A = True, B = False unless stated otherwise   name (required) _____

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, ...

1-6. (**7 pts**)   Which statements are true?

1. **(A)(B)** If data are consistent with a model then they also support it.

2. **(A)(B)** The scientific method dictates that we adopt strict thresholds for acceptance of a model, rejecting the model if the probability of observing the data is less than 0.05. This acceptance threshold is inflexible; a test value of 0.04 provides as meaningful a rejection as a value of 0.0000001, for example.

3. **(A)(B)** For a model to be deemed falsifiable, we must be able to imagine data that are irrelevant to it.

4. **(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 drugs being proposed for marketing.

5. **(A)(B)** For data to be deemed falsifiable, there must be at least one model for which they are relevant

6. **(A)(B)** A null model is part of every properly designed study. A study lacking a null model is not properly designed.

Correlations, Causation & Hidden variables

7-13. (**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 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 a correlation**

7. **(A)(B)**   Smoking causes lung cancer but has no effect on colon cancer

8. **(A)(B)**   On average, the 11:00 lecture of Bio301D has more attending students than the 10:00 lecture

9. **(A)(B)**   Texting while driving increases accident rates

10. **(A)(B)**   25% of A&M students attend home football games; the same 25% also attend A&M rallys; the other 75% attend neither

11. **(A)(B)** 25% of A&M students attend home football games but not rallys; the other 75% attend A&M rallys but not home games

12. **(A)(B)**   Adult men are on average taller than adult women

13. **(A)(B)**   35% of UT students have blood type A. 35% of SMU students have blood type A

14-16 (**6 pts**) Cancer rates of dogs whose owners use lawn pesticides are higher than cancer rates of dogs whose owners do not use pesticides. Which of the following models invokes a third variable to explain the **cause** of this correlation? Recall that, for models that invoke a third variable, reducing lawn pesticide use will not by itself reduce dog cancer rate. **A = 3rd variable present, B = absent**

Choose (A) if third variable present	Causal model
14. (A)(B)	Dog owners that use lawn pesticides also put insecticidal flea collars on their dogs; owners that do not use lawn pesticides avoid flea collars. The flea collars lead to dog cancer.
15. (A)(B)	Lawn pesticides are used more heavily in yards that are infested by insects and other 'bugs.' The bugs carry disease agents that infect dogs, and it is those disease agents that cause dog cancer.
16. (A)(B)	Pesticides change the composition of bacteria and fungi in the yard. Different bacteria and fungi determine the cancer rate of dogs inhabiting the yard.
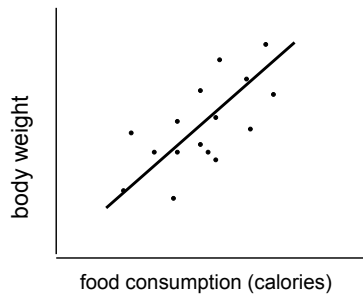
17-19. (6 pts) What does the graph actually show/illustrate – what can you conclude is necessarily true from the graph?

17. (A) (B) Heavier people consume more calories than lighter people (on average)

18. (A) (B) Increasing food consumption has no effect on body weight

19. (A) (B) Increasing food consumption causes increased body weight

20-23 (8 pts) The following table gives percent of people belonging to the Republican party according to whether they own a car and whether they have health insurance. Answer the following options about the possible correlations that could result from this table.

		Health Insurance	
		yes	no
Own car	yes	45% Republican	15% Republican
	no	25% Republican	12% Republican

A = true, B = false

20. (A)(B) The table shows that the combination of owning a car and having health insurance has the highest fraction of Republicans among the 4 cells.

21. (A)(B) If no other 3rd variables apply, the table shows that owning a car will be (positively) correlated with being Republican no matter what numbers of people go in each of the 4 cells.

22. (A)(B) If no other 3rd variables apply, the table shows that having health insurance will be (positively) correlated with being Republcan no matter what numbers of people go in each of the 4 cells.

23. (A)(B) Until you get the numbers for each of the cells, you cannot say what per cent of car ownership (or car non-ownership) is Republican.

24-26. (5 pts) Consider the example of moderate alcohol consumption and longevity. How could people who drink moderately live longer than non-drinkers even though moderate alcohol consumption reduces longevity? Which models produce this combination of patterns? **A = produce the pattern, B = do not**

24 (A)(B) Healthy people drink moderately, whereas those who are sick and prone to die somewhat early avoid alcohol. The reduced lifespan from drinking alcohol has only a mild effect on the longevity of healthy people, so they tend to live longer than the sick ones who avoid alcohol.

25 (A)(B) People who drink moderately take better care of their health in other ways that more than compensates for the negative effect of the alcohol. Non-drinkers do not take care of their health and thus have shortened lifespans.

26 (A)(B) Moderate consumption of alcohol causes people to eat more and be heavier. The increased body weight reduces their life span. Non-drinkers experience less weight gain and thus do not suffer the life-shortening effects.

27-30. (8 points) Which of the following constitutes an example of **inferring causation from correlation** (i.e., in which a correlation leads someone to infer the causal basis of the correlation)? Base your answer only on the information provided. Do not choose answers as true that merely describe a correlation, that argue correlation from causation, or that test the causal basis of a correlation. **A = infers causation from correlation; B = does not infer causation from correlation**

27 **(A)(B)** You read that people who eat fast food have more health problems than average. You have never eaten much fast food, but this information increases your resolve to avoid fast food.

28 **(A)(B)** 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. As a consequence, sleepy drivers are involved in auto accidents more often than are awake drivers.

29 **(A)(B)** A scientist observed that milk maids tended not to get smallpox. He guessed that this low incidence of smallpox was due to a milkmaid's exposure to cowpox, so he developed a vaccine against smallpox using the cowpox virus.

30 **(A)(B)** Quitting the smoking habit reduces a person's lung cancer rate. As a consequence, former smokers who have quit the habit have lower lung cancer rates than those who continue smoking.

Controls

31-38 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 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.

31-34 (6 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**

31. (A)(B) student major

32. (A)(B) student gender

33. (A)(B) courses taken

34. (A)(B) SAT score

35-38 (6 pts) What variables lie outside the study? **A = outside the study   B = not**

35. (A)(B) student major

36. (A)(B) student gender

37. (A)(B) Texas universities (UT, Rice U, SMU, Baylor U, …)

38. (A)(B) class rank (Freshman, Sophomore, Junior, Senior)

39-42. (5 pts) The Monty Python video compared penguin intelligence to human intelligence. Which are true about that video?

39. (A)(B) Three models of intelligence were tested: IQ score, performance in a maze (at the zoo), and brain size

40. (A)(B) No brain size comparison between humans and penguins controlled for other variables

41. (A)(B) The maze test controlled for body size by using a larger/taller maze for humans than for penguins

42. (A)(B) At least one IQ test controlled for (i) ability to speak English, (ii) inability to speak English, and (iii) testing environment.

43-45. (6 pts) Researchers are attempting to identify the causes of a student getting good grades in college. The variables (factors) being considered are in columns: W, X, Y, Z and M. Each row (option) describes the factors present (+) and absent (-) for a select group of students. Each row also has an associated average grade for the group (not shown). Which statements are correct about the factors being controlled?

		factor				
		W	X	Y	Z	M
Option	(A)	+	+	+	+	+
	(B)	+	+	+	+	-
	(C)	+	-	+	-	+
	(D)	+	-	-	+	-
	(E)	+	-	-	-	-
	(F)	+	-	+	-	-
	(G)	+	+	-	-	+
	(H)	+	-	+	+	-

A = true, B = false

43. (A)(B) The pair of options A & E together control for all factors except W

44. (A) (B) Pair A & B controls for the same set of factors as pair C & F

45. (A) (B) All possible pairs of options control for W

Experiments

46-49. (4pts) Which features of ideal data apply to experiments but are not relevant to correlational data? **A = unique to experiments; B = relevant to both**

46. (A)(B) blind

47. (A)(B) randomization

48. (A)(B) controls

49. (A)(B) replication

50-58. Prisoners of Silence video (FC = facilitated communication). *The video showed tests of FC suggesting that the facilitator, not the person with autism (PWA), was the author of the typed responses.*

50-54 (5 pts) Which design features were explicitly included in the experiments? **A = explicitly included, B = not explicitly included**

50. (A) (B) Explicit protocol

51. (A) (B) replication

52. (A) (B) randomization

53. (A) (B) standards

54. (A) (B) blind

55-58 (5 pts) Which of the following are true about the controls (if any) in the FC experiment – as discussed in class?

55. (A)(B) Controls for the test consisted of objects/photos already familiar to the PWA

56. (A)(B) Controls for the photo identification test consisted of the message passing test (shown only for Betsy Wheaton)

57. (A)(B) Controls established that the FC environment was working normally.

58. (A)(B) Use of a facilitator familiar to the PWA represented the control

59-62 . (6 pts). Which of the following studies describe experiments, regardless of whether the experiment was designed well or poorly. **A = experiment, B = not an experiment**

59. (A)(B) To establish the validity of Facilitated Communication, you watch the facilitator carefully and record brain waves on the facilitator and person with autism as responses are being typed under the normal FC conditions. The data are analyzed by neurobiologists who know how to interpret the brain waves.

60. (A)(B) You suspect that tire pressure has a measureable effect on the gas mileage of your car (miles per gallon, or mpg). To quanitify this effect, you undertake car and tire maintenance as usual, but you record tire pressure and mpg at weekly intervals over 6 months. The data show no pattern.

61. (A)(B) A professor worried about student evaluation scores for his class suspects that his usual manner of dress is too casual to impress students. In previous years, before he became suspicious of this possible cause, he dressed casually on every day of the semester. In the first semester that he wondered if his dress style mattered, he wears a suit to impress students on the day that evaluations are done. His evaluations go up

62. (A)(B) A researcher merely records the diets of a large number of pregnant women. He finds that women who took twice the recommended daily dose of vitamin A have a 1 in 57 chance of a child with birth defects..

63-66. (6 pts) *Secrets of the Psychics video and our personality survey. Several experimental tests of psychic practices were shown in the video, plus most of the class participated in an online survey*. Which options are correct?

63. (A)(B) We concluded from the video that it is possible to test the validity of psychic predictions experimentally BUT that it is <u>not</u> possible to show that there is no (zero) validity to sets of psychic predictions.

64. (A)(B) The horoscope experiment shown in the video was a close parallel to the personality survey exercise that you were asked to do online, in that both used a mock description of a person and students were asked to score the accuracy of the description.

65. (A)(B) Randomization. In light of the goal, the horoscope experiment would have been improved if the distribution of who got which horoscope had been randomized.

66. (A)(B) There was no basis for evaluting the palm reading experiment described in the video because the experimenter had no data from controls.

67-70. (4pts) Which options are true about experiments?

67. (A)(B) Experiments are able to control for unwanted variables better than correlational data

68. (A)(B) Only experiments, not correlational data, can be analyzed blindly

69. (A)(B) Experiments can control for hidden variables <u>that have not even been identified</u>.

70. (A)(B) Two types of experiments were noted, one in which the variables to be controlled for are known in advance

71-73. (3pts) Which are true of clinical trials with humans?

71. (A)(B) They typically include features of blind, random, and replication, but they often lack controls (for ethical reasons).

72. (A)(B) If you participate in a study, you will be included all in three phases (I, II, III)

73. (A)(B) Clinical trials qualify as experiments on humans.

74. (3 pts) Key code, name, and ID number. Fill in (**A**) in scantron field 74 to indicate your key for this version of the exam.

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