HW due a start of class 8-2-10.

1. Let X = the number of tosses to obtain the first head.

a. Guess μ = E X (it is intuitive)

b. Can you guess σ?

c. Let x_1 denote the number of tosses you have to make to get the first head. Repeat the experiment to get x_2 (the number of tosses you have to make to get the first head the second time you try the experiment). Do this 30 times getting $x_1, \ldots, x_{30}$. Record the results (number of tosses required for each of 30 replications of "tossing unitl the first head."

d. From your sample of n = 30 give

$\bar{x}$ (sample mean), an estimate of μ

s, your estimate of σ

$\frac{s}{\sqrt{n}}$, your estimate of the standard deviation of $\bar{x}$

MOE (margin of error for $\bar{x}$) = $1.96 \frac{s}{\sqrt{n}}$

95% z-based CI for $\boldsymbol{\mu}$

If μ is not in your interval then a "bad" event has occurred.
What is the probability of this "bad" event?

Around what fraction of the class should have an 80% t-CI containing $\boldsymbol{\mu}$?

Prepare a histogram of your 30 numbers, does it look at all as though X is normal distributed?

2. Let X = the number of heads in 10 tosses of a coin. Although X is not normally distributed (it is binomial) the distribution is not far from normal with mean np, and standard deviation $\sqrt{n\,p\,(1-p)}$. For n = 3 times toss a coin 10 times recording the number of heads x_1, x_2, x_3 in each of the three experiments.

From your sample of n = 3 give

$\bar{x}$ (sample mean), an estimate of μ

s, your estimate of σ

$\frac{s}{\sqrt{n}}$, your estimate of the standard deviation of $\overline{x}$

df

t-MOE (margin of error for $\overline{x}$) = $t_{0.025}\ \frac{s}{\sqrt{n}}$

80% t-based CI for μ

If μ is not in your interval then a "bad" event has occurred.
What is the probability of this "bad" event?

Around what fraction of the class should have an 80% t-CI containing μ?

3. A 95% z-CI for μ based on a large sample selected with replacement from a population is given as [3.884, 3.9170].

MOE

Interval for 68% confidence

$\overline{x}$

95% z-CI if instead the sampling is without replacement, population size N = 1000 and sample size n = 100.