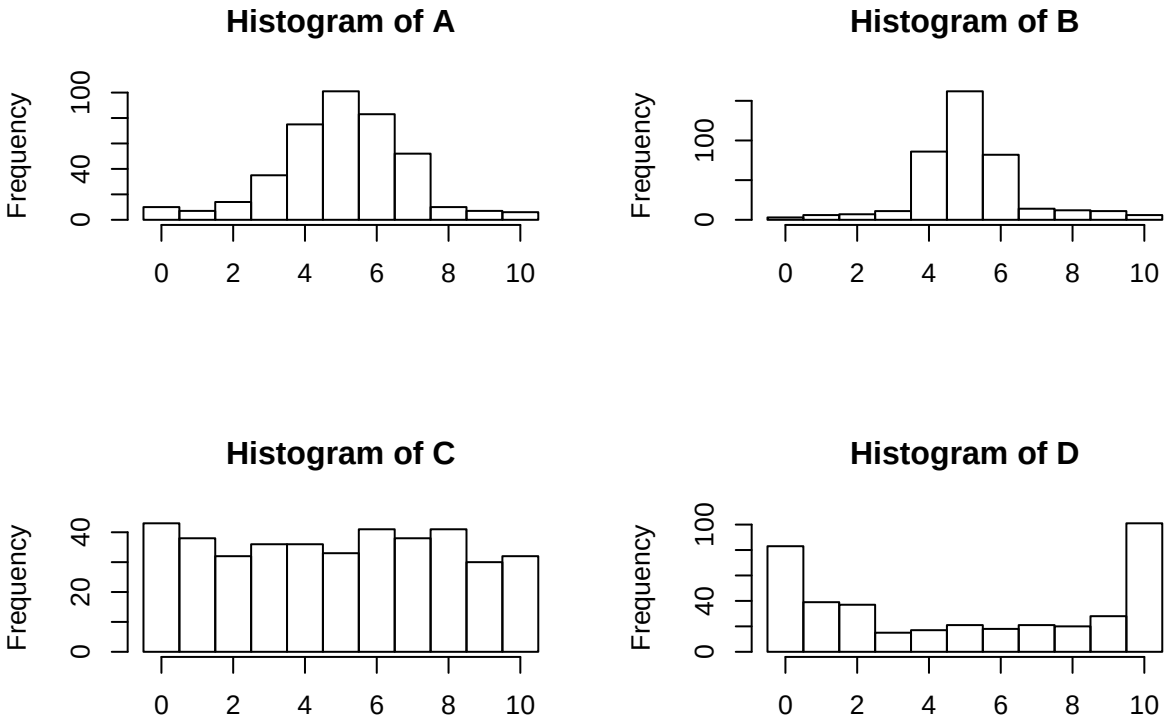
c. Which **two** rivers had medians less than 600 ft^3/s?

d. Which river had the highest percentage of its measurements above 700 ft^3/s?

e. Which river had the largest IQR?

Question 8 (10 pts)

Four different variables were each measured 400 times. The resulting histograms are shown below.



a. Which variable's distribution has the largest standard deviation? (Multiple Choice)
- A, because its measurements tend to be nearest the center.
- B, because its measurements tend to be nearest the center.
- C, because the frequencies are all similar.
- D, because its measurements tend to be farthest from the center.
- All, because they all have the same range.
- Impossible to tell, because the exact measurements are unknown.

b. Which variable's distribution has the smallest standard deviation? (Multiple Choice)
- A, because its measurements tend to be nearest the center.
- B, because its measurements tend to be nearest the center.
- C, because the frequencies are all similar.
- D, because its measurements tend to be farthest from the center.
- All, because they all have the same range.
- Impossible to tell, because the exact measurements are unknown.

Question 9 (10 pts)

The means and standard deviations for adult human females and males are given.

sex	mean	standard deviation
female	95.7 cm	6.8 cm
male	97.8 cm	6.3 cm

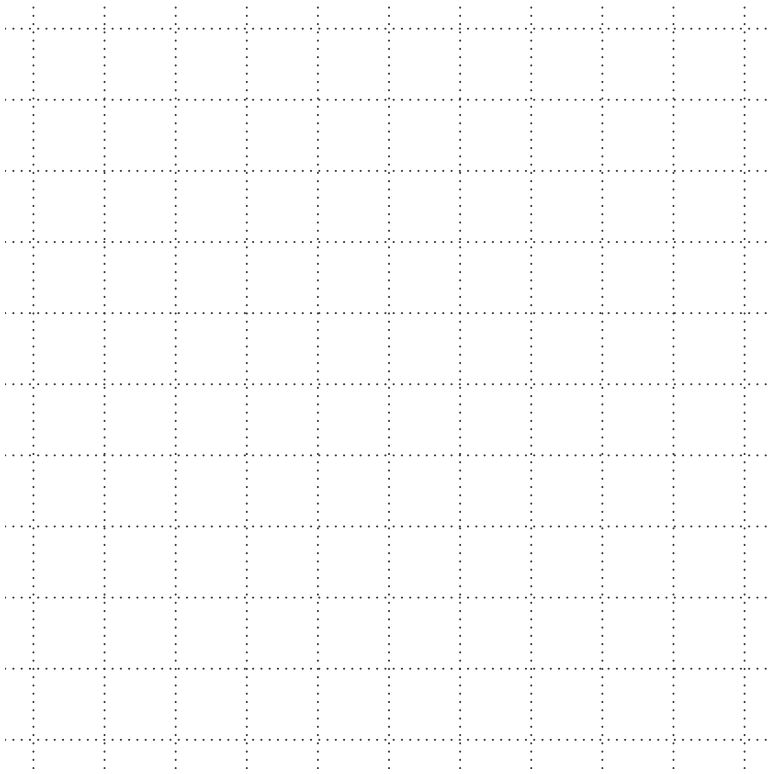
For each sex, determine the interval of typical measurements.

Question 10 (10 pts)

Please make a *relative-frequency table* and a *relative-frequency histogram* from the following (sorted) continuous data by using the supplied classes.

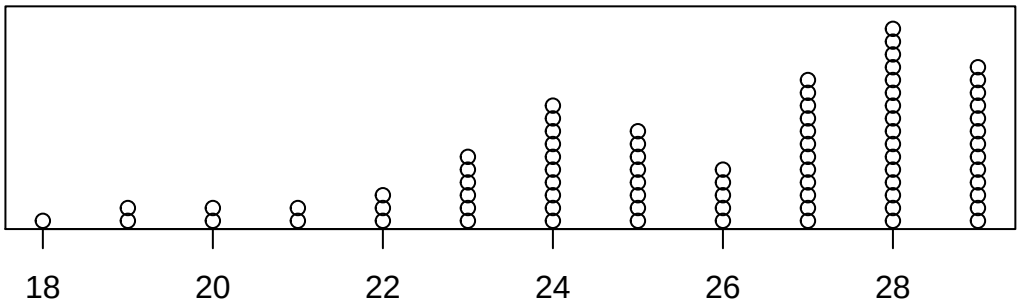
288.51	292.28	292.74	294.14	295.88	297.18	299.28	299.74	300.7	303.02
303.49	303.81	306.1	306.85	307.09	307.17	307.69	307.82	308.94	309.6
311.24	312.16	312.16	312.44	312.58	313.37	315.01	315.94	316.6	319.23
320.87	321.19	321.85	322.01	322.04	322.73	322.77	322.89	322.91	323.27

class	frequency	relative frequency
285 - 290		
290 - 295		
295 - 300		
300 - 305		
305 - 310		
310 - 315		
315 - 320		
320 - 325		



EXTRA CREDIT 1 (3 pts)

For the following distribution, should median or mean be used to describe the center? Why?



EXTRA CREDIT 2 (2 pts)

The amounts of money different students spend on textbooks is approximately normal with a **mean** of \$235 and a **standard deviation** of \$20. According to the *standard deviation rule*, about 2.5% of the students spend more than what amount of money on textbooks?