Name _Key_   Algebra 2 ~~Homework~~

For 1 & 2:

- identify whether the study is a survey, observational study, or experiment, and give a reason for your answer.
- For observational studies, identify the population of interest.
- For experiments, identify the treatment and response variables.

1. Linda wanted to know if it is easier for students to memorize a list of common three-letter words (such as fly, pen, red, ...) than a list of three-letter nonsense words (such as vir, zop, twq, ...). She randomly selected 28 students from all tenth-graders in her district. She put 14 blue and 14 red chips in a jar, and without looking each student chose a chip. Those with red chips were given the list of common words; those with blue chips were given the list of nonsense words. She gave all students one minute to memorize their list. After the minute, she collected the lists and asked them to write down all the words that they could remember. She recorded the number of correct words recalled.

· Experiment – students were randomly assigned to memorize a list of common words or nonsense words.

· 2 Trmts – common words and nonsense words

· Response variable – # correct words recalled.

2. Ken wants to compare how many hours a week that sixth graders spend doing mathematics homework to how many hours a week that eleventh graders spend doing mathematics homework. He randomly selects ten sixth graders and ten eleventh graders and records how many hours each student spent on mathematics homework in a certain week.

· Obs. study – stud. randomly selected from a pop. of interest, but no trmt was administered.

· Pop of Interest – 6th + 11th graders
 study was to observe # hrs spent on math hw in a certain week

3. Suppose that in your health class you read two studies on the relationship between eating breakfast and success in school for elementary school children. Both studies concluded that eating breakfast causes elementary school children to be successful in school.

   a. Suppose that one of the studies was an observational study. Describe how you would recognize that they had conducted an observational study. Were the researchers correct in their causal conclusion? Researchers went to several elem. schools in a district and randomly sampled many students. They determined if students ate b'fast or not on a regular basis + had the district provide the students' academic performance. findings not causal bc it was obs. study. Stud. not randomly assigned trmt.

b. Suppose that one of the studies was an experiment. Describe how you would recognize that they had conducted an experiment. Were the researchers correct in their ~~casual~~ causal conclusion?

Researchers found 100 students of comparable abilities. They randomly assigned 50 of them to eat b'fast ; other 50 to not eat b'fast for this year. After a year academic achievement was determined for each student. Conclusion is causal since random assign. constituted an exper.

4. Data from a random sample of 50 students in a school district showed a positive relationship between reading score on a standardized reading exam and shoe size. Can it be concluded that having bigger feet causes one to have a higher reading score? Explain your answer.

No, this is an obs. study. The main lurking variable is that age is the link between reading score + shoe size.

Use the following scenarios for Problems 5-7.

a. Researchers want to determine if there is a relationship between whether or not a woman smoked during pregnancy and the birth weight of her baby. Researchers examined records for the past five years at a large hospital.

b. A large high school wants to know the proportion of students who currently use illegal drugs. Uniformed police officers asked a random sample of 200 students about their drug use.

c. A company develops a new dog food. The company wants to know if dogs would prefer its new food over the competition's dog food. One hundred dogs, who were food-deprived overnight, were given equal amounts of the two dog foods: the new food vs. competitor's food. The proportion of dogs preferring the new food was recorded.

5. Which scenario above describes an experiment? Explain why.

Scenario C bc dogs were given a trmt; the choice betw. the new food & competitor's food & their preference was recorded.

6. Which scenario describes a survey? Will the results of the survey be accurate? Why or why not?

Scenario B. The results would likely NOT be accurate bc students would not answer honestly about drug usage to a uniformed officer.

7. The remaining scenario is a(n) _Observational study_. Is it possible to perform an experiment to determine if a relationship exists? Why or why not?

Not possible because mothers would be randomly assigned to smoke or not smoke during pregnancy. It's unethical and illegal to tell a person they MUST smoke.

<u>**Vocab:**</u>

Population: Entire set of subjects in which there is an interest

Sample: Part of the population from which info/data is gathered

Subject: Participant in the study

Response Variable: Not controlled by the experimenter and is measured as part of the experiment

Treatment: Conditions to which subjects are randomly assigned by the experimenter

Random Selection: Using chance process to determine which members of a population are included in the sample.

    -Used in observational studies, surveys & experiments

    -Allows generalization to a population

Random Assignment: Used in experiments to assign subjects treatments

    -Allows for cause & effect conclusions in well-designed experiments

Two studies are described below. One is an observational study, while the other is an experiment.

Study A:

A new dog food, specially designed for older dogs, has been developed. A veterinarian wants to test this new food against another dog food currently on the market to see if it improves dogs' health. Thirty older dogs were randomly assigned to either the "new" food group or the "current" food group. After they were fed either the "new" or "current" food for six months, their improvement in health was rated.

Study B:

The administration at a large school wanted to determine if there was a difference in the mean number of text messages sent by 9th grade students and by 11th grade students during a day. Each person in a random sample of thirty 9th grade students was asked how many text messages he or she sent per day. Each person in another random sample of thirty 11th grade students was asked how many text messages he or she sent per day. The difference in the mean number of texts per day was determined.

1.   Which study is the experiment? Explain.

Study A because trmt (new or current food) is randomly assigned to the dogs and a response variable (health improvement) was measured

In study B, the data were collected from two random samples of students.

Random selection

2. Can the results of the survey be generalized to all 9th grade and all 11th grade students at the school? Why or why not?

Yes b/c the participant were randomly selected from each population

3. Suppose there really is a difference in the mean number of texts sent by 9th grade students and by 11th grade students. Can we say that the grade level of the students is the cause of the difference in the mean number of texts sent? Why or why not?

No b/c we cannot determine cause and effect from an obs. study (survey)

In study A, the dogs were randomly assigned to one of the two types of food.

4. Suppose the dogs that were fed the new food showed improved health. Can we say that the new food is the cause of the improvement in the dogs' health? Why or why not?

Yes b/c we can determine cause and effect from a well-designed experiment

5. Can the results of the dog food study be generalized to all dogs?

No b/c he only sampled from older dogs at his vet office. only if random selection from the population of interest

The table below summarizes the differences between the terms random selection and random assignment.

6. For each statement, put a check mark in the appropriate column(s)

	Random Selection *(sample)*	Random Assignment
Used in experiments	✓ *(not required)*	✓ *(trmt)*
Used in observational studies	✓	
Allows generalization to the population	✓	
Allows a cause and effect conclusion		✓

7. For each of the following, does the group described constitute a population or a sample? Or, could it be considered to be either a population or a sample? Explain your answer.

a. The animals that live in Yellowstone National Park.

Population-subjects are **ALL** animals that live in Yellowstone National Park

b. People who are asked how they voted in an exit poll.

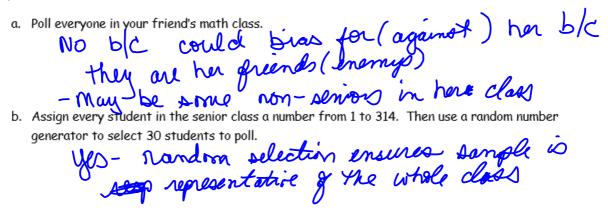Population-if **ALL** people exiting the polling place were asked how they voted on a certain day

Sample-if only **SOME** people were asked

c. Some cars on the lot of the local car dealer.

Sample-example: a customer may only be interested in 2-door models

8. **If a sample is taken for the purpose of generalizing to a population, the sample must be representative of the population.** In other words, **it must be similar to the population even though it is smaller than the population.** For example, suppose you are the campaign manager for your friend who is running for *Senior Class President.* You would like to know what proportion of students would vote for her if the election were held today. The class is too big to ask everyone (314 students). What would you do?

Comment on whether or not each of the following sampling procedures should be used. Explain why or why not.

a. Poll everyone in your friend's math class.

No b/c could bias for (against) her b/c they are her friends (enemys)
— Maybe some non-seniors in here class

b. Assign every student in the senior class a number from 1 to 314. Then use a random number generator to select 30 students to poll.

Yes - random selection ensures sample is ~~also~~ representative of the whole class

c. Ask each student that is going through the lunch line in the cafeteria who they will vote for.

No - b/c non-seniors ~~also~~ also in line

- There is no procedure that guarantees a representative sample. But the best procedure to obtain a representative sample is one that gives every different possible sample an equal chance to be chosen. The sample resulting from such a procedure is called a **Random Sample**.

9. (Using a RNT): The school newspaper is planning an article on family-friendly places to stay over spring break at a nearby beach town. The editors intend to call 4 randomly chosen hotels to ask about their amenities for families with children. They have an alphabetized list of all 28 hotels in the town. Use the Table of Random Digits at line 23 to select the 4 hotels.

01 Aloha Kai	08 Captiva	15 Palm Tree	22 Sea Shell
02 Anchor Down	09 Casa del Mar	16 Radisson	23 Silver Beach
03 Banana Bay	10 Coconuts	17 Ramada	24 Sunset Beach
04 Banyan Tree	11 Diplomat	18 Sandpiper	25 Tradewinds
05 Beach Castle	12 Holiday Inn	19 Sea Castle	26 Tropical Breeze
06 Best Western	13 Lime Tree	20 Sea Club	27 Tropical Shores
07 Cabana	14 Outrigger	21 Sea Grape	28 Veranda

23	4	1	1	9	7	0	7	2	9	0	9	7	0	4	6	2	3	1	0	9
24	9	9	2	7	1	3	2	9	0	3	9	0	7	5	6	7	1	7	8	7

41 (19) 70 72 90 97 (04) 62 31 (09) 99 (27)

NYS COMMON CORE MATHEMATICS CURRICULUM   Lesson 13 M4

ALGEBRA II

Table of Random Digits

Row																				
1	6	6	7	2	8	0	0	8	4	0	0	4	6	0	3	2	2	4	6	8
2	8	0	3	1	1	1	1	2	7	0	1	9	1	2	7	1	3	3	5	3
3	5	3	5	7	3	6	3	1	7	2	5	5	1	4	7	1	6	5	6	5
4	9	1	1	9	2	8	3	0	3	6	7	7	4	7	5	9	8	1	8	3
5	9	0	2	9	9	7	4	6	3	6	6	3	7	4	2	7	0	0	1	9
6	8	1	4	6	4	6	8	2	8	9	5	5	2	9	6	2	5	3	0	3
7	4	1	1	9	7	0	7	2	9	0	9	7	0	4	6	2	3	1	0	9
8	9	9	2	7	1	3	2	9	0	3	9	0	7	5	6	7	1	7	8	7
9	3	4	2	2	9	1	9	0	7	8	1	6	2	5	3	9	0	9	1	0
10	2	7	3	9	5	9	9	3	2	9	3	9	1	9	0	5	5	1	4	2
11	0	2	5	4	0	8	1	7	0	7	1	3	0	4	3	0	6	4	4	4
12	8	6	0	5	4	8	8	2	7	7	0	1	0	1	7	1	3	5	3	4
13	4	2	6	4	5	2	4	2	6	1	7	5	6	6	4	0	8	4	1	2
14	4	4	9	8	7	3	4	3	8	2	9	1	5	3	5	9	8	9	2	9
15	6	4	8	0	0	0	4	2	3	8	1	8	4	0	9	5	0	9	0	4
16	3	2	3	8	4	8	8	6	2	9	1	0	1	9	9	3	0	7	3	5
17	6	6	7	2	8	0	0	8	4	0	0	4	6	0	3	2	2	4	6	8
18	8	0	3	1	1	1	1	2	7	0	1	9	1	2	7	1	3	3	5	3
19	5	3	5	7	3	6	3	1	7	2	5	5	1	4	7	1	6	5	6	5
20	9	1	1	9	2	8	3	0	3	6	7	7	4	7	5	9	8	1	8	3
21	9	0	2	9	9	7	4	6	3	6	6	3	7	4	2	7	0	0	1	9
22	8	1	4	6	4	6	8	2	8	9	5	5	2	9	6	2	5	3	0	3
23	4	1	1	9	7	0	7	2	9	0	9	7	0	4	6	2	3	1	0	9
24	9	9	2	7	1	3	2	9	0	3	9	0	7	5	6	7	1	7	8	7
25	3	4	2	2	9	1	9	0	7	8	1	6	2	5	3	9	0	9	1	0
26	2	7	3	9	5	9	9	3	2	9	3	9	1	9	0	5	5	1	4	2
27	0	2	5	4	0	8	1	7	0	7	1	3	0	4	3	0	6	4	4	4
28	8	6	0	5	4	8	8	2	7	7	0	1	0	1	7	1	3	5	3	4
29	4	2	6	4	5	2	4	2	6	1	7	5	6	6	4	0	8	4	1	2
30	4	4	9	8	7	3	4	3	8	2	9	1	5	3	5	9	8	9	2	9
31	6	4	8	0	0	0	4	2	3	8	1	8	4	0	9	5	0	9	0	4
32	3	2	3	8	4	8	8	6	2	9	1	0	1	9	9	3	0	7	3	5
33	6	6	7	2	8	0	0	8	4	0	0	4	6	0	3	2	2	4	6	8
34	8	0	3	1	1	1	1	2	7	0	1	9	1	2	7	1	3	3	5	3
35	5	3	5	7	3	6	3	1	7	2	5	5	1	4	7	1	6	5	6	5
36	9	1	1	9	2	8	3	0	3	6	7	7	4	7	5	9	8	1	8	3
37	9	0	2	9	9	7	4	6	3	6	6	3	7	4	2	7	0	0	1	9
38	8	1	4	6	4	6	8	2	8	9	5	5	2	9	6	2	5	3	0	3
39	4	1	1	9	7	0	7	2	9	0	9	7	0	4	6	2	3	1	0	9
40	9	9	2	7	1	3	2	9	0	3	9	0	7	5	6	7	1	7	8	7

10. What are the identification numbers for 10 students chosen at random from a population of 510 students based on line 27 of the table of random digits?

$001 - 510$

27	0	2	5	4	0	8	1	7	0	7	1	3	0	4	3	0	6	4	4	4
28	8	6	0	5	4	8	8	2	7	7	0	1	0	1	7	1	3	5	3	4
29	4	2	6	4	5	2	4	2	6	1	7	5	6	6	4	0	8	4	1	2

025 408 170 713 043 064 448 605

488 271 010 171