

key

CC Math 3

Name: _____

Unit 1 - Statistics REVIEW

Directions: For all questions, answers must be justified thoroughly. Show all work - answers in isolation will not be given credit. Include a diagram where appropriate and write all answers in a complete sentence.

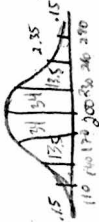
1. In 1995, the College Board adjusted the scale on the math SAT test, which made it difficult to compare scores on tests taken before 1995 (when the mean score was 470 with a standard deviation of 110) and tests taken after 1995 (when the mean score was 500 with a standard deviation of 100). Colleen took the test in 1994 and scored a 500. Her sister Jane took the test in 1996 and scored a 520. Which girl did better?

$$Z_c = \frac{500 - 470}{110} = \frac{3}{11} = .27$$

$$Z_s = \frac{520 - 500}{100} = \frac{20}{100} = .2$$

Colleen

2. The mean weight of college football players is 200 pounds with a standard deviation of 30. Find the probability that a randomly selected player:



- a. weighs between 170 and 260 $68 + 13.5 = 81.5\%$
- b. weighs less than 170 $13.5 + 2.5 = 16\%$
- c. weighs over 290 $.15\%$
- d. weighs less than 140 2.5%
- e. weighs between 140 and 230 81.5%

3. Oranges sold on a market stall have weights that are normally distributed with a mean of 218 kg and a standard deviation of 0.25 kg. For an orange chosen at random, find the probability that its weight lies between 2 kg and 2.5 kg.

$$\text{Normal cdf}(2, 2.5, 218, 0.25) = .664$$

4. A teacher travels from home to work by car each weekday by one of two routes, X or Y. For route X, her journey times are normally distributed with a mean of 30.4 minutes and a standard deviation of 3.6 minutes. Calculate the probability that her journey time on a particular day takes between 25 minutes and 35 minutes.

$$\text{Normal cdf}(25, 35, 30.4, 3.6) = .8325$$

5. A survey was conducted to measure the number of hours per week adults in the United States spend on home computers. In the survey, the number of hours was normally distributed, with a mean of 7 hours and a standard deviation of 1 hour. A survey participant is randomly selected.

- a. Find the probability that the hours spent on the home computer by the participant are less than 4.5 hours per week. $\text{Normal cdf}(0, 4.5, 7, 1) = .0062$
- b. Find the probability that the hours spent on the home computer by the participant are between 4.5 and 9.5 hours per week. $\text{Normal cdf}(4.5, 9.5, 7, 1) = .9876$
- c. How much time would a random adult have to spend on his home computer to be in the 85th percentile of all adults? $\text{Normal}(.85, 7, 1) = 8.04 \text{ hours}$



6. Identify which kinds of bias is in each of the following scenarios.

- a) Students are asked by their teacher whether they had ever cheated on a test. *Req.*
- b) A fast-food franchiser uses a cluster survey to find out about employer-employee relations.
- c) A survey asks the question: "Are you in favor of holding the Olympics in Toronto, even though your taxes may increase?" *Voluntary*
- d) A radio station asks listeners to call in to voice their opinions on whether a Canadian figure skater should have won a gold medal. *Voluntary*

7. An important part of employee compensation is a benefits package that might include health insurance, life insurance, child care, vacation days, etc. Suppose you want to conduct a survey of benefit packages available in privately owned businesses in Raleigh. You want a sample size of 100. Some sampling techniques are described below. Categorize each technique as simple random sampling, stratified sampling, systematic sampling, cluster sampling, or convenience sampling.

- a) Assign each business in the Wake County Business Directory a number, then use a random number table to select the businesses to be included in the sample. *SR*
- b) Use the postal ZIP codes to divide the county into regions. Pick a random sample of 3 ZIP code areas, and then include all businesses in each selected ZIP code area. *Cluster*
- c) Send a team of five research assistants to Fayetteville Street in downtown Raleigh. Let each assistant select a block or building and interview an employee from each business found. Each researcher can have the rest of the day off after getting responses from 20 different businesses. *Conv.*
- d) Using the Wake County Business Directory, number all of the businesses. Select a starting place at random, then use every 50th business listed until you have 100 businesses. *SR*
- e) Group the businesses into 10 different categories: medical, shopping, retail, manufacturing, financial, construction, etc. Then select a random sample of 10 businesses from each group. *Strat.*

8. Modern Managed Hospitals (MMH) is a national for-profit chain of hospitals. Management wants to survey patients discharged this past year to obtain patient satisfaction profiles. They wish to use a sample of such patients. Some sampling techniques are described below.
Categorize each technique as simple random sampling, stratified sampling, systematic sampling, cluster sampling, or convenience sampling.

- a) Obtain a list of patients discharged from all MMH facilities. Divide the patients according to the length of hospital stay (3 days or less, 3 - 7 days, 8 - 14 days, more than 14 days). Draw simple random samples from each group. *stratified*
- b) Obtain a list of patients discharged from all MMH facilities. Number these patients, and then use a random-number table to obtain the sample. *SR*
- c) Randomly select a few MMH facilities from each of five geographic regions, and then take all patients on the discharge list of the selected hospitals. *cluster*
- d) At the beginning of the year, instruct all MMH facilities to survey every 500th patient discharged. *systematic*
- e) Instruct each MMH facility to survey 10 discharged patients this week and send in the results. *conv.*

9. Determine whether each of the following is an observational study or an experiment:

- a) Fifty people with clinical depression were divided into two groups. Over a 6 month period, one group was given a traditional treatment for depression while the other group was given a new drug. The people were evaluated at the end of the period to determine whether their depression had improved. *ex.*
- b) One hundred people who regularly work out at a gym and one hundred people who do not workout are tested for their cholesterol levels to determine whether exercise helps lower cholesterol! *obs. study - choice to workout*
- c) In 2002, the Journal Science reported that a study of women in Finland indicated that having sons shortened the lifespans of mothers by about 34 weeks per son, but daughters helped to lengthen the mothers' lives. The data came from church records from the period 1640 to 1870. *obs. study*
- d) To determine whether or not apples really do keep the doctor away, forty patients at a doctor's office were asked to report how often they came to the doctor and the number of apples they had eaten recently. *obs. study*

e) To determine whether music really helped students' scores on a test, a teacher who taught two U S History classes played classical music during testing for one class and played no music during testing for the other class. *ex*

10. A poll reports that 58% of the voters prefer Candidate B with a margin of error of $\pm 4.5\%$. Estimate the number of voters in the poll.

$$ME = .045 = \frac{1}{n} \quad \text{so } n = \left(\frac{1}{.045}\right)^2 = 500$$

11. A news report states that based on a recent survey of randomly selected high school seniors, it is estimated that 30% of all seniors drink alcohol on a regular basis (margin of error $\pm 3.5\%$).

- a) Identify the population and the sample. *all HS seniors - pop*
- b) Identify whether the underlined value is a parameter or a statistic. *statistic*

c) Must it be true that between 26.5% and 33.5% of all high school seniors drink alcohol on a regular basis? *no.*

d) How large was the sample size? $ME = .035 = \frac{1}{n} \quad \text{so } n = \left(\frac{1}{.035}\right)^2 = 816$

12. A player's batting average is .4. He bats five times per game.

a) How could you use random digits to simulate his times at bat? *0-4 = hit, 5-9 = no hit*

b) Based on the simulation below, what is the probability that he gets at least 2 hits in five times at bat in a game?

3 hits	2
2 hits	2
3 hits	2
1	3
5	2
<hr/>	
	$\geq 2 = \frac{9}{10}$ or 90%

c) How many games are represented above? *10*

13. A game of chance is based on rolling a pair of fair six-sided dice. The player wins if the sum of the two numbers is greater than or equal to 8.

- a. How will you use the calculator's randInt function to simulate this game? *randInt(2,12,1)*
- b. Run 20 trials and report the probability of winning based of your simulation.

* Don't forget to make your note card and bring it with you on test day!*

b)

10	6	12	7
5	6	10	5
3	3	8	5
5	8	9	2
6	5	2	7

$$P(x \geq 8) = \frac{6}{20} = \frac{3}{10} \text{ or } 30\%$$