STAT*2040 W13

Test 1 (White Version)

February 8 2013

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University of Guelph
Department of Mathematics and Statistics

STAT*2040
Statistics I

Test 1 (White version)
February 8 2013

Examiner: Jeremy Balka

This exam is 70 minutes in duration

Name:

ID:

Signature:

Please read the instructions:

1. Fill out your name and ID number above.

2. When the examination starts, make sure your question paper is complete. You should have 21 multiple choice questions, along with a formula sheet. The first question is just a bookkeeping question, and does not count for marks, but please fill it in to ensure your exam is properly graded.

3. Do all rough work on this paper.

4. You are allowed to bring in a calculator, and pens and pencils.

5. There is only **one** correct answer for each question. Fill in only one bubble for each question.

6. Fill out the computer answer sheet in pencil as you go. *There will be no extra time given at the end of the exam to fill in the sheet.*

7. The answers given in the exam are often rounded versions of the correct answer. Choose the closest value.

1. The colour of the first page of this examination booklet (the cover sheet) is:

   (a) White
   (b) Yellow

2. A study surveyed 2,000 postmenopausal women. The women were asked several questions, including: "Do you practice hormone replacement therapy?" and "Do you have heart disease?" It was found that women who practiced hormone replacement therapy were found to have a lower risk of heart disease.

   Consider the following statements.

   I. This is an experiment, not an observational study.
   II. The response variable is post-menopausal women.
   III. This type of study can yield very strong evidence of a causal link between heart disease and hormone replacement therapy in post-menopausal women.

   Which of these statements are true?

   (a) Just I.
   (b) I and III.
   (c) II and III.
   (d) All of them.
   (e) None of them.

3. Which one of the following statements is true? (Assume for the purposes of this question that the events do not have probability exactly equal to 0 or 1.)

   (a) Mutually exclusive events can be independent.
   (b) The probability of the intersection of two events can be greater than the probability of their union.
   (c) If $P(A|B) = 1$ then $P(A \cap B) = 1$
   (d) The sample mean is always greater than the sample variance.
   (e) Percentiles can be negative.

4. Consider the following sample of 4 observations: $-2, 4, 6, 10$. What is the value of the sample variance? (Choose the closest value.)

   (a) 3
   (b) 5
   (c) 25
   (d) 35
   (e) 53

5. Which one of the following statements is true?

   (a) A parameter is a numerical characteristic of a sample.
   (b) A statistic is a numerical characteristic of a population.
   (c) A statistic is usually exactly equal to the parameter is estimates.
   (d) The value of a statistic stays constant from sample to sample.
   (e) None of the above.

6. Suppose a sample data set has a perfectly symmetric distribution with a mean of 0 and a standard deviation of 1. If each of the observations is multiplied by 18, then 1 is added, what are the values of the mean, median, and standard deviation of the new observations?

   (a) All 3 quantities are 18.
   (b) All 3 quantities are 1.
   (c) The mean and median are both 1, and the standard deviation is 18.
   (d) The mean and median are 1, and the standard deviation is 19.
   (e) The mean is 1, the standard deviation is 18, but it is impossible to determine the median.

7. Which one of the following statements is true?

   (a) The standard deviation can be negative.
   (b) The standard deviation can be greater than the variance.
   (c) The standard deviation is always greater than Q_1.
   (d) The units of the standard deviation are the square of the units of the original variable.
   (e) The standard deviation cannot be less than 1.

8. Which one of the following statements about sampling is FALSE? (If A-D are all true, answer option E.)

   (a) In simple random sampling from a finite population, each member of the population has the same chance of being selected in the sample.
   (b) In simple random sampling from a finite population, each possible sample of size n has the same chance of being selected.
   (c) Simple random sampling is always done *with* replacement.
   (d) Stratified random sampling is a type of sampling that has some advantages over simple random sampling in some situations.
   (e) None of the above.

9. Suppose A and B are two events such that $P(A) = 0.4$, $P(B) = 0.3$ and $P(A \cup B) = 0.65$. What is $P(A \cap B^c)$? (Choose the closest value.)

   (a) 0.28
   (b) 0.30
   (c) 0.35
   (d) 0.40
   (e) 0.95

10. Let A be the event that a randomly selected North American is a Canadian citizen. Let B be the event that a randomly selected North American is currently in Newfoundland. Which one of the following statements is true?

    (a) $P(A|B) < P(A)$.
    (b) $P(B|A) < 0.5$.
    (c) A and B are mutually exclusive.
    (d) A and B are independent.
    (e) $P(B|A) = P(A \cap B)$.

11. Consider the boxplots given in Figure 1. Which one of the following statements is true?

(a) Sample A shows some signs of left skewness.
(b) Sample B is has a standard deviation that is greater than 3.
(c) The IQR for Sample B is greater than 2.
(d) There are 4 outliers in the plot, plus 1 extreme outlier.
(e) For Sample A, $Q_3 + 1.5 \times \text{IQR}$ is less than 5.

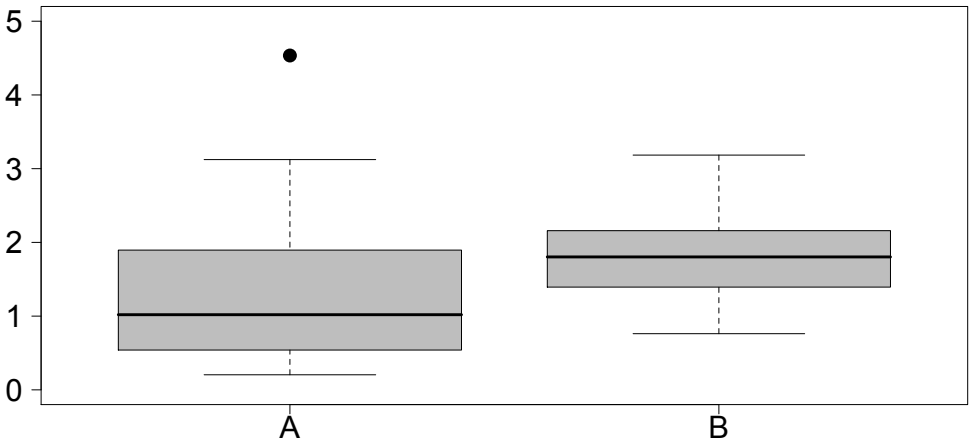

Figure 1: Two boxplots.

12. Is there a relationship between fatty fish consumption and the rate of prostate cancer? A study followed 6272 Swedish men for 30 years. They were categorized according to their fish consumption, and to whether they developed prostate cancer. The following table summarizes the results.

	Fish consumption			
	Never/seldom	Small	Moderate	Large
Prostate cancer	14	201	209	42
No prostate cancer	110	2420	2769	507

If one of these 6272 men is randomly selected, what is the probability their fish consumption was large or moderate, given they got prostate cancer?

(a) 0.52
(b) 0.54
(c) 0.56
(d) 0.58
(e) 0.60

13. Consider the following probability distribution of a random variable X.

x	12	14	16	18
$p(x)$	?	0.20	0.20	0.20

One of the probabilities in the table is missing. Find the missing probability, then calculate the mean of X. What is the mean of X?

(a) 14.4
(b) 14.6
(c) 14.8
(d) 15.0
(e) 15.2

14. The adult literacy rate in Gabon is approximately 88%. If 15 adults in Gabon are randomly selected, what is the probability exactly 13 are literate? (Choose the closest value.)

(a) 0.21
(b) 0.23
(c) 0.25
(d) 0.27
(e) 0.29

15. The adult literacy rate in Gabon is approximately 88%. If 10 adults in Gabon are randomly selected, what is the probability at least 2 are not literate? (Choose the closest value.)

(a) 0.12
(b) 0.17
(c) 0.34
(d) 0.42
(e) 0.62

16. Which one of the following statements is true?

(a) If $P(A|B) = 0$, A and B are independent.
(b) If A and B are independent, $P(A \cup B) = P(A) + P(B)$.
(c) If A and B are mutually exclusive, $P(A \cap B) = P(A) + P(B)$.
(d) If $P(A|B) = 1$, then $P(B|A) = 1$.
(e) If $P(A) = P(B)$, then $P(A|B) = P(B|A)$.

17. John has a crush on Stephanie. A friend of John's is having a party on Friday night. If Stephanie goes to the party, the probability that John will also go is 0.98. If Stephanie does not go to the party, the probability that John goes is 0.06. If the probability that Stephanie does not go to the party is 0.30, what is the probability that John goes? (Choose the closest value.)

(a) 0.06
(b) 0.69
(c) 0.70
(d) 0.76
(e) 0.82

18. In a group of 25 deer mice, 5 carry hantavirus. If 3 of these 25 mice are randomly selected without replacement, what is the probability exactly 1 carries hantavirus? (Choose the closest value.)

(a) 0.28
(b) 0.34
(c) 0.38
(d) 0.41
(e) 0.44

19. A certain genetic defect affects 0.1% of the population. A test is available for this defect. If someone has the defect, the test will fail to detect it with probability 0.02. If somebody does not have the defect, the test will give a false positive with probability 0.05. Given a randomly selected person tests positive for this defect, what is the probability they have the defect? (Choose the closest value.)

    (a) 0.01
    (b) 0.02
    (c) 0.03
    (d) 0.04
    (e) 0.98

20. Of the following 5 variables, which one would be best modelled by a Poisson distribution?

    (a) The amount of water in a randomly selected bottle of water.
    (b) The weight of a randomly selected University of Guelph Student.
    (c) The number of red cards when 2 cards are randomly drawn with replacement from a standard deck.
    (d) The number of moose-car collisions in Northern Ontario on a randomly selected day in June.
    (e) The number of cars in a randomly selected 100 square metre portion of the University of Guelph campus on a Wednesday at 2:15 pm.

21. Which one of the following statements is true?

    (a) The mean of a binomial random variable cannot be less than 1.
    (b) The mean of a Poisson random variable cannot be less than 1.
    (c) The variance of a binomial random variable can be less than its mean.
    (d) A binomial random variable can take on negative values.
    (e) The expected value of a binomial random variable must be equal to one of its possible values.