What's new: Under the new, online delivery of tests and answers, you should deliver your answers by the end of exam time to the class email (cors236@uidaho.edu) or to BbLearn (as a short answer to the quiz labeled 'exam 3 answers').

Begin your set of answers with:

Last name, First name, last 4 digits of your Vandal ID.

Then provide your answers separated by commas. You may do this in any of various formats, but keep the answers in order:

A, A, F, H, … for all 63 answers, or

1. A, 2. A, 3. F, 4. H, … or even

1-5: A, A, F, H, C 6-10: B, B, B, B, A

I don't necessarily care how you provide the answers, other than putting commas between them, but I recommend some occasional numbering to be sure you have not gotten your answers out of order or skipped some.

**Note**: you will be providing 63 answers.

*Italicized phrases and sentences should be considered true.*

**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.

**Language and concepts**

**1-5. (8 pts). (Evidence of absence vs. absence of evidence)** Which statements either:

**(A)** Can legitimately be made only if we have some data to support a conclusion or reject some models

**(B)** Can legitimately be made in the absence of data

**(disregard the fact that some of these statements are not true)**

**1.** (A)(B) Masks are not effective against the new corona virus

**2.** (A)(B) There is no evidence that genetically modified plants are unsafe to eat

**3.** (A)(B) There is no evidence that genetically modified plants are safe to eat

**4.**(A)(B) Psychics have no predictive power.

**5.**(A)(B) Despite extensive testing, we have observed no cases of covid-19 in Latah County

**6-8**. **(5 pts)** A few days ago, the World Health Organization (WHO) revised its advice about ibuprofen and covid-19 infections to:

"We do not currently believe there is any proven scientific evidence linking over-the-counter use of ibuprofen to the aggravation of COVID-19."

What does this statement mean – how should it be interpreted? **(A) = True** (B) = False

**6. (A)(B).** Ibuprofen is known to be safe for treating COVID-19

**7. (A)(B).** Ibuprofen is harmful for treating COVID-19

**8. (A)(B).** We do not yet know whether ibuprofen is safe, harmful, or has no effect – it could be any if those possibilities.

## Correlations, Causation & 3rd variables

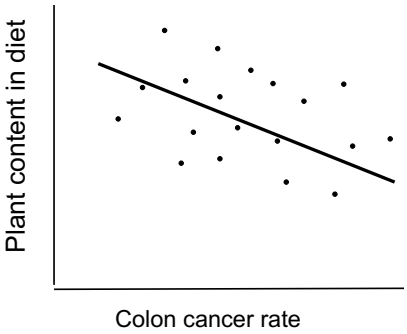
**9-12**. **(7 pts)** Say that it has been observed that people who take high doses of ibuprofen more often die from covid-19 than people who don't take ibuprofen. Which of the following are valid conclusions from this observation? **(A) = True**, (B) = False

**9. (A)(B).** Ibuprofen aggravates (contributes to) death from covid-19 infections

**10. (A)(B).**. Serious covid-19 infections cause people to take ibuprofen

**11. (A)(B).** We cannot rule out that ibuprofen contributes to death from covid-19 infections

**12. (A)(B).** We cannot rule out that serious covid-19 infections cause people to take ibuprofen




**13-16 (8 pts).** Across a set of US cities we observe the pattern (shown in the figure) between dietary plant consumption and colon cancer rate. Which models are *consistent* with these data? This question is the same as asking which models cannot be rejected.

**A = consistent, thus cannot be rejected, B = not consistent – can be rejected**

**13** (A) (B) Colon cancer rates are increased by eating more plants

**14.** (A) (B) Colon cancer rates are reduced by eating more plants

**15.** (A) (B) Plant consumption has no causal effect on colon cancer rates

**16.** (A) (B) Cities with higher dietary plant consumption have older populations than cities with low plant consumption, and age is the cause of colon cancer.

**17-20 (8 pts)** The death rate of covid-19 patients is higher in people taking ibuprofen than in people not taking ibuprofen. Which of the following models explain(s) the cause of this correlation by some means **other than** ibuprofen causes higher death rates from covid-19?

**A = a model in which ibuprofen is NOT the cause of higher death, B = ibuprofen causes higher death**

| Choose (A) if ibuprofen is not the cause of higher death | Causal model |
|---|---|
| **17.** (A)(B) | Ibuprofen lowers immunity and thereby makes people more susceptible to dying from any infection, including covid-19. |
| **18.** (A)(B) | Older people are more inclined to take ibuprofen than are young people. Higher death rates from covid-19 are due to age. |
| **19.** (A)(B) | The more serious a covid-19 infection becomes, the more likely the patient is to take ibuprofen to alleviate the symptoms. Death rate increases with how serious the infection is, and ibuprofen actually reduces the death rate over what it would be otherwise. |
| **20.** (A)(B) | People who take ibuprofen tend to have underlying health issues. The underlying health issues are what lead to the increase in covid-19 deaths. |

**21-26**. **(10 pts)** Which of the following options is indicated? Base your answer only on the information provided.

**(A)** no correlation or causation is indicated.
**(B)** correlation only – the statement merely describing one or more non-zero correlations,
**(C)** correlation and causation are described but go in opposite directions (Simpson's paradox)
**(D)** correlation is used to infer/argue causation (i.e., a correlation leads people to infer the causal basis of the correlation)
**(E)** causation is used to explain a correlation (both correlation and causation must go in the same direction)

**21.** (A)(B)(C)(D)(E) Athletic teams whose uniforms are red have higher win rates than teams whose uniforms are not red.

**22** (A)(B)(C)(D)(E) A company that makes face masks finds that people who wear masks have lower infection rates of covid-19 than people who do not wear masks. People who learn of this fact buy masks to protect themselves.

**23** (A)(B)(C)(D)(E) Studying improves a student's exam scores. Yet students who study more have lower exam scores than students who study less.

**24.** (A)(B)(C)(D)(E)) 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.

**25.** (A)(B)(C)(D)(E) People who eat lots of sugar have high levels of tooth decay. People who avoid dental checkups have high levels of tooth decay. People who eat sugar and avoid dental checkups have the highest levels of tooth decay.

**26.** (A)(B)(C)(D)(E) 50% of BSU students attend their university's football games

## Controls, controlled variables and Experiments

**27-28 (2.5 pts each)** When we observe a correlation between two variables (X, Y) where we suspect a possible causal relationship, *w*hy do we try to control for 3rd variables in determining whether X causes Y or Y causes X? **(A) True** (B) False

**27. (A)(B)** The 3rd variables can be the actual cause of the correlation. If a 3rd variable is causal and we successfully control for it, then the correlation between X and Y will disappear.

**28. (A)(B)**. 3rd variables can be imbalanced in their associations between X and Y. We want to control for 3rd variables to destroy those imbalances and thus destroy the ability of 3rd variables to influence the correlation.

**29-34. (10 pts)** An associate of yours markets a dietary supplement for weight loss. You consider the following experimental design to test whether it works. You are asked about which variables are controlled or manipulated.

Which are true (A = TRUE, B = false)

Design. For 200 overweight male patients enrolled in a diet study, all are put on a vegetarian diet and told that the diet will enable them to lose 30 pounds. In addition to the diet, you will give the patients either the supplement in a capsule/pill or an empty capsule indistinguishable from the pill but which has no supplement. You randomly assign the supplements versus empty capsules to your 200 patients and tell the patients all capsules are the same digestive aid. You compare weight change among the two groups after 2 months to see if there is an effect of the supplement.

Which are true of this Design with respect to testing the effect of the supplement?

**29 (A)(B)** It controls for vegetarian diet
**30 (A)(B)** It controls for body weight of the patient
**31 (A)(B)** It controls for educational background of the patient
**32 (A)(B)** It controls for patient expectation of weight change.
**33 (A)(B)** Patient expectation of weight change is a treatment variable.
**34 (A)(B)** Supplement is a treatment variable.

**35-39.** (**9 pts**) Holly is testing the effect of different chemical additives on tomato production/output. She mixes different combinations of chemicals and adds them to the soil of the plants. The different chemical additives are calcium, nitrogen, phosphate, and potassium. The different plants are grown separately to be sure that the chemicals given one plant do not leach to other plants. Different mixes are indicated by rows (A)-(H) in the following table, a + indicating the additive is present in the mix, a - indicating absence. There is no *a priori* expectation that these additives will have any effect on tomato production. After 2 months growth, she measures plant output given each mix; output is given in the right-most column. Which statements in the following questions are true?

**A = TRUE, B = false**

| | **chemical additive** | | | | | |
|---|---|---|---|---|---|---|
| **Mix** | | calcium | nitrogen | phosphate | potassium | **plant output** |
| | (A) | + | - | + | - | $O_A$ |
| | (B) | - | + | - | + | $O_B$ |
| | (C) | - | + | + | + | $O_C$ |
| | (D) | - | - | - | - | $O_D$ |
| | (E) | + | + | + | + | $O_E$ |
| | (F) | + | + | - | + | $O_F$ |
| | (G) | - | + | + | + | $O_G$ |
| | (H) | + | + | - | - | $O_H$ |

**35.** **(A) (B)** The output of plants given mix (E) is expected to be higher than the output of plants given mix (D).

**36.** **(A) (B)** A comparison of output of plants given mix (A) with plants given mix (B) controls for all additives.

**37.** **(A) (B)** A comparison of mix (E) with mix (F) controls for 3 of the 4 chemical additives.

**38.** **(A) (B)** The average output of plants given one mix is always expected to differ from the average output of plants given a different mix.

**39.** **(A) (B)** At least one pair of comparisons allows you to assess the effect of phosphate when all other chemicals are controlled.

**40-44 (9 pts)**. Which of the following studies describe(s) experiments, regardless of whether the experiment was designed well or poorly and regardless of ethics. The goal is given (but not underlined). The question is whether the option describes an experiment for obtaining data with respect to the goal. **(A) = is an experiment** **(B) is not**

**40. (A)(B)** You normally study for tests only the night before an exam, but this time, you study 2 days in advance to see if your score improves.

**41 (A)( B)** You analyze surveys from 1,000 college students (the surveys have data on lifestyles and health issues) to identify possible correlates of health issues.

**42. (A)(B)** You wish to see if your students respond more favorably to horoscopes that are individualized to them personally than to horoscopes that are generic and not personalized. You give half your students the identically same horoscope, the other half get individualized descriptions, but you tell everyone that they were getting individualized descriptions. You collect their responses to the horoscopes to see if there is a difference between the two groups.

**43. (A)(B)** During sequestration from covid-19, you have run out of your favorite brand of spaghetti sauce. To avoid starving, you try a new brand because you have no choice.

**44. (A)(B)** A researcher wants to know the effect of maternal diet on birth defects. For mothers who have recently given birth and for whom the status of their baby is known (with or without defects), she has the mothers fill out surveys to describe their diet in the last year (without knowing the purpose). From these surveys, she analyzes the data by sorting the mothers into age groups. She finds that mothers in their 20s who took thrice the recommended daily dose of vitamin A have a 1 in 570 chance of a child with birth defects, but mothers in their 30s have a 1 in 400 chance.

**45-52.** (**10 pts**) **Prisoners of Silence video (FC = facilitated communication).** *The video showed tests of FC suggesting that the facilitator, not the child with autism, was the author of the typed responses.* The following questions require you to address and interpret the features of this experiment. *Tthis one is straight out of a lecture)*

**A = TRUE** **B = false**

**45.** **(A)(B)** Models. An experiment was done to test the *null* model that the child knew the answers *( the question is whether this experiment used the null model approach)*,

**46.** **(A)(B)** Manipulation. The *manipulation* (what makes the test an experiment) consisted of showing the facilitator something different than what was shown to the child and not letting the facilitator know what the child saw.

**47.**(A)(B) Variables. The 'third variable' in FC that the experiment needed to eliminate was child knowledge of the answer.

**48.** **(A)(B)** Controls. The controls in this experiment consisted of showing the facilitator and child the same picture/object.

**49.** **(A)(B)** Ideal data. An explicit protocol for the experiment was evident from the way the study was conducted.

**50.** **(A)(B)** The study is considered an experiment specifically <u>because</u> it included controls, replication and randomization.

**51.** **(A)(B)** Type of experiment. This experiment was the type in which the relevant 3rd variable was known in advance

**52.**(A)(B) Blind. The experiment included blind in some respects but not in others. For example, the facilitators knew they were being tested and so were not blinded in that respect.

**53-58.** (**8 pts**) **Nova video – *Secrets of the psychics*.** *Class was shown 2 psychic experiments in the video (bogus horoscope and palm reading) and, as an online exercise, was subjected to a mock personality experiment whose design was similar to the horoscope experiment in the video. (Neglect the Moscow psychics part of the video.)* The following questions require you to address and interpret the features of these three tests/experiments.

**A = TRUE** **B = false**

**53.** **(A)(B)** Models. In at least two of these tests, the models being compared were:

'responses reflect the personalized accuracy of a reading/description'
versus
'responses reflect the expectation of personalized accuracy.'

**54.** **(A)(B)** All three tests required that the subjects were blinded in some fashion.

**55.** **(A)(B)** Null model. The type of analysis used in the horoscope experiment was a null model approach.

**56.** **(A)(B)** Controlled variables. The horoscope/personality designs maintained an expectation of personalized accuracy for all subjects.

**57.** **(A)(B)** Controls. A control group was evident in the palm reading 'study'

**58-62 (8 pts)** We want to control for as many 3rd variables as possible in asking whether smoking causes cancer. What can we say about the following potential study designs? Questions apply to the design immediately above them. **(A) = True**

**Design 1:** From thousands of people for which you have histories of cancer and smoking versus not smoking (by their choice), compare cancer rates in a randomly chosen subset of smokers to cancer rates in a randomly chosen subset of non-smokers.

**58 (A)(B)** The randomization controls for third variables that may differ between smokers and non-smokers

**59 (A)(B)** The extent to which the random choice controls for 3rd variables between smokers and non-smokers depends on how big the randomly chosen subsets are.

**Design 2:** Now imagine that, for the people for which you have histories of smoking, cancer, you also have information on lifestyles, gender and age. You compare cancer rates between smokers and non-smokers when controlling for all recorded characteristics.

**60 (A)(B)** This approach is correlational.

**61 (A)(B)** This approach would control for all possible unwanted third variables.

**62 (A)(B)** Randomly choosing subsets of smokers and of non-smokers combined with an analysis of differences in recorded characteristics would guarantee that you can discover any possible causal third variable that might between smokers and non-smokers.

**63. (2 pts)** (A) **Key code, name, and ID number**. Provide answer (**A**) on question 63 to indicate your key for this version of the exam. Be sure your name and last 4 digits of your Vandal ID are included at the front of your string of answers you upload for this exam.