

You must turn in both this hard copy (with your name on it) and your scantron to receive credit for this exam.

One answer and only one answer per question. Leaving a question blank or filling in 2+ answers will be incorrect no matter what.

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

1-4 (6pts) Which types of data are consistent with a model? (A) = consistent with (B) = not

Note that 'consistent' means only that the data cannot be used to reject/refute the model.

1. (A)(B) Data that are inconclusive **cannot refute so consistent -- yes**
2. (A)(B) Data that are irrelevant to the model **cannot refute so consistent -- yes**
3. (A)(B) Data that support the model **do not refute so consistent -- yes**
4. (A)(B) Data that refute the model **no: if they refute, they are not consistent**

5-8 (6pts). Null models. Which are true? **A = true B = false**

5. (A)(B) A null model is usually chosen because it has been supported in prior studies. Null models are generally not chosen without considering previous scientific tests. **No. They are chosen because they are a kind of default. Their success in previous analyses is irrelevant.**
6. (A)(B). Examples of null models in use in the US include 'innocent until proven guilty' in criminal trials and 'safe until proven harmful' for herbal remedies. **Yes. Gone over in class. This one is memorization.**
7. (A)(B) A null model is part of every properly designed study. A study lacking a null model is not properly designed. **No. We in fact addressed an alternative approach to null models (equal alternatives). If this statement was true, the equal alternatives approach would not be valid.**
8. (A)(B) In a test of a null model such as that involving the probability of heads in a coin flip, ANY observable outcome is theoretically possible under the null model. **Yes, assuming that the probability of heads lies between 0 and 1 (but is not exactly 0 or 1).**

9-11 (4pts). Which statements either: **This question is from the 'evidence of absence' versus 'absence of evidence' lecture**

- (A) Indicate that we have some evidence to support a conclusion or reject some models
 - (B) Indicate that we do not necessarily have data
 - (C) Are impossible because the statement requires ruling out all alternatives. If this option applies, use it in place of (A) & (B)
9. (A)(B)(C) There are no aliens on earth **Impossible because it implies that ruling out alternatives.**
 10. (A)(B)(C) We cannot rule out a breach in protocol **statement can be made in the absence of data**
 11. (A)(B)(C) There was a breach in protocol **indicates that we have evidence to rule out 'no breach'**

Correlations, Causation & Hidden variables

12-15 (7 pts) Consider the following data and answer the questions about correlations.

25% of UT students use Mac computers (the other 75% do not use Macs)

30% of Texas A&M students use Mac computers (the other 70% do not use Macs)

A = true B = false

12. (A)(B) The data can be interpreted as two variables measured on a single population of students **yes. One variable is Mac ownership, the other is university attended (old keys may have this wrong).**
13. (A)(B) The data can be interpreted as two variables measured on two populations of students **No. Could be one variable on two populations, but definitely not 2 variables on 2 populations.**

14. (A)(B) The problem provides enough information to decide if a correlation is present. **Yes, by virtue of the fact that the data qualify as two variables on one population (or one variable on two populations).**
15. (A)(B) A positive correlation is indicated by the data. **Not as given. There is no way to assign a 'sign' to the variable of university attended – A&M is not a 'larger' or 'smaller' value than UT**

16-21. (8 pts) Which of the following statements describes a (non-zero) correlation? Do not choose any option that describes a zero correlation, or for which a correlation is undefined, or which describes causation but no 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 having some attribute, assume that others in the group do not have it. **A = is a (non-zero) correlation, B = not**

- 16) (A)(B) 30% of UT students have iPhones (the others do not) **No. One variable on one population. Not possible**
- 17) (A)(B) 30% of UT students have iPhones (the others do not); of those with iPhones, 85% are right-handed, 15% are not **No. Don't have two variables on one population or one variable on two populations.**
- 18) (A)(B) Joe and Bonnie are big UT fans. They have special burnt orange shirts that they wear on UT game days and only on UT game days. **Yes. Variable 1 is type of shirt; variable 2 is day. Furthermore, there is an association, so that if you see them wearing burnt orange, you know it is a game day.**
- 19) (A)(B) Smoking causes lung cancer, thus smokers have higher lung cancer rates than non-smokers. **Yes. First part of sentence is causation; second is correlation.**
- 20) (A)(B) Insurance companies raise premiums on drivers when the drivers get traffic tickets **No, is a statement of causation**
- 21) (A)(B) In the past 3 decades, STD rates have usually declined after taxes on beer were raised. **Yes, is a correlation.**

22-30. Recall the hypothetical table giving accident rate per car per year per 100,000 miles:

		Type of car	
		sports	safe
Car color	red	5	1
	other	10	2

22-25 (6pts). Which of the following are true? (A) = true (B) = false

22. (A) (B) From this table, it is possible to obtain a correlation in which red cars have higher accident rates than other colored cars. **Yes, as in the extreme case of all red cars being sports (accident rate 5) and all not red being safe (accident rate 2)**
23. (A) (B) From this table, it is possible to obtain a correlation in which red cars have lower accident rates than other colored cars. **Yes, as in the extreme case of all red cars being safe (accident rate 1) and all not red being sports (accident rate 10)**
24. (A) (B) From this table, it is possible to obtain a correlation in which sports cars have higher accident rates than 'safe' cars. **Yes. The lowest possible accident rate of a sports car is 5, the highest possible accident rate of safe is 2. This table will always show sports cars to have higher accident rates than safe cars.**
25. (A) (B) From this table, it is possible to obtain a correlation in which sports cars have lower accident rates than 'safe' cars. **No. For by the same logic as in 24 – the average accident rate of a sports car cannot be less than 5; the average accident rate of a safe car cannot be more than 2.**

26-30 (6pts). Suppose that cities with high car accident rates have higher proportions of red cars than cities with lower accident rates. Which models are *consistent* with these data? This question is the same as asking which models cannot be rejected. **Pay attention to the second sentence of the question, but also note that this question asks which models are consistent with a correlation – ANY causal**

model is consistent with the correlation (e.g., Simpson's paradox)

A = consistent, B = not

- 26. (A) (B) Red causes a car to have a *lower* accident rate than other colors. **Consistent because model is causal**
- 27. (A) (B) A high proportion of red cars causes a city to have high accident rates **Consistent because model is causal**
- 28. (A) (B) A low proportion of red cars causes a city to have high accident rates **Consistent because model is causal**
- 29. (A) (B) Red has no effect on car accident rate. **Consistent because model is causal**
- 30. (A) (B) Cities with high proportions of trucks have a higher accident rate than cities with low proportions of trucks. **Consistent because model is irrelevant**

31-34 (8 pts) Background radiation rates are higher in houses made of stone than in wood houses. Which of the following models invokes a 3rd variable to explain the cause of this correlation between background radiation and construction material? **Think about whether changing the material of the house and only that would change the background radiation level. If it would change radiation level, then a third variable is not invoked.**

A = 3rd variable present, B = no 3rd variable

Choose (A) if third variable present	Causal model
31. (A)(B)	Stone houses are more common in parts of the country where rocks are available for construction. These parts of the country also have more radioactive elements in the soil. Radiation released from the soil is responsible for the background radiation in the houses. Third variable is soil
32. (A)(B)	Stone has trace amounts of metal atoms that are radioactive. Stone thus releases more radiation than wood. Radiation released from stone is responsible for the higher background radiation in stone houses. No third variable – stone is causal
33. (A)(B)	For cultural reasons, stone houses were often built with basements, whereas wood houses usually lack basements. Radon – a radioactive gas – seeps from the ground into houses, and basements provide a much bigger input of radon than does a foundation that lies on top of the ground. Differences in radon levels due to the presence/absence of basements thus explains the difference in background radiation levels. Third variable is basements.
34. (A)(B)	The background radiation in houses comes from outer space. Wood blocks this radiation better than stone, so less radiation gets into the inside of houses if the house is made of wood than of stone. No third variable.

35-39. (8 pts) Which of the following options is indicated in 35-39? Base your answer only on the information provided.

- (A) inferring causation from correlation (i.e., a correlation leads people to infer the causal basis of the correlation)
- (B) merely describing a non-zero correlation,
- (C) merely describing a zero correlation
- (D) describing correlation from causation

35. (A)(B)(C)(D) A friend tells you that people eating a Mediterranean diet live longer than people eating other diets. Wishing to live long, you adopt a Mediterranean diet. **Your adoption of a new diet is an action based on a correlation. (A)**

36 (A)(B)(C)(D) People who drink modest amounts of alcohol have higher survival rates than people who drink nothing and than people who drink excessively. As a consequence, the medical profession is now beginning to suggest that modest alcohol

consumption is a way to enhance longevity. **By recommending alcohol consumption, there is an inference of causation from the correlation. (A)**

37. (A)(B)(C)(D) Drinking alcohol impairs a person's coordination. = **causation** As a consequence, drunk drivers are involved in auto accidents more often than are sober drivers. = **correlation (D)**
38. (A)(B)(C)(D) UT students are just as likely to party on Friday night as on Saturday night **describing a zero correlation, because there is no change in likelihood of partying between Friday and Saturday**
39. (A)(B)(C)(D) A person is more apt to make mistakes when they are sleepy than when they have had adequate sleep because the lack of sleep impairs judgment = **causation**. As a consequence, sleepy drivers are involved in auto accidents more often than are awake drivers. = **correlation**

Controls and controlled variables

40-42. (5 pts) When investigating the possible cause of higher cancer rates in residents living near nuclear power plants (NPP) than in residents living far from the plant, which of the following would control for average level of smoking (a 3rd variable) as the cause of the observed cancer elevation? **A = smoking controlled B = smoking not controlled**

40. (A)(B) Among residents living near NPP, compare cancer rates of smokers with those of non-smokers. **Does not control for smoking because the level of smoking is not the same between the two groups; does the opposite – acts as if smoking is a treatment variable.**
41. (A)(B) Compare cancer rates of smokers living near NPP with cancer rates of non-smokers living away from NPP **Does not control for smoking because the level of smoking varies between the groups.**
42. (A)(B) Compare cancer rates in a random group of residents living near the power plant with cancer rates in a random group of residents living away from the power plant. **Does not control for smoking, since we know nothing about the level of smoking in the two groups. The randomization does not accomplish anything to equal smoking rates between the two groups.**

43-47 A professor conducts an experiment with the incoming 2011 UT Freshman class (thousands of male and female students across all college disciplines and all majors) to determine the effect on grades of exposing them to different 'mindset' training exercises. Students are assigned randomly to either of two groups. One group watches a video emphasizing that intelligence can be developed ('growth mindset'). The other is exposed to a video emphasizing that intelligence is static ('fixed mindset'). Grades of the students from each group are compared at the end of the first year.

43-45 (5 pts) What variables are explicitly controlled for or expected to be controlled for within the individuals included in this experiment? Do not infer more than is given. **A = controlled, B = not**

43. (A)(B) educational background of the student **is controlled by virtue of the random assignment**
44. (A)(B) student age **is controlled by virtue of the random assignment**
45. (A)(B) hair color **is controlled by virtue of the random assignment**

46,47 (3 pts) Each of the following two questions gives a feature that is variable in the population of all UT students. Which of those features would NOT be variable in the students participating in the study? **A = not variable in the study B = variable in the study**

46. (A)(B) year of entry to UT **Not variable – because the study is confined to a single class**
47. (A)(B) class rank at the time of the study (Freshman, Sophomore, Junior, Senior) **Not variable – because the study is confined to Freshmen**

48-52. (8 pts) Edis makes chocolate truffles of various flavors. She conducts an experiment to see which ingredients are most desired by her customers. She makes chocolates with different combinations of ingredients V, X, Y, Z and M (+ indicates the ingredient is present, - is absent). She then finds out how strongly people prefer the combination; preference level is given in the right-most column. Which statements in the following questions are true? **To understand what is being asked in some of these questions, you need to know that a factor controlled between two options cannot be responsible for a difference in preference; only factors that differ can influence preference differences.**

Option	factor					Preference
	V	X	Y	Z	M	
(A)	+	+	+	+	+	P _A
(B)	-	-	-	-	-	P _B
(C)	+	-	+	+	+	P _C
(D)	+	-	-	+	-	P _D
(E)	+	-	-	-	-	P _E
(F)	+	+	-	-	-	P _F
(G)	-	+	-	-	+	P _G
(H)	+	-	+	-	-	P _H

A = true, B = false

48. (A)(B) Option A is the most strongly preferred combination of flavors because it has all + states. **Nonsense. The most strongly preferred combination depends on the P values, and you are not given those. You cannot say which is most preferred.**
49. (A) (B) To know the effect of ingredient X on preference when all other ingredients are controlled, one could compare preferences for A&C. **Yes, this combination controls for everything but X**
50. (A) (B) To know the effect of ingredient X on preference when all other ingredients are controlled, one cannot use the pair E&F, because many ingredients are absent in both E and F. **No. It is true that many ingredients are absent from (E) and (F), but that does not mean those variables are not controlled. Everything other than X is controlled, just as in 49.**
51. (A) (B) Comparing preferences between A and B controls for all ingredients. **No. None are controlled.**
52. (A)(B) Comparing preference levels for options G and H would indicate the effect of ingredient Z on preference. **No, the only variable that IS controlled is Z; differences in preference for the others could be due to any of them.**

Experiments

53-58. (8 pts) **Prisoners of Silence video (FC = facilitated communication).** *The video showed tests of FC suggesting that the facilitator, not the child, was the author of the typed responses.* Which of the following are true about that experiment?

A = true/valid B = not true/ not valid

53. (A)(B) Controls were the cases in which both the facilitator and child were shown the same object. **Yes (as covered in class). The treatment is showing them different objects.**
54. (A)(B) The testing environment was formally laid out, the protocol was unambiguous and regimented; because of this strict protocol, we say the experiment was controlled. **No, not at all what is meant by a control.**
55. (A)(B) Blind was an essential part of the experiment; blind is therefore the reason the study was considered an experiment **No. First part true, second not. A manipulation – not blind -- makes it an experiment.**
56. (A)(B) The experiments were specific tests of sexual abuse and were centered on the language and content in some of those descriptions of abuse. **No. The experiments were supposedly motivated by the sexual abuse descriptions, but the experiments addressed much simpler issues.**
57. (A)(B) This was the type of experiment in which 3rd variables were controlled by random assignment to treatment vs. control groups. **No. The third variable was known in advance and was destroyed by explicitly controlling it, not by randomization.**
58. (A)(B) The source of the typing (child or facilitator) was less clear in some tests than others, and statistics were required to distinguish between the two models. **No. If you watched the video, you will recall that there was no ambiguity at all in the outcome and interpretation.**
- 59-62. (6pts) Which options about the in-class personality survey and/or the horoscope test shown in the video are true?

A = true, B = false

59. (A)(B) Neither study was an experiment because there was no manipulation – everyone got the same personality description, so there was no way to manipulate. **Wrong. It was an experiment BECAUSE everyone got the same description.**
60. (A)(B) A control group for the horoscope study (shown in the video) was ambiguous. Horoscopes done the usual way would have been one type of control. **Yes on both. We had to cover this in class, because the video did not discuss controls.**

61. (A)(B) The study shown in the video differed from our class exercise in that the personality descriptions used for our class gave many specific details about the personality. **No. The Bio301D descriptions used a lot of the same language as in the video.**
62. (A)(B) The null model being tested in the video was that horoscopes provide at least some level of predictive power. **No. Was not a null model type of test. Equal alternatives.**

63-66. (5 pts) For the palm reading portion of the video, which design features were present AND are correctly explained by the option?

A = correct B = false

63. (A)(B) Controls were present: they were the readings done on the opposite hand (the left hand) from the usual reading. **No. First part true, but the controls were the readings done the right way.**
64. (A)(B) No replication was apparent, because only one palm reader was shown. **No. Only one reader was shown, but replication was evident from his description of trying the 'reverse' reading on at least 2 subjects.**
65. (A)(B) These studies cannot be done blindly because the client knows their palm is being read; there is no way to get a response from the client unless they know their palm is being read. **No. The client is not told whether the reading is done correctly or incorrectly.**
66. (A)(B) For the palm reader, two thirds of his descriptions were wrong, but the other third were accurate. **No, and kind of a petty question. The 2/3 wrong refers to the Moscow picture psychics**
67. (4 pts) (A) **Key code, name, and ID number.** Fill in (A) in scantron question 67 to indicate your key for this version of the exam.

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