Cors 236 Exam 1 (2023) : 48 questions, 3 pages

Answer every question (1-48) with a single letter. Put your answers on Canvas (Test 1_2023).

If not specified otherwise, assume   A = True/yes   B =False/no

If any part of a question/option is wrong, treat the entire question as wrong.

SM = Scientific method; where applicable, goals are underlined

1-10. (10 pts) The use of evidence to evaluate a model is part of what we are calling the scientific method. Which of the following questions/problems fall within the realm of and could be addressed with evidence-based evaluation of models (or more generally, could be studied with the scientific method as we are using it in this class)?

(A) Could be studied and lies within bounds of science,

(B) Could not be studied as a science problem and/or lies outside the bounds of science

1. (A)(B) What characteristics of job candidates will affect their abilities to get tenure at a university?

2. (A)(B) What was the gross income of Home Depot last year?

3. (A)(B)   Does partying the night before an exam affect your performance on the exam?

4. (A)(B)   Does Bigfoot exist?

5. (A)(B) Are telecommuters (workers at home) as productive for a company as in-person workers?

6. (A)(B)   Does diet affect lifespan?

7. (A)(B) Are psychics better at picking winning lottery numbers than are other people?

8. (A)(B) How do we use geometry to calculate the height of a tree?

9. (A)(B) What moral obligations does society have to offer reparations to descendants of individuals who were mistreated by the US establishment in earlier times?

10. (A)(B) What kinds of management styles result in companies avoiding bankruptcy?

11-14 (4 pts) A field test is done to measure the effect a biological control agent on pest numbers. Assuming the trial is done correctly by scientific standards, what are possible outcomes (and possibly from later work, also done well)? Each option should be considered independently of others.

(A) is a possible outcome if the trial is done right   **(B)** not a possible outcome

11. (A)(B) The trial finds that the biological control agent definitely reduces pest numbers.

12. (A)(B) The trial finds that the biological control agent definitely increases pest numbers.

13. (A)(B) Study results are so inconclusive that the biological control agent might work at increasing or decreasing pest numbers, but the study cannot say.

14. (A)(B) The field test finds the opposite effect of a previous trial of the same biological control agent.

15-23 (9 pts) Which descriptions allow you to suspect a failure to adhere to proper scientific method (for the goal underlined)? If needed, rely on the 'shortcuts' given in class for some of the questions.

(A) is suspicious -- likely not good SM   **(B)** not suspicious – very possibly consistent with SM

15. (A)(B) A new forensic method claiming to match suspects to crime scene samples has never been tested for its true success rate.

16. (A)(B) A company developing a computer model to detect breast cancer from ultrasound changes the model often because the predictions are imperfect.

17. (A)(B) A farmer wanting to maintain financial stability continues to use age-old farming methods as profits increase over the years.

18. (A)(B) A teacher wanting to use the best ways to prepare students for finding jobs in today's society teaches the same material for decades without knowing the success rate of those students in job searches.

(A) is suspicious -- likely not good SM   (B) not suspicious – very possibly consistent with SM

19. (A)(B) A company charged with protecting consumer health claims that smoking is safe because 60% of smokers die of natural causes but neglects to account for the other 40%.

20. (A)(B) A politician wishing to maximize her voter support frequently changes her style of campaigning but never measures the public impact of each style.

21. (A)(B) A homeowner wants his gasoline mower to start. He changes the spark plug, discovers that the mower now starts, and makes no other changes to the mower.

22. (A)(B) A student hoping to avoid hangovers after partying keeps partying and hoping he will grow out of hangovers.

23. (A)(B) A fisherman wanting to catch lots of fish changes lures often if the fish are not biting.

24-48. Identifying SM elements. Below are paragraphs, each giving a description of a process with possible parallels to the scientific method (SM). In the questions that follow each paragraph, you are asked either to match a scientific method element with a quote taken from the paragraph or asked something about SM elements. In each paragraph, the goal is underlined. Answers should be based only on what is explicitly described. Not all answers need be used for a paragraph, and some elements may be used more than once. If a model is used as a Revision, choose Revision. Using the goal given, you are to thread the description in the paragraph onto the scientific method template and then answer how the quoted phrases fit into the scientific method template. Some problems may not describe a fit to all scientific method elements – you need to figure this out. To qualify as a SM element, the quote need not describe all instances of that element in the paragraph.

24-26 (3 pts) The developer of a new method of voice analysis hopes his method is able to determine whether a person is telling the truth in statements given to the police. The method (word lie detection) was developed by comparing word combinations used in known lies with word combinations used in known true statements. Once developed, the method is being used to analyze the words used in 911 calls to determine whether they match the known lies or truths. Around the US, there is a lot of interest from prosecutors in word lie detection of 911 calls. However, there have been no formal efforts to determine whether the method actually works at discovering lies.

(A) True   (B) False

24. (A) (B) in the context here, an 911 call analysis by 'word lie detection' is a model of whether a person told the truth in a 911 call

25. (A) (B) the fact that prosecutors are interested in 911 call analysis indicates that there are data supporting the method

26. (A) (B) that there have been no formal efforts to determine whether the method actually works means that evaluation is absent.

27-30 (4 pts) A veterinarian wants to avoid infecting dogs and cats during surgeries. Her usual method of sterilizing wounds is to scrub the incision site with alcohol immediately before incision. However, when using that method, pets sometimes develop an infection, which is undesirable. She guesses that the problem is poor cleansing of the dog's skin before incision. She has heard that chlorhexidine gluconate (CG) is a better antiseptic than alcohol, so she decides to start using CG instead of alcohol.

(A) Model   (B) Data   (C) Evaluation   (D) Revision   (E) None

27. (A) (B) (C) (D) (E)   scrub the incision site with alcohol

28. (A) (B) (C) (D) (E)   pets sometimes develop an infection

29. (A) (B) (C) (D) (E)   decides to start using CG instead of alcohol

30. (A) (B) (C) (D) (E)   A veterinarian

31-33 (3 pts) You are starting a company hired to remove snow from residential sidewalks and driveways. The snowfalls in your area are usually no more than 3" deep, so you decide that a snowblower is not cost-effective, and you will use shovels. However, there are 3 different types of shovels that you might use (differing in size and weight: shovels X, Y and Z). You want to use the type of shovel that leads to the fastest clearing of snow. You have three choices: shovel X, shovel Y, or shovel Z.   When used on 50 feet of sidewalk, shoveling with X takes 10 minutes, shoveling with Y takes 12 minutes, and shoveling with Z takes 8 minutes.

(A) Model   (B) Data   (C) Evaluation   (D) Revision   (E) None

31. (A) (B) (C) (D) (E) shovel X

32. (A) (B) (C) (D) (E) shoveling with Z takes 9 minutes

33. (A) (B) (C) (D) (E) snowfalls in your area are usually no more than 3" deep

34-37 (4 pts) You are attempting to find out <u>how to soak dried split peas prior to cooking so that they soften when boiled for an hour</u>. The problem is that they usually remain hard and crunchy after cooking. Your approach in the past has been to add 1 tablespoon of salt to a half gallon of tap water and 1 pound of peas, soaking for 8 hours, then rinsing before cooking. You try several different approaches, always soaking them for 8 hours but changing what is added to the half gallon of water, and then rinsing before cooking. On Monday, you soak the peas as before in tap water, but without salt. After cooking, they remain crunchy, which is not what you want. On Wednesday, you soak in distilled water without salt. After cooking, they are a mix of soft and crunchy, still not quite what you want. On Friday, you use tap water with a teaspoon of baking soda. This time the peas are soft after cooking, as desired, so you abandon your salt method and decide to use baking soda henceforth.

        (A) Model   **(B)** Data   **(C)** Evaluation   **(D)** Revision   **(E)** None

34. (A) (B) (C) (D) (E)   After cooking, they remain crunchy

35. (A) (B) (C) (D) (E)   you soak in distilled water without salt.

36. (A) (B) (C) (D) (E)   still not quite what you want

37. (A) (B) (C) (D) (E)   you abandon your salt method and decide to use baking soda henceforth

38-40 (3 pts) Carol is an avid duck photographer. She wants to <u>attract ducks to fly close to her blind so she can</u> <u>take closeup pictures of birds in flight</u>. To attract lots of ducks for closeup pictures, she uses decoys. However, there are many different kinds of decoys that can be purchased. Her gut feeling (intuition) is that the kinds of decoys used makes a difference to how many ducks she attracts, so every year, she buys new decoys, thinking that the most-recently advertised decoys are better than decoys that have been on the market longer. However, she never actually keeps records of how well each kind of decoy works, she just keeps changing the decoys used based on how they appeal to her.

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

38. (A) (B)   decoys are used as models to achieve her goal

39. (A) (B)   'Her intuition' describes a scientifically-based evaluation

40. (A) (B)   The fact that she keeps changing decoys indicates that she is using a scientific basis for revision.

41-44 (4 pts) John works at a restaurant and is trying to reduce a mouse infestation with <u>the most effective method of killing mice</u>. He tries several methods and counts the number of mice killed by each: poison, glue, and traps. In the course of a week, poison kills 20 mice, glue kills 15, and traps kill 11. John decides that poison is the best method.

        (A) Model   **(B)** Data   **(C)** Evaluation   **(D)** Revision   **(E)** None

41. (A) (B) (C) (D) (E) poison kills 20 mice, glue kills 15, and traps kill 11.

42. (A) (B) (C) (D) (E) John works at a restaurant

43. (A) (B) (C) (D) (E) John decides that poison is the best method.

44. (A) (B) (C) (D) (E) poison, glue, and traps

45-48 (4 pts) David wants to get a good job, but thinks it will take time to get something he will get one, so he plans on making many applications. He <u>wants the best resume for his qualifications – the resume style that will get him the most invitations for interviews</u>. He does not have much experience with applications or interviews and so he uses what he thinks is the scientific method. He develops s short resume style and sends it to 10 different job advertisements. He is invited to only 1 interview, which is not satisfactory. He thus develops a second resume style and sends it to 10 more job advertisements. He is invited to 3 interviews. He thinks he can do better, so he develops a third resume style and sends it to 10 more job advertisements.

        (A) Model   **(B)** Data   **(C)** Evaluation   **(D)** Revision   **(E)** None

    45. (A) (B) (C) (D) (E) a short resume style
    46. (A) (B) (C) (D) (E) a third resume style
    47. (A) (B) (C) (D) (E) 1 interview
    48. (A) (B) (C) (D) (E) thinks he can do better