

# Statistics

Name \_\_\_\_\_

## Unit 7 Review #4

1. Identify the bolded number as a parameter or statistic.

a. The National Center for Health Statistics reports that the mean systolic blood pressure for males 35 to 44 years of age is **128** and the standard deviation is 15. The medical director of a large company looks at the medical records of 72 executives in this age group and finds that the mean systolic blood pressure for these executives is **126.07**.

128 - parameter  
126.07 - statistic

b. Nationwide, **84%** of people are living in the same house they were living in one year ago. The town council of Pleasant Valley surveys 100 residents and find that **75%** of them have not moved in the past year.

84% - parameter  
75% - statistic

2. According to the 2000 U.S. Census, 80% of Americans over the age of 25 have earned a high school diploma. Suppose we take a random sample of 120 Americans and record the proportion,  $\hat{p}$ , of individuals in our sample that have a high school diploma.

(a) What are the mean and standard deviation of the sampling distribution of  $\hat{p}$ ?

$$\mu_{\hat{p}} = .8 \quad \sigma_{\hat{p}} = \sqrt{\frac{.8(1-.8)}{120}} = .03652$$

(b) What is the approximate shape of the sampling distribution? Justify your answer.

It is approximately normal because

$$\begin{array}{ll} np \geq 10 & \text{and } n(1-p) \geq 10 \\ 120(.8) & 120(1-.8) \\ 96 \geq 10 & 24 \geq 10 \end{array}$$

3. George is a big fan of music from the 1960s, and 26% of the songs on his smartphone are Beatles songs. Suppose George sets his mp3 player to "shuffle," so that it selects songs randomly (assume the shuffle function permits repetition of songs, so the "population" of songs is essentially infinite). During a long drive, George plays 50 randomly-selected songs.

(a) What are the mean and standard deviation of the proportion of the 50 randomly-selected songs that are Beatles songs?

$$\mu_{\hat{p}} = .26 \quad \sigma_{\hat{p}} = \sqrt{\frac{.26(1-.26)}{50}} = .062$$

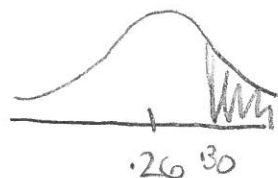
(b) Can we use the formula for standard deviation? Why or why not?

yes  $10(50) < \text{All George's songs}$

(c) Can we use the normal approximation? Justify your answer.

yes because  $np \geq 10$  and  $n(1-p) \geq 10$   
 $50(.26) \geq 10$  and  $50(1-.26) \geq 10$   
 $13 \geq 10$  and  $37 \geq 10$

(d) Calculate the probability that more than 30% of the 50 randomly-selected songs are Beatles songs.



LB .3  
 UB 10000  
 $\mu$  .26  
 $\sigma$  .062  
 .2594

4. The customer care manager at a cell phone company keeps track of how long each help-line caller spends on hold before speaking to a customer service representative. He finds that the distribution of wait times for all callers has a mean of 12 minutes with a standard deviation of 5 minutes. The distribution is moderately skewed to the right. Suppose the manager takes a random sample of 10 callers and calculates their mean wait time,  $\bar{x}$ .

(a) What is the mean of the sampling distribution of  $\bar{x}$ ?

$$\mu_{\bar{x}} = 12$$

(b) Is it possible to calculate the standard deviation of  $\bar{x}$ ? If it is, do the calculation. If it isn't, explain why.

yes, because  $10(10) < \text{All callers}$

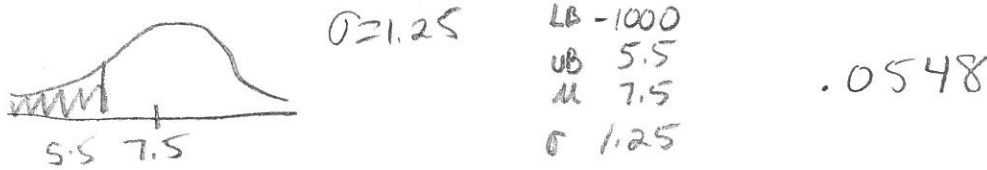
$$\sigma_{\bar{x}} = \frac{5}{\sqrt{10}} = 1.5811$$

(c) Do you know the approximate shape of the sampling distribution of  $\bar{x}$ ? If so, describe the shape and justify your answer. If not, explain why not.

No, the population is skewed and our sample size is too small ( $10 < 30$ )

5. The weights of newborn children in the United States vary according to the Normal distribution with mean 7.5 pounds and standard deviation 1.25 pounds. The government classifies a newborn as having low birth weight if the weight is less than 5.5 pounds.

(a) What is the probability that a baby chosen at random weighs less than 5.5 pounds at birth?

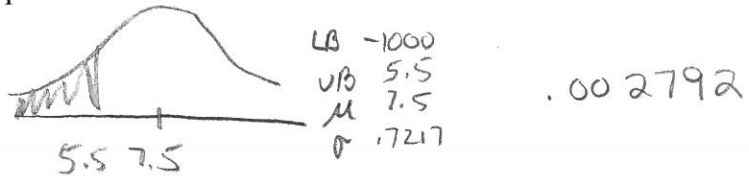


(b) You choose three babies at random and compute their mean weight,  $\bar{x}$ . What is the probability that their average birth weight is less than 5.5 pounds?

Need new s.d.

$$\sigma_{\bar{x}} = \frac{1.25}{\sqrt{3}} = .7217$$

$$\mu_{\bar{x}} = 7.5$$



6. Suppose you are going to roll a fair six-sided die 60 times and record  $\hat{p}$ , the proportion of times that a 1 or a 2 is showing.

(a) What is the mean of the sampling distribution of  $\hat{p}$ ?

$$\mu_{\hat{p}} = \frac{1}{3} \quad (\text{there is a } \frac{1}{3} \text{ prob of getting a 1 or 2})$$

(b) What is the standard deviation of the sampling distribution of  $\hat{p}$ ?

$$\sigma_{\hat{p}} = \sqrt{\frac{\frac{1}{3}(1-\frac{1}{3})}{60}} = .060858$$

(c) Describe the shape of the sampling distribution of  $\hat{p}$ . Justify your answer.

Approximately normal because  $n p \geq 10$  and  $n(1-p) \geq 10$   
 $60(\frac{1}{3}) = 20 \geq 10$  and  $60(1-\frac{1}{3}) = 40 \geq 10$

(d) Suppose that when you actually roll the die 60 times, you get 30 rolls of 1 or 2, for a  $\hat{p}$  of 0.5. Find the probability of getting 50% or higher of the rolls show a 1 or 2.

