

STAT 1222

Spring 2010

Common Final Exam

May 6, 2010

Please print the following information:

Name: _____

Instructor: _____

Student ID #: _____

Section/Time: _____

THIS EXAM HAS TWO PARTS

PART I. Consists of 30 multiple choice questions worth a total of 60 points. Read all questions carefully. You may do calculations on the test paper. Mark the number of the opscan sheet corresponding to the test question number with a Number 2 pencil or a mechanical pencil with HB lead. Mark only one answer; otherwise the answer will be counted as incorrect. In case there is more than one answer, mark the best answer. Please make sure that your name appears on the opscan sheet in the spaces provided.

PART II. This part consists of 3 questions (40 points in total). You MUST show all work for each question in the space provided to receive full credit for that question. If you write your explanations in another part of the test, please indicate accordingly.

At the end of the examination, you MUST hand in this test booklet, your answer sheet and all scratch paper.

FOR DEPARTMENTAL USE ONLY:

PART II:

Questions	1	2	3
Maximum	16	12	12
Score			

Part I

Part II

Total

Use the following information to answer the questions 1 to 3.

Consider the sample data: 10, 12, 8, 11, 15, 7.

1. Find the sample mean of the data.
 - (a) 10
 - (b) 10.5
 - (c) 11
 - (d) 12
 - (e) None of the above

2. The sample standard deviation of the data is about
 - (a) 8.30
 - (b) 2.88
 - (c) 2.63
 - (d) 6.92
 - (e) None of the above

3. Find the first quartile of the sample.
 - (a) 9
 - (b) 8
 - (c) 10
 - (d) 11
 - (e) None of the above

The following is for questions 4-5

The mean value of land and building per acre from a sample of farms is \$1000, with a standard deviation of \$200. The data set has a bell-shaped symmetric distribution.

4. Between what two values do about 68% of the data fall?
- (a) (1000,1400)
 - (b) (1200,1400)
 - (c) (600,1000)
 - (d) (800,1200)
 - (e) None of the above
5. Approximately what percentage of data will be between \$800 and \$1400?
- (a) 84%
 - (b) 95%
 - (c) 81.5%
 - (d) 99%
 - (e) 68%

Use the following information for questions 6 to 8

The following table shows the estimated number (in thousand) of earned degrees conferred in USA in the year 2001 by level and gender. A person who earned a degree in the year 2001 is randomly selected.

	Bachelor's	Master's	Total
Male	600	250	
Female	800	350	
Total			

6. What's the probability that this person earned a Master's degree?
- (a) 0.70
 - (b) 0.40
 - (c) 0.175
 - (d) 0.125
 - (e) 0.30
7. What's the probability that this person earned a Bachelors' degree and is a female?
- (a) 0.30
 - (b) 0.60
 - (c) 0.40
 - (d) 0.70
 - (e) 0.35
8. What's the probability that this person earned a Master's degree or is a female?
- (a) 0.30
 - (b) 0.175
 - (c) 0.575
 - (d) 0.75
 - (e) 0.70

Use the following information for questions 9 to 11

The following is a probability distribution for a discrete random variable X .

X	-1	0	1	10
$P(X)$	0.2	0.5	0.2	0.1

9. Find $P(X \geq 0)$

- (a) 0.1 (b) 0.3 (c) 0.8 (d) 0.6 (e) 1.0

10. The mean (expected value) of X is

- (a) 2.5
(b) -2.5
(c) -1.0
(d) 1.0
(e) None of the above

11. The standard deviation of X is closest to

- (a) 9.40
(b) 3.07
(c) 25.67
(d) 5.07
(e) None of the above

Use the following information for questions 12 to 14.

The monthly utility bills in a city are normally distributed, with a mean of \$100 and a standard deviation of \$10.

12. Find the probability that a random selected utility bill is between \$85 and \$125.
- (a) 0.0668
 - (b) 0.9938
 - (c) 0.5000
 - (d) 0.9500
 - (e) 0.9270
13. If 300 utility bills are randomly selected from this city, approximately how many of them will be more than \$115?
- (a) 20
 - (b) 115
 - (c) 150
 - (d) 280
 - (e) 250
14. Find a value of the utility bill such that only 5% of utility bills in this city is larger than that.
- (a) 116.45
 - (b) 84.55
 - (c) 99.95
 - (d) 100.05
 - (e) None of the above

Use the following information for questions 15 to 16.

It is known that the mean price of a college textbook was \$70 with the standard deviation of \$14. Consider a random sample of 49 college textbooks, and let \bar{x} represent the mean of the sample.

15. Find the mean and standard deviation of \bar{x} , i.e., $\mu_{\bar{x}}, \sigma_{\bar{x}}$.

(a) $\mu_{\bar{x}} = 49, \sigma_{\bar{x}} = 14$

(b) $\mu_{\bar{x}} = 49, \sigma_{\bar{x}} = 2.0$

(c) $\mu_{\bar{x}} = 70, \sigma_{\bar{x}} = 14$

(d) $\mu_{\bar{x}} = 70, \sigma_{\bar{x}} = 2.0$

(e) $\mu_{\bar{x}} = 14, \sigma_{\bar{x}} = 2.0$

16. What is the probability that the sample mean price \bar{x} is above \$69?

(a) 0.3085

(b) 0.5279

(c) 0.4721

(d) 0.6915

(e) 0.2500

Use the following information for questions 17 to 18.

In a clinical trial, 200 patients who received a new medication are randomly selected. It was found that 40 of them suffered serious side effects from this new medication. Let p denote the population proportion of patients who suffered serious side effects from this new medication.

17. Find a point estimate for p and also construct a 95% confidence interval for p .
- (a) 0.20, (0.153, 0.247)
 - (b) 0.80, (0.799, 0.881)
 - (c) 20, (0.125, 0.195)
 - (d) 20, (0.145, 0.255)
 - (e) 0.20, (0.145, 0.255)
18. Using the information from the above sample, find the minimum sample size needed to estimate the population proportion p with 80% confidence. The estimate must be accurate to within .02 of p .
- (a) 1024
 - (b) 656
 - (c) 1692
 - (d) 4096
 - (e) 82
19. Consider testing $H_0 : \mu = 12$ vs $H_a : \mu \neq 12$. We commit a type I error if we reject H_0 when $\mu = 12$. We commit a type II error if
- (a) we reject H_0 when $\mu \neq 12$.
 - (b) we reject H_0 when $\mu = 12$.
 - (c) we fail to reject H_0 when $\mu = 12$.
 - (d) We fail to reject H_0 when $\mu \neq 12$.
 - (e) None of the above

Use the following information for questions 20 to 22.

Northwest claims that exactly 80% flights arrived on time in this September. 100 flights were randomly selected in this September, and 70% were on time.

20. Set up the null and alternative hypotheses to test for the Northwest's claim.
- (a) $H_0 : p \leq 0.70$ versus $H_a : p > 0.70$
 - (b) $H_0 : p = 0.80$ versus $H_a : p \neq 0.80$
 - (c) $H_0 : p \geq 0.80$ versus $H_a : \mu < 0.80$
 - (d) $H_0 : p \leq 0.80$ versus $H_a : \mu > 0.80$
 - (e) $H_0 : \bar{x} \leq 0.70$ versus $H_a : \bar{x} > 0.70$
21. Find the value of the standardized test statistics for the above test.
- (a) -2.50
 - (b) 2.50
 - (c) 2.18
 - (d) -2.18
 - (e) None of the above
22. Find the P-value for the test and state your conclusion at the significance level of 0.05.
- (a) P-value: 0.0062; Decision: Fail to reject H_0 .
 - (b) P-value: 0.0062; Decision: Reject H_0 .
 - (c) P-value: 0.0124; Decision: Fail to reject H_0 .
 - (d) P-value: 0.0124; Decision: Reject H_0 .
 - (e) P-value: 0.9876; Decision: Fail to Reject H_0 .

The following is used for questions 23-25.

A pharmaceutical company claims that its medicine helps reduce the blood pressure. The table shows the blood pressures of 5 patients before and after taking the medicine.

Member	1	2	3	4	5
Before	120	150	140	135	130
After	125	130	130	140	120

The difference in the blood pressures (after – before) for this sample of 5 patients results in $\bar{d} = -6$ and $s_d = 10.8397$. Assume that the blood pressures are approximately normally distributed.

23. Does the medicine reduce the blood pressure? Choose the appropriate hypotheses to test the claim.

- (a) $H_0 : \mu_d = 0$ versus $H_a : \mu_d \neq 0$
- (b) $H_0 : \bar{d} \leq 0$ versus $H_a : \bar{d} > 0$
- (c) $H_0 : \mu_d \leq 0$ versus $H_a : \mu_d > 0$
- (d) $H_0 : \mu_d \geq 0$ versus $H_a : \mu_d < 0$.
- (e) $H_0 : \mu_d < 0$ versus $H_a : \mu_d \geq 0$.

24. Calculate the value of the standardized test statistic.

- (a) 2.354
- (b) -1.238
- (c) 0.816
- (d) -1.689
- (e) -2.365

25. Find the rejection region and state your decision at $\alpha = .05$.

- (a) Rejection Region: $t < 2.353$; Decision: Reject H_0
- (b) Rejection Region: $t < -3.182$; Decision: Reject H_0
- (c) Rejection Region: $t > 2.132$; Decision: Fail to reject H_0
- (d) Rejection Region: $t > 3.182$; Decision: Fail to reject H_0
- (e) Rejection Region: $t < -2.132$; Decision: Fail to reject H_0

Use the following information for questions 26 to 28

The American Automobile Association claims that the average daily cost for meals and lodging for vacationing in Texas is larger than the same average costs for vacationing in North Carolina. The table below shows the results of a random survey of vacationers in each state. The two samples are independent.

Texas	North Carolina
$n_1 = 35$	$n_2 = 50$
$\bar{x}_1 = \$218$	$\bar{x}_2 = \$208$
$s_1 = \$28$	$s_2 = \$15$

26. Choose the correct hypothesis to test the claim.

- (a) $H_0 : \mu_1 \geq \mu_2$ vs. $H_a : \mu_1 < \mu_2$
- (b) $H_0 : \bar{x}_1 \leq \bar{x}_2$ vs. $H_a : \bar{x}_1 > \bar{x}_2$
- (c) $H_0 : \mu_1 \leq \mu_2$ vs. $H_a : \mu_1 > \mu_2$
- (d) $H_0 : \bar{x}_1 \geq \bar{x}_2$ vs. $H_a : \bar{x}_1 < \bar{x}_2$
- (e) $H_0 : \mu_1 = \mu_2$ vs. $H_a : \mu_1 \neq \mu_2$

27. The value of the standardized test statistic is close to

- (a) -1.93
- (b) 1.93
- (c) 2.575
- (d) 3.52
- (e) -3.06

28. Find the p-value of this test.

- (a) 0.9731
- (b) 0.0250
- (c) 0.9500
- (d) 0.0500
- (e) 0.0269

The following is used for questions 29-30.

The amounts of 6 restaurant bills x (in dollars) and the corresponding amounts of the tips y (in dollars) are given in the below.

Bill	32.98	49.72	70.29	97.34	43.58	52.44
Tip	4.50	5.28	10.00	16.00	5.50	7.00

The regression equation is $\hat{y} = 0.19x - 2.73$, and the coefficient of correlation is $r \approx 0.98$.

29. Based on the given r , which of the following conclusions may be made?
- (a) x and y are very poorly correlated.
 - (b) x and y are strongly correlated, and y tends to increase as x is decreased.
 - (c) x and y are strongly correlated, and y tends to increase as x is increased.
 - (d) x and y are moderately correlated, and y tends to increase as x is decreased.
 - (e) None of the above
30. Predict the amount of the tip if the bill is $x = \$50$.
- (a) The predicted amount of tip is \$10.25
 - (b) The predicted amount of tip is \$8.56
 - (c) The predicted amount of tip is \$6.77
 - (d) The predicted amount of tip is \$4.35
 - (e) The amount of tip cannot be predicted

End of Multiple Choice Section

1. An experiment is conducted to determine the relationship between the amount of a certain drug in the bloodstream and the length of time it takes to react to a stimulus. A random sample of 5 persons who took this drug is selected. The amount of drug in the bloodstream x and the reaction time y in selected persons showed that

$$\sum x = 15, \quad \sum x^2 = 55, \quad \sum y = 10, \quad \sum y^2 = 26, \quad \sum xy = 37.$$

- (a) [4 pts.] Find the coefficient of correlation between x and y and interpret its meaning in the context of the problem.

- (b) [5 pts.] At $\alpha = .05$, test the significance of the coefficient of correlation.

- (c) [5 pts.] Find the equation of the regression line between y and x .

- (d) [2 pts.] Use the equation in part (c) to predict y when $x = 3.5$.

2. The following data gives the amount of salaries (thousand) in dollars for 14 persons.

47 28 35 5 12 62 57
39 58 42 37 23 54 62

- (a) [3 pts.] Construct a stem-and-leaf plot for the data.
- (b) [5 pts.] Find the five-number summaries, *i.e.*, (Minimum, First Quartile, Second Quartile, Third Quartile, Maximum).
- (c) [2 pts.] Find the interquartile range(IQR).
- (d) [2 pts.] Draw a box-whisker plot.

3. A random sample of 25 employees for the retailer showed a sample mean of 9.2 minutes and a standard deviation of 2 minutes. Assume that the time spent by employees on personal phone calls is normally distributed. Let μ denote the mean time spent by employees spent on personal phone calls.

(a) [3 pts.] Find the 95% confidence interval for μ .

(b)[3 pts.] An employee group for a national retailer claims that the mean time spent by employees on personal phone calls is less than 10 minutes per day. Specify the correct null and alternative hypotheses you would use to investigate the employee group's claim.

(c) [3 pts.] Find the value of the standardized test statistic.

(d)[3 pts.] Find the rejection region at $\alpha = .05$ and state your conclusion in the context of the problem.