Your answers go on Canvas Test_4_2024.

One answer and only one answer per question. Leaving a question blank or filling in 2+ answers will be incorrect no matter what.   (Canvas should not allow you to choose more than 1.)

A = True, B = False   unless indicated otherwise. If any part of an answer is incorrect, treat all of it as incorrect. If different parts of an option are inconsistent with each other, consider it incorrect.

Evaluation basics

1 (2 pt) A new study of rural counties has found what the authors claim to be a <u>causal</u> association between heavy use of a new herbicide and an increased incidence of blood clot disorders. The blood clot disorders are themselves associated with strokes and heart attacks. This is the first such study to report the association, but that is not surprising because no one had previously looked for an effect. Which one of the following possible (social) consequences of this study do we expect? One answer only.

   (A) The government agency with appropriate authority will impose an immediate ban on use of the herbicide, at least until further study can show otherwise. In this case, the action is justified because the authors suggest that the link is causal.

   (B) Further studies will be undertaken to see if the results are repeatable before any action is taken to halt use of the herbicide.

Weak versus strong statements

2-6 (6 pts) Which statements are weak vs strong? Recall that only a weak statement can be made in the absence of evidence.

   (A) = weak   (B) = strong

   2. (A)(B) There is no evidence that a measles vaccine protects you from influenza.

   3. (A)(B) A diet high in sugars causes heart disease.

   4. (A)(B) A diet high in sugars does not cause heart disease.

   5. (A)(B) We don't know if the newly discovered cattle virus can infect people.

   6. (A)(B) Horoscopes have no predictive power

7-8 (2 pts) Which statements correctly describe the properties of a weak or strong statement? (A) = True

   7. (A)(B) What we call a weak statement is one that can be legitimately made ONLY when there is no evidence.

   8. (A)(B) What we call a strong statement is one that CAN be legitimately in the absence of data because the 'strength' of the statement overcomes the need for data.

Correlations, Causation & 3rd variables

9-12. (5 pts) In the following, how many variables are described? Consider membership in different institutions a variable.

   (A) 0   **(B)** 1   **(C)** 2   **(D)** More than 2

9. (A)(B)(C)(D) All LCSC students eat vegetables

10. (A)(B)(C)(D) 93% of LCSC students eat meat.

11. (A)(B)(C)(D) 7% of LCSC students are vegetarian, 7% of UI students are vegetarian.

12. (A)(B)(C)(D) 4% of Moscow residents have red hair; 50% of Moscow residents are female.

13-16 (5 pts) We observe a correlation. What is meant when we say 'correlation does not imply causation'?

(A) = True   (B) = False

It means

13. (A)(B) that there are no causal variables underlying the observed correlation, not even third variables.

14. (A)(B) that neither of the two variables described in the correlation can be the cause of the correlation.

15. (A)(B) that we should not assume that either of the two variables described in the correlation is the cause – that the correlation could arise from something else.

16. (A)(B) that causation and correlation are completely separate processes, that neither has anything to do with the other.

17-19 (3 pts) Which of the following are ways you can show that a specific causal model is a correct explanation for an observed correlation? These should be ways that we identified in class. **(A) = True**   (B) = False

17 (A)(B) If a statistical test reveals that the data are highly significant, then the causal model can be considered correct.
18 (A)(B) If the correlation exhibits the same pattern/association as would be generated by the causal model, then the causal model can be considered correct.
19 (A)(B) The causal model can be considered correct if it invokes a third variable to explain the correlation.

20-23 (5 pts) Consider the following graph of data, showing a trend that towns with more bars also have more churches; each point is for a different town. Which of the following models can be rejected?   To reject a model, the model cannot possibly yield data like the pattern in the graph.

Number of churches in the town (y-axis)
Number of bars in the town (x-axis)
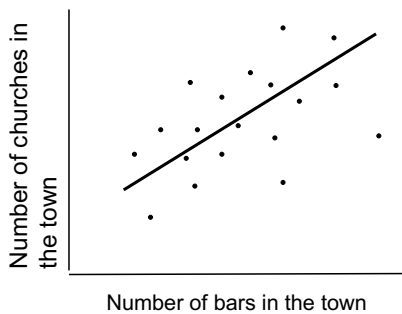
(A) Can be rejected   (B) Cannot be rejected

20. (A)(B) Drinking causes people to seek salvation; more bars leads to more drinking which results in more people wanting to attend church to absolve themselves.

21. (A)(B) Churches cause their members to feel badly about their sins; people who feel badly about their sins are driven to drink.

22. (A)(B) Churches cause their members to feel badly about their sins; people who feel badly about their sins <u>avoid</u> drink.

23. (A)(B) The pattern is caused by population size. Towns with more people have more social institutions of all kinds, including churches and bars.

24-27 (6 pts) People whose diet contains lots of fresh fruits and vegetables live longer. Which of the following models use(s) a 3rd variable to explain the cause of this correlation? You should use the method given in class to decide if a third variable is invoked.

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

Choose (A) if third variable is used	Causal model
24. (A)(B)	Fresh fruits and vegetables are expensive, so a person's income level largely determines how much fruits and vegetables they eat – higher income causes someone to eat more fruits and vegetables. A person's health care access also increases with income level, and health care access is what affects longevity.
25. (A)(B)	Access to fresh fruits and vegetables varies geographically – is higher in rural areas where food plants are grown, compared to high-density cities. Living in rural areas promotes longevity because there is less crime and less pollution than in a city.
26. (A)(B)	A high proportion of fresh fruits and vegetables in the diet means that the diet contains fewer carbohydrates – eating more fruits and vegetables forces a person to eat fewer carbs because a person can only eat so much. High carbohydrate diets shorten lifespan.
27. (A)(B)	Fresh fruits and vegetables promote health by providing antioxidants and healthy fats that protect against cancer and heart disease. The reduced cancer and heart disease increase longevity.

28-30 (4 pts) In which of the following is a correlation used to suggest or infer causation? These are excerpts from news articles. **Bold texts are headlines from the article.** To justify answer (A), the question must both describe a correlation and somehow suggest or imply a causal interpretation (perhaps in the title).

(A) = the correlation is used to suggest causation   (B) not

28. (A)(B) Don't let the government get you down. It seems that too many people do, especially when leadership leans toward the right. University of Sydney researchers discovered that, during the 20th century in New South Wales, suicides occurred most often when both federal and state governments were conservative.

29. (A)(B) Higher beer tax would lower STD rate. Cheap beer is a leading contributor to the spread of STDs, according to a government report. Comparing changes in gonorrhea rates to changes in alcohol policy in all states from 1981 to 1995, in years following beer tax increases, gonorrhea rates usually dropped among young people.

30. (A)(B) Study abroad found to cause higher graduation rate. Sixty percent of students who study abroad graduate in four years compared to 45 percent of non-participants, according to a study by the director of the Study Abroad Office.

31-37. (10 pts) Which of the following options is indicated? Base your answer only on the information provided.

(A) no correlation or causation is described.

(B) correlation only – the statement merely describing one or more non-zero correlations,

(C) causation only – the statement merely describing one or more causal models,

(D) correlation and causation are described. Choose this if the problem describes the use of correlation to infer causation.

31. (A)(B)(C)(D) High schools whose teachers are paid above average have students whose standard test scores are above average.

32. (A)(B)(C)(D) A study reveals that athletic teams wearing red uniforms have higher winning rates than teams wearing other colors. To help ensure a losing streak in Anderson High school (a high school competing with his son's high school) --, the owner of athletic jersey business convinces Anderson High to purchase blue and yellow uniforms.

33. (A)(B)(C)(D) In attempting to correct decades of gender discrimination, the University of Idalou intentionally accepts a higher fraction of women than of men in each of its programs. Despite this effort, the average acceptance rate of women to the University remains less than that of men.

    (A) no correlation or causation is described.

    (B) correlation only – the statement merely describing one or more non-zero correlations,

    (C) causation only – the statement merely describing one or more causal models,

    (D) correlation and causation are described. Choose this if the problem describes the use of correlation to infer causation.

34. (A)(B)(C)(D) Eating a high-carbohydrate diet causes heart disease. Frequent exercise reduces heart disease.

35. (A)(B)(C)(D) Students who also participate in community activities have higher graduation rates than students who don't. Despite this, participating in community activity lowers graduation rates.

36. (A)(B)(C)(D) Having a pet at home increases the survival rates of the elderly. Consequently, old people who have pets live somewhat longer than old people without pets.

37. (A)(B)(C)(D) 40% of BSU students attend their university's football games

38-40 (4 pts). In 2013, the following email was sent to all UI advisors. (The full email is not included.) In the following questions, indicate whether the advice to advisors is valid. For an answer to be correct, any reasoning provided must also be legitimate.

Dear advisors:

All Students Should Enroll in at Least 15 credits every semester

According to the Complete College America initiative (and the Complete College Idaho plan), students who attempt at least fifteen credits per term are significantly more likely to graduate from a university. They are also more likely to persist from the first to the second year and feel more connected to their institution. Over the last six years, less than 50% of UI students have been enrolled in 15 or more credits and we would like to address this issue immediately.

Please work with your incoming and current students to identify the best 15 (or more) credits to fit their needs and developmental level. There are certainly cases where a student cannot undertake this course load (e.g. working full time, overextended in other areas, etc.) but we believe the typical UI student is fully capable of completing a 15 credit semester.

Which of the following are true? A = True

38. (A)(B) The advice (gray highlight) is valid because taking at least 15 hours will increase the likelihood of graduation for all students.

39. (A)(B) The advice is valid because the first paragraph describes a causal relationship between graduation and hours taken.

40. (A)(B) Even though we cannot be sure that the association between hours/semester and graduation is causal, we can be confident that taking 15 hours/semester will increase anyone's graduation rate.