name (required) _____

Language of evaluation: falsifiability, irrelevant, consistent, support, null, ...

1. (5pts) Which of the following options are true? MTF

A) We discussed a newspaper article on pet psychics. It was suggested that many of the claims of a pet psychic (about how the pet feels) are not falsifiable. Yes, because there is no way to gather data (test a model) on how your pet 'feels' or what it is thinking.

B) When data are irrelevant to a model, it means the model could not possibly be refuted by the data, no matter how the data had turned out. True by definition.

C) If data are irrelevant to a model, they are also consistent with it. True because of (B) above; But the relationship does not go the other way – data can be consistent without being irrelevant.

D) It was briefly mentioned that the FDA does not require testing nor approval of herbal remedies and other natural dietary supplements before being marketed; drugs do require testing and approval. This example was used to illustrate contrasting *null* models of 'safe until proven harmful' for herbal remedies and 'harmful until proven safe' for drugs. Yes on both points

E) A null model is considered proven if the data support it with P > 0.95. No, we don't say 'proven.' The only thing we can do with a null model (or any other) is accept or reject. Larger P values have no specific benefit if a null model is accepted.

2. (**7 pts**) Which statements are true? MTF

A) In testing the model that 60-year old coffee drinkers experience half the stroke rate of 60-year old non-coffee drinkers, data showing that 60-year old coffee drinkers experience 5 strokes per 10,000 and 60 year old non-coffee drinkers experience 2 strokes per 10,000 would be inconsistent with the model. (Ignore the possibility of sampling error.) This pattern goes in the opposite direction, hence inconsistent (option is true).

B) In testing the model that 60-year old coffee drinkers experience half the stroke rate of 60-year old non-coffee drinkers, data showing that 60-year old **smokers** experience 2 strokes per 10,000 and 60 year old **non-smokers** experience 2 strokes per 10,000 would be consistent with the model. (Ignore the possibility of sampling error.) Yes, because the data are on smokers so are irrelevant to the model about coffee drinkers.

C) A null model is often rejected if the probability of observing the data (P) is < 0.05. However, additional data may change that outcome and lead to the model being accepted. Yes, because what ultimately matters is how the model behaves in the long run. In particular, when using this .05 criterion, you will wrongly reject a null model when it is true 1 in 20 times.

D) If data are consistent with a model, then they also support it. No. Support implies consistent, but not the other way around as worded in this question – consistent could mean irrelevant.

E) A null model is usually chosen because it has been supported in prior studies. It is generally not true that null models are chosen without considering previous scientific tests. No to the both sentences - a null model is chosen for reasons other than support, rather because it is neutral.

Correlations & Causation

3. (7 pts) Which of the following statements describe a (non-zero) correlation? Do not choose any option that describes a zero correlation, for which a correlation is undefined, or which describes causation without an associated correlation. If insufficient information is given to determine whether a correlation exists, treat it as if there is no correlation. If part of a group is described as doing an activity or possessing some attribute, assume that others in the group do not do the activity or lack the attribute. MTF

(A) The accident rate of red cars is 5 per 1,000 per year; the accident rate of non-red cars is 3 per 1,000 per year. Yes, two categories of car have different rates.

(B) Large universities have higher football winning rates than small universities Yes, two sizes of university, different winning rates.

(C) Schools that have large student bodies spend more on athletics than schools with small student bodies Yes, two sizes of schools, different expenditures

(D) Two thirds of women voted in the last election, one third of males did not vote. No. Two variables are given, but the voting rate is 2/3 for both men and women, which is a zero correlation.

(E) Texting while driving increases a driver's car accident rate No. Is a causal model with no correlation.

(F) People who talk on cell phones while driving have higher accident rates than people who do not talk on cell phones while driving. Yes. Two behaviors, different accident rates.

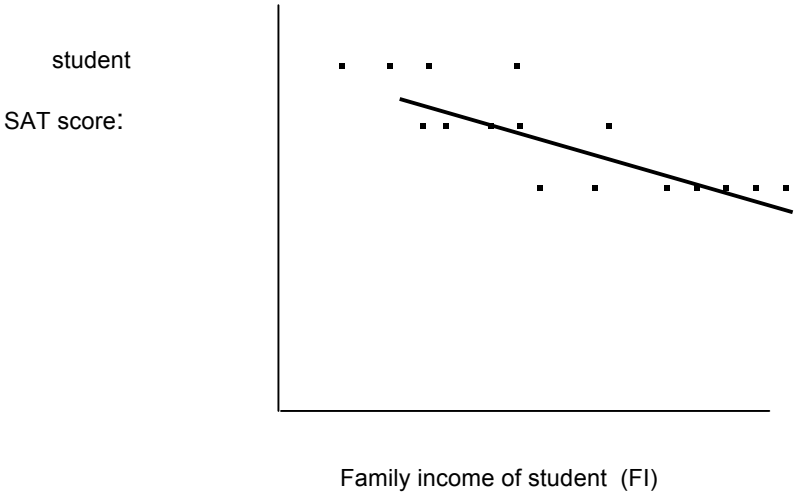
(G) The UT tower is orange on nights of a major athletic victory but is not orange on nights of a major athletic loss. Yes, two states of the tower, each associated with a different athletic outcome.

4 (8 pts) Counties with a high fish content in the diet have lower heart disease rates (by age) than countries with high content of red meat. One model is that fish consumption leads to healthier hearts than does red meat consumption.

Which of the following models instead invoke a third variable to explain the **cause** of this correlation? In answering, recall that, for models that invoke a third variable, replacing red meat consumption with fish consumption would not by itself reduce heart disease. MTF

Causal model	Third variable?
People living in countries that consume lots of fish tend to have jobs associated with manual labor (e.g., working on boats) and get more exercise than people in countries eating lots of red meat. Higher levels of exercise lead to lower heart disease rates. Third variable isgiven: exercise is given as the cause of heart disease, not diet. Changing red meat or fish in diet won't change the pattern.	(A)
People in countries that consume lots of fish tend to live near oceans. Living near oceans is less stressful than living inland. Higher stress levels lead to more heart disease. Third variable is given: stress is the cause, not diet. Changing red meat or fish in diet won't change the pattern.	(B)
Fish have different types of fats/oils than does red meat. The types of oils in fish cause fewer heart problems than the types of oils in red meat. No, fish food content is given here as the cause, and dietary fish is one of the variables in the correlation. If you change fish for red meat, heart disease WILL change. so no third variable.	(C)
People in countries that consume lots of fish tend to live near oceans. Healthier types of crop plants can be grown near oceans than can be grown inland. Healthier plants in the diet leads to reduced heart disease. Third variable is given – plants in diet. If fish is exchanged for red meat, heart disease will not change.	(D)

5. (6 pts) Which models(s) are **inconsistent** with the following graph? (INCONSISTENT!) That is, mark an answer if it CAN BE RULED OUT using the information in the following graph. Assume you have no data other than what is presented in this graph. MTF



(A) SAT score is correlated with FI

(B) SAT score is negatively correlated with FI

(C) SAT score is positively correlated with FI

(D) Parents in wealthier families encourage their children to study more than parents of poorer families

(E) Parents in wealthier families encourage their children to study less than parents of poorer families

(F) Children of wealthier families worry less about academic performance than children of poorer families

(G) Children of wealthier families worry more about academic performance than children of poorer families

Data are correlational. You cannot refute any causal models (D-G) and can only refute a correlational model that goes in the opposite direction. So only C can be rejected.

6) (5pts) Consider a correlation between college grades and belonging to a sorority/fraternity: members of these social organizations have lower grades than non-members. If grades are due to owning vs. not owning a car instead of membership, what grades are expected in cells 1 & 2 of the following table? Assume that no other variables are important. (one answer only)

		membership in frat/sorority:	
		no	yes
own car:	yes	(1)	low grades
	no	high grades	(2)

A) 1 is high, 2 is high

B) 1 is high, 2 is low

C) 1 is low, 2 is high

D) 1 is low, 2 is low

If grades are due to owning a car, membership has no effect (in this simple example). So the pattern in the table is that grades vary with car ownership and not with membership. Thus grades will be the same within a row.

7) (5pts) The following table gives voting rates of people according to whether they drink coffee and exercise more than 2hr/week. Answer the following options about the possible correlations that could result from this table. MTF (DIFFICULT!)

		Coffee drinking	
		yes	no
exercise	yes	vote in 70% of elections	vote in 65% of elections
	no	vote in 80% of elections	vote in 50% of elections

The table does not tell you how many people go in each of the cells. Three of the options require you to understand that any correlation needs to account for how many people are in each cell.

A) If no other 3rd variables apply, the table shows that the combination of no coffee and no exercise has the lowest voting rate no matter what numbers of people go in each of the 4 cells. this option does not depend on the number of people in each cell; it merely claims that the lowest entry is in the no-coffee, no-exercise cell. Since 50% is the lowest entry in the table, it is true.

B) If no other 3rd variables apply, the table shows that coffee drinking will be correlated with higher voting rates no matter what numbers of people go in each of the 4 cells. True. The overall voting rate of coffee drinkers must lie between 70% and 80%, and you cannot say where the average lies until you know the numbers of people in each cell. However, the overall/average voting rate of coffee drinkers cannot be less than 70%. Since the voting rate of non-coffee drinkers must lie between 50% and 65% (and thus cannot exceed 65%), it must be true that coffee drinkers will have a higher voting rate than non-coffee drinkers.

C) If no other 3rd variables apply, the table shows that exercise will be correlated with lower voting rates no matter what numbers of people go in each of the 4 cells. Use the same reasoning as in (B). The average voting rate of those who exercise will lie between 50% and 80%. The average voting rate of those who do not exercise will lie between 65% and 70%. Now you cannot say which will be larger until you know the numbers in each cell – the higher average voting rate could be in either exercise group. Thus the option is false.

D) Until you get the numbers for each of the cells, you cannot say what per cent of all coffee drinkers votes. True Since the numbers in the two cells of coffee drinkers are not equal (70% and 80%) you do not know what the overall voting rate will

be. If the two percentages were the same, then the overall voting rate would not matter on the numbers of people in the two cells.

Controls

8. (6pts) Mark all of the following statements about controls that are correct. In some options, you are asked to decide if a factor X is controlled. MTF

(A) Controls were introduced in lecture in the context of correlational data. Thus controls do not apply to just experiments. Both statements are true. We introduced controls in the context of car accident rates, several lectures before experiments. Indeed, experiments were introduced as a way of creating ideal controls.

(B) The random assignment of people to control and treatment groups in an experiment controls for 3rd variables, even those that are unknown to the investigators. True. That is the purpose of the randomized design.

(C) Factor X is controlled if X is present to the same degree in the Control and Treatment Groups Yes, by definition

(D) Factor X is not controlled when X is absent from both the Control and Treatment groups because it is irrelevant to the study. No First part of sentence is wrong; no need to worry about what the second part means.

(E) Individuals who possess the factors that get controlled are assigned to just the Control group. No. Is an attempt to confuse anyone who does not understand controls

9. (6 pts) Researchers are attempting to identify the causes of a student getting good grades in college. The variables being considered are: a healthy diet, whether the individual had more than 2 brothers and/or sisters ('sibs'), whether the family was impoverished ('poor'), whether the student participates in athletics, and whether the student is a member of a sorority or fraternity ('social').

Which two rows would you want to compare to determine if **diet is correlated with differences in grades when all other factors are controlled**? In evaluating possible answers, pick any comparison that controls for **all** unwanted factors, and assume that these treatments differ only in the ways stated. Mark exactly two options, or option J if none apply. Each row (each option) describes a different set of factors. If multiple combinations satisfy the problem, any correct combination will be accepted. (Two answers or J).

		factor				
		diet	sibs	poor	athletics	social
Option	(A)	+	+	+	+	+
	(B)	-	+	+	+	-
	(C)	-	-	+	-	+
	(D)	-	-	-	+	-
	(E)	-	-	-	-	-
	(F)	+	-	+	-	-
	(G)	+	+	-	-	+
	(H)	+	+	+	+	-
	(I)	-	-	+	+	-
	(J)	No combination satisfies the request				

Look for two rows in which diet has different signs, but the signs are the same between rows within each other factor. B and H work.

10. (5 pts) The Monty Python video on penguin intelligence compared the performance of humans and penguins on an IQ exam. Consider the last test shown in that video (with the immigrants at the zoo). Mark all of the following factors that were controlled for in that IQ test shown. MTF

(A) inability to speak English

(B) ability to speak English

(C) brain size

(D) body size

(E) testing environment

(F) environment in which the subjects were born and raised

Everything that is the same between the human groups and penguin group is 'controlled' – ability and inability to speak English are flip sides of the same factor (if one is controlled, so is the other) and was controlled in the final test; and testing environment was the same.

Experiments

11,12. *As described in the Book, epidemiologists in Britain noted a correlation that certain cancers were more frequent among residents living near nuclear power plants than in the population at large*. The following two questions pertain to this study and its implications.

11. (4pts) Which of the following models are consistent with this correlation? MTF

(A) nuclear power plant locations reduce cancer rates

(B) nuclear power plant locations have no effect on cancer rates

(C) nuclear power plant locations increase cancer rates

the data are correlational, so any causal model is consistent (A, B, C)

12. (4pts). Now suppose that we had been randomly assigning where people live in Britain over the last 100 years, and that we still observed that residents living near nuclear power plants had higher-than-average cancer rates. (Randomly assigning where a person lives would of course be unethical. However, assume for the sake of this question that it could be done.) Which of the following models would now be consistent with this correlation? MTF

(A) nuclear power plant locations reduce cancer rates

(B) nuclear power plant locations have no effect on cancer rates

(C) nuclear power plant locations increase cancer rates

Now that you've done a randomized experiment that should control for all third variables, only one option is viable – C.

13. (6pts) Which options about the in-class personality survey are true? MTF

Most of these options merely demand that you participated in the survey and the lecture (and could remember it).

(A) The design used in class included manipulation (experiment), replication, and blind but not randomization.

(B) Most of the Bio301 students scored the personality description of themselves as reasonably accurate (a score of 3 or better on a scale of –5 to +5).

(C) The personality descriptions in these experiments (our class and the video) were specific in many details about the person. No, the use of vague details was what made the experiment work.

(D) Both experiments would have been improved by including a group in which the personality description was assigned randomly to the student. We specifically noted that randomization would have had no effect.

(E) We suggested that it was ambiguous as to whether a control group was present in the video. We did indeed make this

point.

14. (6pts) Prisoners of Silence video. Which of the following options about the FC (facilitated communication) video are true? MTF

(A) Experiment: *Lecture and the book described two types of experiments regarding how to control for unwanted correlations among variables*. The FC experiment was **NOT** the type in which unknown variables were controlled by randomization. True, it was the type designed to control for a specific, know variable – effect of the facilitator.

(B) Replication: tests were conducted with multiple autistic children, multiple facilitators, and the type of test was even varied. Yes, as shown and discussed.

(C) Controls: in these studies, the controls were the parts of the tests in which the facilitator and child were shown the same information. Even in these cases, the typing did not give the right answer. No. First sentence is true, second is false.

(D) Blind was an essential feature of these tests. Yes, the experiment could not have been done unless the facilitator did not see what the child was seeing.

(E) The test results were equivocal – the child sometimes communicated information known only to him/her correctly. The right answer was never obtained if the facilitator did not know 'the answer.' No abiguity.

(F) The design qualified as an experiment because it changed the normal FC environment: the child and Facilitator were often shown different information. Yes

15. (6pts) Which are true of phase III clinical drug trials with humans? MTF

A) They typically include 100-200 people No, it's 10X this many

B) They are considered safer than phase I and II trials Yes, because previous trials increase the chance that harmful effects will be discovered. Phase I and II trials precede phase III trials.

C) The use of placebos means that they include controls; controls would necessarily be absent if placebos were not used No, placeboes mean 'blind.' You could have controls without being blind.

D) The use of placebos means that the participants are blinded; blind would necessarily be absent if people were informed of the purpose of the study and given no pill instead of a placebo Yes, for reasons given in (C).

E) Phase II and III trials are considered human experiments but phase I trials are not first part true, last part false. So entire option should be considered false.

16. (5pts) Which features of ideal data apply to experiments but not correlational data? MTF

(A) blind (B) randomization (C) replication (D) controls

The only distinction between experiments and correlational data is 'manipulation.' None of these options apply to just experiments.

17. (7pts). Which of the following studies describe experiments, regardless of whether the experiment was designed well or poorly. Some of these studies would be considered unethical, but the question is merely about which studies are experiments. MTF

(A) Your normal practice of hosting a party is to limit invitations to those known for their 'social' skills at being the life of the party. But they invariably leave a mess and make no attempt to clean up, which is a problem for you. The next time you host a party, therefore, you also invite some less social but more considerate individuals, to see if they assist with the cleanup. Yes – describes a manipulation to test a model. = an experiment.

(B) About half the time you make chocolate mousse for dessert, it turns out well, half the time it does not. From now on, you decide to record the relevant variables at each step – temperature, time, how fresh the ingredients – to discover the cause of success versus failure. You ultimately decide that several factors are at work, not a single one. No – no manipulation, just recording data.

(C) You are not pleased with the scores on exams 1 and 2. You therefore increase your study effort for exam 3 to see if you can do better. Yes, a manipulation to test a model.

(D) At the end of the semester, you think back on the various exams you took and how well you did, with the intent of finding what allows you to perform well. You realize that good performance was always preceded by eating Thai food the night before the exam, poor performance was preceded by eating junk food. The following semester you continue your behavior

as usual but note whether the pattern continues. No manipulation, because no behavior is changed.

(E) A professor makes out two versions of each exam, but writes the second version by modifying questions from the first. He/she has noticed that scores for the second version average about 5 points lower than scores for the first, which is undesirable. In attempting to correct the problem, the two versions of the next exam are initially developed the same way, but the questions are then randomized between the two versions to eliminate any bias in difficulty. Yes, a detailed manipulation is described, with a clear model to be tested.

18. (4 pts) Key code, name, and ID number. Fill in (**A B**) in scantron field 18 to indicate your key for this version of the exam. Some people lose 2 points by failing to fill in these bubbles.

Be sure your name and EID number are correctly bubbled in on the scantron.

Your name is required on this exam form and the scantron form to receive credit for this test.