

Cors 236 Exam 3 (2024) : 46 questions, 4 pages **Put your answers on Canvas (Test 3_2024)**
Answer every question (1-46) with a single letter. Answers with no letter or two letters will get 0 pts.

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.

1-6. (6 pts) Identify the type of error indicated. If there is no indication of error in the data, choose (F).

(A) Sampling B) Bias C) RPA D) Human and technical (E) Flawed analysis F) None

1. **(A)(B)(C)(D)(E)(F)**. Your bathroom scale reads your weight at 141 pounds, but your true weight is 140.67330.
2. **(A)(B)(C)(D)(E)(F)**. In the airburst test of a batch of condoms, randomly sampled, 3 break out of the first 50 tested but only 2 break out of the next 50 tested. What kind of error almost certainly underlies the difference in these two observed breakage rates?
3. **(A)(B)(C)(D)(E)(F)**. A scale used in the lab reads 0.45 grams too high because the technician did not zero the machine before using it.
4. **(A)(B)(C)(D)(E)(F)**. In a trial with DNA evidence, the prosecution's expert claims that the 'random match probability' they calculated was 1/300, whereas the defense expert using the same data calculates that the value should be 1/15.
5. **(A)(B)(C)(D)(E)(F)**. In attempting to survey attitudes representing all UI students on sexually transmitted disease prevention, the pollster surveys only male students, hundreds of them and randomly chosen from all male students. What is the major kind of error that this poll would be prone to in representing all UI students?
6. **(A)(B)(C)(D)(E)(F)**. A clinical trial to test a drug fails to use a placebo (fake pill). What is the major kind of error to which this test of the drug would be prone?

7-11 (5 pts). Identify the type of error indicated as requested or indicated by the underlined text?

7. A firm uses two methods to assess customer satisfaction of its products. One method uses a postcard included with each product that the customer voluntarily returns anonymously. The other method uses a phone survey of a random sample of customers. The postcard responses indicate a much higher level of customer satisfaction than does the phone survey. What type of error is suggested by the higher favorable response from postcards?

A) Sampling B) Bias C) RPA D) Human and technical (E) Flawed analysis F) None

8. Some brands of toilet paper advertise an exact number of sheets per roll (e.g., 200). Machines ensure that each sheet is the same length as the others in the roll. Some decades ago, a person claimed that the actual number of sheets was a few less than advertised. What they had done was measure the length of a couple sheets, then divide that into the total length of the roll to come up with a number of less than 200 sheets. They were wrong – when counted directly, there were 200 sheets. What kind of error explains their mistake?

A) Sampling B) Bias C) RPA D) Human and technical (E) Flawed analysis F) None

9. A lab technician uses a machine to measure arsenic concentration in water samples; the machine is capable of measuring to the nearest .000001 concentration, and arsenic concentrations do not change over time. Measuring the *same* sample on two consecutive days, the machine reads .000035 one day but .000742 the next day. What kind of error is most likely responsible for this difference?

A) Sampling B) Bias C) RPA D) Human and technical (E) Flawed analysis F) None

10. The random choice of a few employees for a company drug test could lead to what kind of 'error' in who gets tested vs who does not?

A) Sampling B) Bias C) RPA D) Human and technical (E) Flawed analysis F) None

11. A teacher who grades written assignments while knowing who wrote each one is prone to what type of error in the grading?

A) Sampling B) Bias C) RPA D) Human and technical (E) Flawed analysis F) None

12-15 (4 pts). You are testing which of two cake recipes has the broadest appeal to adults. You bake two cakes from each recipe and cut each into 10 slices. The cakes and slices look the same, regardless of the recipe, so people cannot tell one from the other. At Farmers Market, you put all 40 slices out on a table (each slice on its own plate) and let passers-by try one; they don't know that there are two recipes, so no one is tempted to try two slices. After a taster eats their slice, they are given a token to drop into one of three boxes indicating how much they like the cake ("poor flavor", "good flavor", "excellent flavor"). The tokens are individually numbered so that they can be distinguished by which cake recipe they were associated with. Which features are indicated? **(A) = True (B) = False**

12. **(A)(B)** Replication

13. **(A)(B)** Random

14. **(A)(B)** Blind

15. **(A)(B)** Standards

16-19 (4 pts). Before subjecting your employees to drug tests, you decide to evaluate the quality of the testing lab. You take a sample from yourself, split it into 3 tubes, each tube labeled with a different code but no name. You do the same for one of your employees – 3 coded tubes from them, none of the codes being the same among the 6 tubes. You send them off for testing. You realize that the lab – if it's not making mistakes-- should give the same result for all 3 tubes from the same person but a different result for tubes from different people. Which are true? Note that an answer must give the correct reason to be true. **(A) = True**

16. **(A)(B)** Replication is present at several levels here – you are testing samples from two people and also are testing multiple samples from each person.

17. **(A)(B)** Random is present here because the lab does not know which tubes belong to which person

18. **(A)(B)** Blind is present here because you do not know in advance how well the lab will perform.

19. **(A)(B)** Standards: by sending multiple tubes from the same person, you will know that the lab is making mistakes if they give different results for samples from the same person.

20-24. (5 pts) Which options identify a valid "fix" for the type of error (or problem) indicated; a "fix" may either reduce that error or allow you to detect that error some of the time. If the error is bias, then the fix must clearly remove the possibility of bias. The (possible) error or problem you need to solve is indicated with underline.

A = the fix is valid;

B = the fix is not valid or has obvious flaws

The 'Error'	Fix (choose A if the fix is valid)
20. The manager of a crime lab is worried that her analytical team is <u>analyzing the samples in ways that intentionally support their prejudices about who they think is guilty.</u>	20. (A)(B) Send the same samples to another lab, with samples coded. Compare the results.
21. Your fingerprint lab may be <u>failing to detect true matches.</u>	21. (A)(B) Collect 10 fingerprints each (of the same finger) from 20 subjects and send all 200 to the lab for analysis – each fingerprint labeled differently, so the lab does not know which fingerprints came from the same fingers.
22. A drug testing company that processes thousands of samples a week from various sources often accidentally <u>mixes samples and thus gives the wrong result.</u>	22. (A)(B) Send the lab a single sample so that it cannot be mixed up with any other sample you have sent.
23. You are worried that your breathalyzer is not calibrated correctly and thus <u>gives readings that are consistently low for people who have alcohol in their breath. For example, the machine reads 0.04 when the person is really 0.06.</u> The machine, however, cannot give a value less than 0.0.	23. (A)(B) Take 3 readings from the same person in a short period of time. Check to see that the readings are the same.
24. You compare the average caffeine content of Mountain Dew in a sample of 100 bottles produced in Seattle with that of 200 bottles produced in Los Angeles. What can you do to be more confident that <u>sampling error does not account for any difference you find between the Seattle bottles and the Los Angeles bottles?</u>	24. (A)(B) Measure the caffeine content of each bottle twice.

25-27 (3 pts). Using one of her classes in Spring 2023, a professor determines whether ending a lecture with an unsolved problem increases attendance for the following lecture. On odd-numbered class days throughout one month, she ends lecture with an unsolved question, on even-numbered days she does not; attendance is recorded for each of the following lectures. Her class is not told the purpose of this study, or even that the study is being conducted. **(A)** = True **(B)** = False

- 25. **(A)(B)** There is no replication here in any form because only a single class is studied.
- 26. **(A)(B)** Random is present because she is alternating which days have lecture ending with an unsolved question.
- 27. **(A)(B)** Blind is absent because the students can tell whether the lecture ends with an unsolved question.

Forensics

28-36. (10 pts) In each of the following, a property of a forensic method, underlined, is described as absent or what it might consist of. The text following the underline gives a possible example of what the underlined text describes. Which examples correctly describe the underlined text?

- (A)** The non-underlined text correctly describes the underlined. **(B)** The underlined and non-underlined do not agree
- 28. **(A)(B)** Independent verification of a method used for analysis is not possible: when only one lab in a case was employed to determine a match even though other labs exist that could also determine the match.
- 29. **(A)(B)** A possible reference database for matching hair samples would be: a description of the characteristics and methods used to score hair properties.
- 30. **(A)(B)** A proficiency test is absent: a dog sniffing expert whose ability to track a person has never been checked by comparing a person's known path (directly observed) to the expert's claims of what the path was.
- 31. **(A)(B)** A fully blind analysis is present: samples are sent to a lab for analysis; the tubes are labeled with names of suspect, victim, and crime sample, but no one in the lab personally knows any of the people involved.
- 32. **(A)(B)** Independent verification of a method used for analysis is present: when the lab can pass a proficiency test.
- 33. **(A)(B)** A proficiency test would be satisfied when: a bite-mark expert has convinced each and every jury in over 100 trials to convict based on his testimonies.
- 34. **(A)(B)** The possibility of 'Independent verification' would **Not** be satisfied when: only one laboratory in the world is capable of the analysis.
- 35. **(A)(B)** A reference database for bullet lead analysis would be satisfied by: the data from analyses of lead from 100,000 different bullets from across the country.
- 36. **(A)(B)** A reference database for matching hair samples between people would be satisfied by: the data from characterizations of 1,000 different hairs from the suspect's head in the case being tried.

37-39 (4 pts). Read the following paragraph. Then answer the questions about 'ideal forensic' properties. The underlined text in each question refers to an ideal forensic property that is either present or absent. Other parts of the question explain why the property is present or absent. Choose **A** if the property (or its absence) is correctly explained in the question.

A dog trainer who uses dogs to track people from scenes of crimes to their homes testifies in court that his dog tracked the defendant to his house 7 days after the crime occurred. The trainer has used his dogs for tracking in over 100 cases. He claims to have tested his dogs twice by having people walk predetermined routes and then seeing whether his dog can track them immediately after – his dogs correctly tracked the person both times.

A = explained correctly **B= not explained correctly**

- 37. **(A) (B)** a reference database is indicated by the fact that the trainer has tracked people in over 100 cases.
- 38. **(A) (B)** the odors used by the dogs for tracking would be considered discrete characteristics because the dog only follows one trail.
- 39. **(A) (B)** a proficiency test is indicated and would be considered adequate for the particulars of this case because it showed that the dog can follow a fresh scent.

40-43. (6 pts). Read the following paragraph. Then answer the questions.

A suspected perpetrator of vandalism is on trial. The crime is defacing a public display by painting it with blue paint. The only evidence to connect the defendant to the crime is an analysis of trace elements in paint – trace amounts of the metals cadmium, lead, cobalt, and nickel. Although it has not been formally analyzed, it is suspected that all paint has trace amounts of these metals, but the amounts would not be the same between different batches of paint. The lab claims that the trace element analysis of the vandal paint matches the analysis of the can of blue paint in the defendant's garage. The lab's claim is that the minute amounts of each metal in the two sources of paint (the can and the crime scene) are too similar to have arisen by chance. The lab has done similar analyses in 5 previous trials.

Which questions correctly identify the features of 'ideal forensics' that the paragraph indicates as being present. The problem must specifically describe their presence for it to be present. **(A) = True (B) = False**

40. (A) (B) a reference database that can be screened for a RMP between the two paint samples is indicated

41. (A) (B) some of the characteristics described for the matching of paint are discrete

42. (A) (B) some of the characteristics described for the matching of paint are not discrete

43. (A) (B) The lab doing the analysis of the paint is indicated as being able to pass blind proficiency tests

44-46 (3 pts). Miscellaneous questions about the forensic lectures. **A = True (B) = False**

44. (A) (B) An eye witness 'test' was given to our class, followed by a short video of an audience subjected to an eyewitness test. Compared to our in-class test, the results in the video gave a favorable impression of eyewitness accuracy.

45. (A) (B) We listed a number of (now discredited) forensic matching methods that have been used in the past (e.g., hair matching, shoeprint matching, ...). One of the challenges with evaluating those methods is that proficiency tests would not have been possible for nearly all of these methods – there would have been no way to assess whether an expert could get the right answer.

46. (A)(B) 'Independent verification possible' would be satisfied if the same lab reporting the results in a trial could repeat the analysis and get the same answer the second time.