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. When you are given a list of options for a set of questions, some options may not be a correct answer for any of the questions. *Statements in italics should be considered true.*

Correlations, Causation & Hidden variables

1-8. (16 pts) Consider the following tables in which each cell gives the average SAT score for students with the characteristics given on the margins of that cell: whether their high school (HS) class size was small versus large and whether their high school teacher salaries were high or low. Also remember that this table does not give the number of students that populate each cell. There are 4 different tables, and you are asked to indicate which tables (could) have a specific property. Ignore the possibility of other variables, besides teacher salary and class size, affecting SAT scores – assume the tables give you all relevant variables. PAY ATTENTION to what variables are being referenced!!

Table		W		X		Y		Z	
		HS class sizes		HS class sizes		HS class sizes		HS class sizes	
		small	large	small	large	small	large	small	large
HS teacher salaries	**high**	**1350**	**1100**	**1100**	**1350**	**1350**	**1300**	**1300**	**1310**
	low	1300	1250	1250	1300	1250	1100	1100	1250

1-4 (8 pts) For each table indicate what properties of (A)-(D) apply. **One answer per question.**

(A) Within the table, the SAT scores shown are <u>always higher</u> for small class sizes when controlling for teacher salary level

(B) Within the table, the SAT scores shown are <u>always lower</u> for small class sizes when controlling for teacher salary level

(C) Within the table, the SAT scores shown are higher for small class sizes at one salary level but lower at the other salary level

(D) Within the table, the SAT scores shown are the same for small class sizes as for large class sizes when controlling for salary

1. (A)(B)(C)(D) Table W **2.** (A)(B)(C)(D) Table X **3.** (A)(B)(C)(D) Table Y **4.** (A)(B)(C)(D) Table Z

5-8 (8 pts) For each table, indicate whether the correlation between SAT score and teacher salary could:

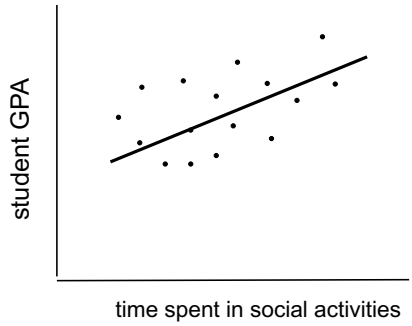
(A) Be either positive or negative

(B) Only be positive – higher SAT scores with higher teacher salaries

(C) Only be negative – lower SAT scores with higher teacher salaries

5. (A)(B)(C) Table W **6.** (A)(B)(C) Table X **7.** (A)(B)(C) Table Y **8.** (A)(B)(C) Table Z

9-14 (9 pts) Consider the following graph of data, showing that students who engage in more social activity time have higher GPAs in college; each point is the average for a different student at the same university. The slope is significantly greater than zero.



Which of the following models <u>can be rejected</u> from these data? If so, choose (A)

(A) Can be ruled out/rejected **(B) Cannot be** ruled out/rejected

9. (A)(B) GPA is negatively correlated with social activity time

10. (A)(B) GPA is not correlated with social activity time

11. (A)(B) GPA is positively correlated with social activity time

12. (A)(B) Spending more time in social activity lowers a person's GPA

13. (A)(B) Spending more time in social activity raises a person's GPA

14. (A)(B) Spending more time in social activity has no effect on a person's GPA

15-18 (10 pts) A correlation: Students who study outside of class have higher GPAs than students who don't study outside of class. Which of the following models invoke(s) a 3rd variable – a variable other than studying outside of class – to explain the cause of this correlation?

A = 3rd variable is invoked, B = no 3rd variable

Choose (A) if third variable is invoked	Causal model
15. (A)(B)	Studying outside of class enables a student to learn the material and thus perform better on exams.
16. (A)(B)	Students who study more outside of class are less sociable and spend less time in contact with other students than students who study little. Decreased contact with other students lowers the chance of acquiring seasonal colds and flus. Seasonal infections reduce student performance on exams.
17. (A)(B)	Students who take better notes in class and participate in class also tend to study outside of class more than other students. Note-taking and participating in class is what results in higher exam scores.
18. (A)(B)	When students are studying outside of class, they are also drinking beverages that enhance brain function. Students who don't study outside of class tend not to consume those beverages. Consuming the beverages increases exam scores.

19-24. **(10 pts)** Which of the following options is indicated? Base your answer only on the information provided. (**One new option has been added from previous exams). Only one answer per question**

(A) no correlation or causation is described among the variables.

(B) correlation only – the question merely describes non-zero correlation(s),

(C) causation only – the question describes one or more causal models with no correlation

(D) correlation is used to explain or argue causation (i.e., a correlation leads someone to infer the causal basis of the correlation)

(E) causation is used to explain or argue a correlation (causation leads someone to infer a correlation, AND both correlation and causation go in the same direction)

(F) correlation and causation are described but go in opposite directions (Simpson's paradox)

(G) correlation and causation are described and go in the same direction, but neither is used to explain the other

19. (A)(B)(C)(D)(E)(F)(G) Drivers of red cars have the same insurance rates as drivers of not-red cars

20 (A)(B)(C)(D)(E)(F)(G) An epidemiologist observes that leukemia rates in children are higher in homes near high-voltage power lines than in homes away from high-voltage power lines. From this she claims that, to reduce leukemia rates, people should avoid living in homes near high-voltage power lines.

21 (A)(B)(C)(D)(E)(F)(G) Lower tooth decay rates are found in towns with high fluoride levels in the drinking water. High fluoride prevents tooth decay.

22. (A)(B)(C)(D)(E)(F)(G) Eating a high-carbohydrate diet causes heart disease. Frequent exercise reduces heart disease.

23. (A)(B)(C)(D)(E)(F)(G) More fish are caught by fishermen on sunny days than on rainy days. However, fish are easier to catch on rainy days than on sunny days, so that a person fishing on rainy days catches more fish than a person fishing on sunny days.

24. (A)(B)(C)(D)(E)(F)(G) Teachers with high salaries have students with higher SAT scores. Students with higher SAT scores have teachers with higher salaries.

Controls, controlled variables and experiments

25-30. (8 pts) You wish to know how to make split pea soup so that the peas fall apart in the cooking process; sometimes they remain hard even when cooked for hours. You suspect the answer may be the type of water used for cooking. Read the design and answer the questions about design properties.

Design 1: You cook one batch of split peas with tap water in a pressure cooker for 2 hrs. You cook a different batch of split peas with distilled water in a crockpot (slow cooker) for 2 hours. Salt and carrots are added to both batches when you start cooking. After the 2 hours, you compare the outcomes of each batch.

Which are true of Design 1? (A = TRUE, B = false)

25 (A)(B) The study controls for type of water used

26 (A)(B) The study manipulates type of water used as a treatment

27 (A)(B) The study controls for addition of carrots

28 (A)(B) The study includes replication

29 (A)(B) The study controls for cooking time

30 (A)(B) The study controls for cooking vessel (slow cooker versus pressure cooker).

31-35. (5 pts) You wish to figure out what determines a person's response to a horoscope. Answer the questions about design.

Design 2: You have two classes, each with 30 students. In one class, all students are 18-year old freshmen; in the other, they are 21-year old seniors. You tell both classes that you will be giving everyone individualized horoscopes; in each class, the students span a range of astrological signs and birth dates, so individualized horoscopes would be unique to each student. In one class, you give the same horoscope to everyone, without regard to their astrological sign and without their knowledge that all horoscopes are the same. In the other, you give individualized horoscopes – done the right way – to each student. You ask the students to assess the horoscopes for accuracy and compare the responses between the two classes.

Which are true of Design 2? (A = TRUE, B = false)

31 (A)(B) The study controls for expectation of horoscope individuality

32 (A)(B) The study controls for student age

33 (A)(B) The study controls for all possible third variables between the classes besides than age

34 (A)(B) The study includes blind

35 (A)(B) The study manipulates horoscope individuality as a treatment variable

36-39. (**8 pts**) You feel lousy some days and good other days. You think your diet may underlie the differences, but you are not sure. You thus decide to manipulate your diet and monitor how you feel. The columns indicate different dietary ingredients that you plan to manipulate (e.g., wheat, nuts, …). On each day, you choose one diet composition specified by a row (A, B, …, H). You will eat rice for calories but otherwise limit your diet to contain only those ingredients given by a "+" in the row. How you feel will be scored in the right-most column during the study; you do not yet know how you will feel or how any ingredient will affect you: inclusion of any ingredient might make you feel better or worse. Indeed, you are not even confident that your diet is contributing to your problem. Which statements in the following questions are true?

	dietary ingredient						**How you feel afterwards**
Composition		wheat	nuts	dairy	meat	caffeine	
	(A)	+	+	+	+	+	?
	(B)	-	-	-	-	-	?
	(C)	+	-	+	+	+	?
	(D)	+	-	-	+	-	?
	(E)	+	-	-	-	-	?
	(F)	+	+	-	-	-	?
	(G)	-	+	-	-	+	?
	(H)	+	-	+	-	+	?

A = TRUE, B = false

36. (A)(B) The diet in (A) is expected to make you feel worse than is (B) because (A) has all the ingredients you are testing.

37. (A) (B) A comparison of (B) and (C) controls for 4 of the 5 ingredients.

38. (A) (B) A comparison of (F) and (G) controls for 3 of the 5 ingredients

39. (A) (B) At least one pair of diets allows you to assess the effect of nuts when all other ingredients are controlled.

40-44 (10 pts). Which of the following studies describe(s) experiments, regardless of whether the experiment was designed well or poorly and regardless of ethics. In each problem, the goal is underlined. The question is whether the option describes an experiment with respect to the goal. **(A) = is an experiment (B) is not**

40. (A)(B) When duck hunting, you normally put out 30 decoys in the hope of attracting ducks. But ducks often shy away from your decoys, and you begin to wonder whether the ducks are learning to avoid large clusters of decoys. On your next hunt, you put out only 1 decoy to see if the ducks continue to shy away.

41 (A)(B) Jimmy is trying to avoid unsightly bed bug bites on his body; he can't avoid the bites, but maybe he can change their appearance. On occasion, he has taken an antihistamine to improve his sleep, and on reflection, he recalls that the bites are less noticeable on days after nights when he took an antihistamine. He thus concludes that antihistamines help avoid the unsightliness of bed bug bites.

42. (A)(B) Over the next year, you will be making several road trips to Abilene. You want to find the fastest routes and times to travel. For the first six trips, you plan and take different combinations of roads at different times of day, keeping track of travel time to see if any of the route differences affect trip duration.

43. (A)(B) You are an avid collector of moths. The work involves going out at night and placing a bright light next to a white sheet; the moths fly to the light land on the sheet, where you count or collect them. You want to find out if the phase of the moon affects the numbers of moths. You have records of collections over the last 10 years, and you compare those to NASA records of moon phases on each collecting night. You discover a negative correlation.

44. (A)(B) You want to know if where you sit in the room during an exam affects your score. On each of the four exams during the semester, you sit in a different part of the room to see if your performance changes.

45-48 (6 pts) What design features were clearly indicated in the video of the horoscope test (regardless of whether they were relevant)?

(A) = present **(B)** absent or not shown

45. (A)(B) random

46. (A)(B) replication

47. (A)(B) blind (at least one way)

48. (A)(B) controls

49-53 (8 pts) In an ideal design of the palm reading experiment (the goal of which is to determine whether reading the 'right way' matters), which would you want to be controlled variables and which be treatment variables? Do not worry about how you might achieve them.

(A) = should be controlled **(B) should be treatment**

49. (A)(B) Client expectation of a legitimate palm reading

50. (A)(B) Reading done the correct way

51. (A)(B) Client skepticism about palm reading

52. (A)(B) Client gender

53. (A)(B) Palm reader knowledge of wheither the reading is being done correctly or not

54-61. 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.* Address and interpret the features of this experiment in the following questions.

54-56. (6 pts) *This test was an experiment of the type in which the relevant 3rd variable(s) was/were known in advance, and the experiment manipulated that/those variable(s).* Which was/were the third variable(s)?

(A) was a relevant 3rd variable **(B) was not a relevant 3rd variable**

54. (A)(B) Child knowledge of the answers

55. (A)(B) Facilitator knowledge of the answers

56. (A)(B) Observer influence (observers are people other than the facilitator and child)

57-61. (6 pts) In what ways was 'blind' relevant to the tests of FC shown?

(A) True **(B) False**

57. (A)(B) Blind was needed to ensure that child did not know he/she was being tested

58. (A)(B) Blind was needed to ensure that facilitator did not know he/she was being tested

59. (A)(B) Blind was needed to avoid observer bias, whereby the person scoring the results would not know who typed which answers

60. (A)(B) Blind was needed to ensure that the facilitator did not know what the child was seeing

61. (A)(B) Blind was needed to ensure that the child did not know how to respond

62. (4 pts) (A) **Key code, name, and ID number**. Fill in (**A**) in scantron question 62 to indicate your key for this version of the exam. Be sure your name and EID number are correctly bubbled in on the scantron.