Math 207
Introduction to Statistics

Exam I

No books, notes or calculators are allowed on this exam.

1. A 1994 study of young children found that those with more body fat tended to have more "controlling" parents. The *San Francisco Chronicle* concluded that "Parents of Fat Kids Should Lighten Up." (20 points)

   a) Was this an observational study or a randomized, controlled experiment? Explain.

   b) Did the study find an association between parents' behavior and children's levels of body fat? Explain.

   c) If controlling behavior causes obesity, could that explain the association?

   d) Suppose there were a gene that caused obesity. Why would that *not* explain the association?

2. In a health study, subjects' heights have an average of 64 inches and an sd of 3 inches. (15 points)

   a) Make a rough sketch of the histogram of subjects' heights. Assume a normal (Gaussian) histogram.

   b) About what percent of the subjects had heights between 61 and 70 inches?

(25 points)

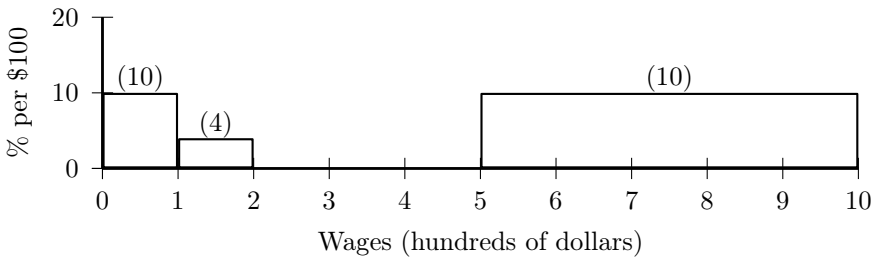
3. a) Find the mean, median and sd of the list -4, 5, 3, 5, 5, 12, 9.

b) Which number(s) in the list are within 1 sd of the mean?

c) If you add 4 to each number in the list, what will the new mean and sd be?

d) If you multiply each number in the list by 4, what will the new mean and sd be?

4. A histogram of monthly wages for part-time employees is shown below (densities are marked in parentheses). Nobody earned more than $1,000 per month. (15 points)



a) The block over the class interval from $200 to $500 is missing. Determine how tall it must be then add it to the histogram.

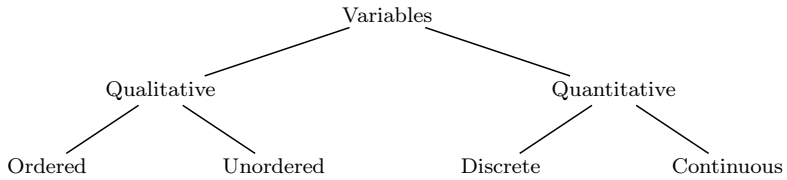
b) About what percent of the employees earned between $600 and $800 per month?

c) About what percent of the employees earned more than $200 per month?

5. Make a sketch then estimate the area under the normal curve. (5 points each)

a) to the right of $z = 1$ b) to the left of $z = -6.5$ c) between $z = -1$ and $z = 3$

6. (10 points) In class we discussed four types of variables: ordered, unordered, discrete and continuous:



In your own words, describe one variable of each of the four types. Write down some values for each of your variables.

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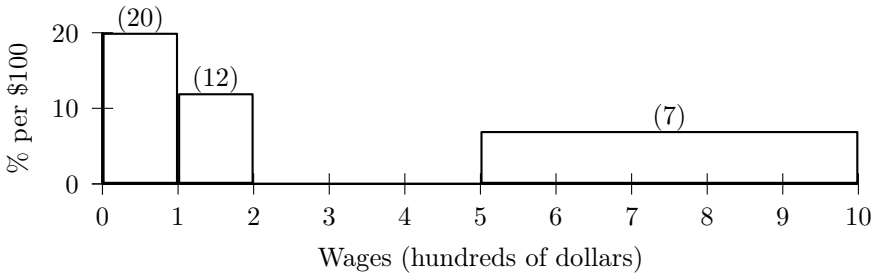
1. A histogram of monthly wages for part-time employees is shown below (densities are marked in parentheses). Nobody earned more than \$1,000 per month. (15 points)



a) The block over the class interval from \$200 to \$500 is missing. Determine how tall it must be then add it to the histogram.

b) About what percent of the employees earned between \$700 and \$1000 per month?

c) About what percent of the employees earned less than \$500 per month?

2. In a health study, subjects' heights have an average of 65 inches and an sd of 5 inches. (15 points)

a) Make a rough sketch of the histogram of subjects' heights. Assume a normal (Gaussian) histogram.

b) About what percent of the subjects had heights between 55 and 75 inches?

3. A 1994 study of young children found that those with more body fat tended to have more "controlling" parents. The *San Francisco Chronicle* concluded that "Parents of Fat Kids Should Lighten Up." (20 points)

a) Was this an observational study or a randomized, controlled experiment? Explain.

b) Did the study find an association between parents' behavior and children's levels of body fat? Explain.

c) If controlling behavior causes obesity, could that explain the association?

d) Suppose there were a gene that caused obesity. Why would that *not* explain the association?

(25 points)

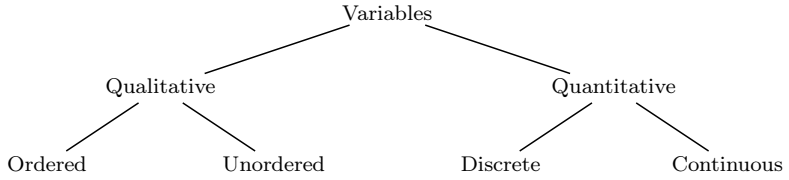
4. a) Find the mean, median and sd of the list 6, 15, 13, 19, 15, 15, 22.

b) Which number(s) in the list are within 1 sd of the mean?

c) If you add 3 to each number in the list, what will the new mean and sd be?

d) If you multiply each number in the list by 3, what will the new mean and sd be?

5. (10 points) In class we discussed four types of variables: ordered, unordered, discrete and continuous:



In your own words, describe one variable of each of the four types. Write down some values for each of your variables.

6. Make a sketch then estimate the area under the normal curve. (5 points each)

a) to the left of $z = 1$

b) to the right of $z = -6.5$

c) between $z = -2$ and $z = 3$

The **mean** of a list of numbers is:

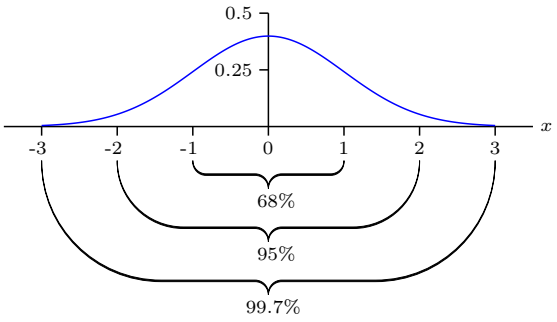
$$\text{mean} = \frac{x_1 + x_2 + \cdots + x_n}{n} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

The **sample standard deviation** is

$$\text{sd} = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n} (x_i - \text{mean}_x)^2}$$

Convert x to **standard units** using:

$$z = \frac{x - \text{mean}}{sd}$$



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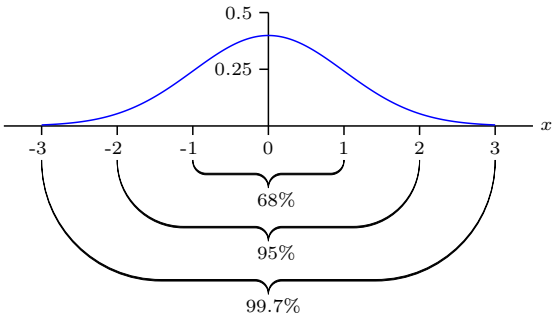
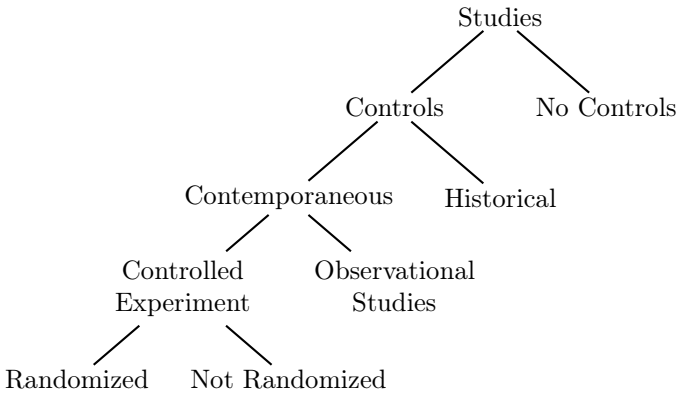
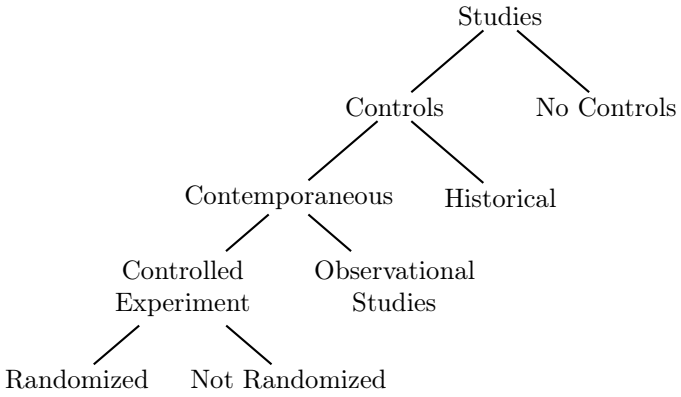



Studies
Controls
No Controls
Contemporaneous
Historical
Controlled Experiment
Observational Studies
Randomized
Not Randomized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