Name _____Period _____ Date _____

AP Statistics – Unit 2 Review

1) What are the 3 principles of experimental design?
2) What does it mean when two variables are confounded?
3) What is the difference between subjects and individuals (or experimental units)?
4) What is the placebo effect?
5) What is the difference between a placebo and a control?
6) What is a lurking variable?
7) We have 21 people that we need to assign to 3 different treatments (trt1, trt2, trt3). Use the section of the table of random digits below and assign the 21 people to the 3 treatment groups. List the numbers that are selected under each of the 3 headings below. **Clearly explain your procedure!!**

TABLE OF RANDOM DIGITS:

08768 11202 34859 09217 18194 45621 05078 66813 65461 50416 99742 08657

8) We want to test the effectiveness of a new cream designed to help healing of cuts and scrapes, against the current cream on the market (Neosporin). We do not feel the need for a placebo cream. We also want to test a new pill that is on the market that claims to speed in healing. There are 80 patients available for the experiment, of which 35 have cuts, and 45 have scrapes/abrasions.
    a. What is are the factors? What are the levels of the factors?
    b. What are the treatments?
    c. What is the response variable?
    d. What are the individuals/subjects?
    e. Design a completely randomized experiment, with blocking included.

9) A researcher wants to see if more expensive mattresses really give a better night's sleep than the discount mattress brand. So they recruit 110 adult volunteers to participate in their study. They will have the adults sleep on the mattresses for 10 nights and then rank their overall quality of sleep (due to the mattress only).
    a. What is the explanatory variable?
    b. What are the treatments?
    c. What is the response variable?
    d. What are the individuals/subjects?
    e. Do you think you should use a placebo group? How about a control group?
    f. Design a matched pairs experiment:

10) An investigator wants to study the effects of two different on plant growth (call them A and B). There are 20 plots in a field that are available to test the fertilizers on. The investigator will measure the amount of growth by the plants after 3 months.
    a. What is the explanatory variable?
    b. What are the treatments?
    c. What is the response variable?
    d. What are the individuals/subjects?

e. Do you think you should use a placebo group? How about a control group?
f. What are some lurking variables when it comes to plant growth?
g. It is known that the plots get different amounts of sunlight because of where they are located on the field. Some have high sun exposure, others have medium, and some have very low sun exposure. Using this information, design a block design experiment:

11) An investigator wants to study the effectiveness of two surgical procedures to correct nearsightedness. Procedure A uses cuts from a scalpel and procedure B uses a laser. The data to be collected are the degrees of improvement in vision after the procedure is performed. There are 80 nearsighted people available for the experiment.
    a. What is the explanatory variable?
    b. What are the treatments?
    c. What is the response variable?
    d. What are the individuals/subjects?
    e. Do you think you should use a placebo group? How about a control group?
    f. Design a completely randomized experiment:
    g. There are two treatments. Why is it NOT ok to do a matched pairs design for this experiment?

12) A study is being done to see if magnets can help relieve back pain. Participants will sleep on top of a pad that has magnets sewn into it. There are 200 people with chronic back pain that are available for the experiment.
    a. We want to use a placebo in this experiment.
        i. How can we do this? Describe the placebo.
        ii. Why is a placebo necessary in this experiment?
    b. What is the factor? What are the levels of the factor?
    c. What are the treatments?
    d. What is the response variable?
    e. What are the individuals/subjects?
    f. Design a completely randomized experiment.
    g. Design a matched pairs experiment instead.
    h. Which design is the better design (CRD or matched pairs)? Justify.

13) It is known that in a specific city the chance that a person has a red hair is only 1 in 7. A researcher wants to conduct a study to see on average how many people in Philadelphia have red hair in a sample of 5 people. Write instructions for a simulation and conduct 10 trials. Clearly label each trial and state your conclusion for the average number of people with red hair in Philadelphia.

58280	17867	07990	85055	55279	83390	37598	93350	05666
55402	87042	55080	76185	19947	79551	77594	87381	99430
44251	30896	72183	3985	94385	55160	50680	68443	95437
74302	06204	71004	76768	16066	94109	90685	92058	81744
99133	36354	34292	90092	21703	64616	03431	47610	31968

# red heads	frequency
0	
1	
2	
3	
4	
5	

14) The World Series ends when a team wins 4 games. Suppose the Phillies are in the World Series and that sports analysts consider the Phillies to have a 65% chance of winning any individual game over their opponent. We want to estimate the likelihood of the underdog (not the Phillies) winning the World Series. We also want to see how many games are played on average. Write instructions for a simulation and conduct 10 trials. Clearly label each trial and state your conclusion.

# games played	frequency	winner of series
4		
5		
6		
7		

31968	61593	36259	70600	53491	95542	78269				
12087	32204	81177	30333	83630	06026	89308				
94179	54907	58280	17867	07990	85055	55279				
83390	37598	93350	05666	55402	87042	55080				
76185	19947	79551	77594	87381	94109	90685	92058	81744	99133	36354
34292	90092	21703	64616	03431	47610	99430	44251	30896	72183	39856

15) Complete the following book problems: p. 288-291 #7, 9, 11, 13, 26, 35, 36
(for #35 & 36, list possible sources of bias with the sampling method listed)

MULTIPLE CHOICE:

The next three questions concern this situation: *Does using a cell phone while driving make an accident more likely? Researchers compared telephone company and police records to find 699 people who had cell phones and were also involved in an auto accident. Using phone billing records, they compared cell phone use in the period of the accident with cell phone use the same period on a previous day. Result: the risk of an accident was 4 times higher when using a cell phone.*

1. This study is

(a) a randomized comparative experiment.
(b) an experiment, but without randomization.
(c) a simple random sample.
(d) an observational study, but not a simple random sample.

2. The explanatory variable in this study is

(a) whether or not the subject had an auto accident.
(b) whether or not the subject was using a cell phone.
(c) the risk of an accident.
(d) whether or not the subject owned a cell phone.

3. An example of a lurking variable that might affect the results of this study is:

(a) whether or not the subject had an auto accident.
(b) whether or not the subject was using a cell phone.
(c) whether or not the subject was talking to a passenger in the car.
(d) whether or not the subject owned a cell phone.

11. Confounding often defeats attempts to show that one variable causes changes in another variable. Confounding means that
(a) this was an observational study, so cause and effect conclusions are not possible
(b) the effects of several variables are mixed up, so we cannot say which is causing the response
(c) we don't know which is the response variable and which is the explanatory variable
(d) we would get widely varied results if we repeated the study many times

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24. The drug manufacturer Merck recently stopped testing a promising new drug to treat depression. It turned out that in a randomized, double-blind trial a dummy pill did almost as well as the new drug. The fact that many people respond to a dummy treatment is called
(a) confounding (b) nonresponse (c) comparison (d) the placebo effect

The next six questions concern this situation: *Want to stop smoking? Nicotine patches may help, and so may taking a drug that fights depression. A report in a recent issue of the New England Journal of Medicine describes a study of what works best. Here is part of the summary: Use of nicotine replacement therapies and the antidepressant bupropion helps people stop smoking. We conducted a double-blind, placebo-controlled comparison of sustained-release bupropion (244 subjects), a nicotine patch (244 subjects), bupropion and a nicotine patch (245 subjects), and placebo (160 subjects) for smoking cessation.*
***Results**. The abstinence rates at 12 months were 15.6 percent in the placebo group, as compared with 16.4 percent in the nicotine patch group, 30.3 percent in the bupropion group, and 35.5 percent in the group given bupropion and the nicotine patch.*

17. How many treatments did this experiment compare?
(a) two. (b) three. (c) four. (d) can't tell from the information given.

18. The response variable in this experiment is
(a) the combination of drug (bupropion or placebo) and nicotine patch.
(b) 893 people who want to quit smoking.
(c) bupropion.
(d) whether or not a subject was able to abstain from smoking for a year.

19. One group received a placebo. Why not just give this group no treatment at all?
(a) It is not ethical to give no treatment at all in this setting.
(b) Just thinking you are getting a treatment may have an effect, and we want to see if the real treatments do better than this.
(c) A placebo is the same thing as no treatment at all. (d) Subjects would be disappointed if not given a pill.

20. The experiment was "double-blind." This means that
(a) neither the subjects nor the people who worked with them knew whether they were taking bupropion or placebo.
(b) the subjects did not know that the treatments were intended to reduce their smoking.
(c) the subjects did not know whether they were taking bupropion or placebo.
(d) subjects were not allowed to see cigarette ads.

21. The subjects of the study included both men and women. All of the subjects were randomly assigned among all the treatments with one use of the table of random digits. This design is called
(a) a simple random sample (b) a completely randomized design.
(c) a matched pairs design. (d) a block design.

22. The subjects of the study included both men and women. If the men and women were separately assigned to treatments, using the table of random digits twice, the design would be
(a) a simple random sample (b) a completely randomized design.
(c) a matched pairs design. (d) a block design.

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52. You work for an advertising agency that is preparing a new television commercial to appeal to women. You have been asked to design an experiment to compare the effectiveness of three versions of the commercial. Each subject will be shown one of the three versions and then asked her attitude toward the product. You think there may be large differences between women who are employed and those who are not. Because of these differences, you should use
(a) a completely randomized design.
(b) a categorical variable.
(c) a block design.
(d) a matched pairs design.
(e) a multistage sample.

97. The essential difference between an experiment and an observational study is
(a) observational studies may have confounded variables, but experiments never do.
(b) in an experiment, people must give their informed consent before being allowed to participate.
(c) observational studies are always biased.
(d) observational studies cannot have response variables.
(e) an experiment imposes treatments on the subjects, but an observational study does not.