

STAT 1222

Common Final Exam

Spring 2011
May 5, 2011

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	15	12	13
Score			

Part I

Part II

Total

Using the following sample data for questions 1, 2 and 3.

-3 1.5 5 2.5 4.5 -1.5

1. Find the mean of the data.
(a) 2.0 (b) 1.5 (c) -1.5 (d) 3.0 (e) less than 1.4
 2. Find the standard deviation of the sample data (rounded off to two decimal places).
(a) 10.30 (b) 8.58 (c) 3.21 (d) 2.93 (e) 4.05
 3. Find the median of the data.
(a) 2 (b) 1.5 (c) -1.5 (d) -0.75 (e) 4
-

Using the following information to answer questions 4, 5 and 6.

The mean price of new homes from a sample of houses is \$150,000 with a standard deviation of \$15,000. The data set has a bell-shaped distribution.

4. Between what two prices do 95% of the new homes fall?
(a) \$135,000 and \$165,000 (b) \$135,000 and \$180,000
(c) \$105,000 and \$195,000 (d) \$165,000 and \$180,000
(e) \$120,000 and \$180,000
 5. Find the approximate percentage of new homes whose prices are less than \$135,000?
(a) 34% (b) 16% (c) 84% (d) 68% (e) 95%
 6. If the price of a new home is \$195,000, what is the corresponding z-score?
(a) $z = -2$ (b) $z = 2$ (c) $z = -3$ (d) $z = 3$ (e) None of the above
-
7. An integer is randomly selected between 1 and 50, inclusively. Find the probability that the number is **not** divisible by 7.
(a) .14 (b) .30 (c) .70 (d) .86 (e) .88
-

Using the following information to answer questions 8, 9 and 10

The following table shows the number of male and female students enrolled in nursing program at an university. A student is randomly selected from this group.

	Nursing majors	Non-nursing majors	Total
Males	100	900	
Females	500	1500	
Total			

8. What is the probability that this student is a nursing major?

- (a) .80 (b) .30 (c) 0.20 (d) 0.33 (e) .67

9. What is the probability that this student is a non-nursing major and is a male?

- (a) .70 (b) .20 (c) 0.30 (d) 0.03 (e) .80

10. What is the probability that this student is a nursing major or is a male?

- (a) .50 (b) .20 (c) 0.33 (d) 0.03 (e) None of the above

The following table gives the probability distribution of a random variable x . Using this to answer questions 11 and 12.

x	-2	1	3	4
$p(x)$.2	.2	.5	.1

11. Find $P(x \leq 3)$.

- (a) .4 (b) .2 (c) .9 (d) 1.0 (e) .6

12. Find the mean value of x .

- (a) 1.5 (b) 2.5 (c) 7.1 (d) 1.0 (e) 1.7
-

Using the following information to answer questions 13, 14 and 15.

On a dry surface, the distribution of the braking distances (in meters) of Honda Accords can be approximated by a normal distribution with a mean of 45 and a standard deviation of 0.5.

13. What is the probability that a randomly selected Honda Accord has a braking distance greater than 44.2?
- (a) .0548 (b) .0455 (c) .9452 (d) .9545 (e) None of the above
14. If 200 Honda Accords are randomly selected, approximately how many of them will have the braking distances between 44.5 and 45.8?
- (a) 157 (b) 43 (c) 189 (d) 32 (e) 168
15. Find a cutoff value for the braking distance such that only 5% of Honda Accords have braking distances greater than it (round off to two decimal places).
- (a) 45.98 (b) 45.82 (c) 44.02 (d) 46.29 (e) 44.18

Using the following information to answer questions 16 and 17.

It is known that the mean annual salary for chauffeurs is \$30,000 with the standard deviation of \$1,500. A random sample of size 36 is drawn from this population. Let \bar{x} represent the mean annual salary of the sample.

16. Find the mean and standard deviation of \bar{x} , i.e., $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$.
- (a) $\mu_{\bar{x}} = 36, \sigma_{\bar{x}} = 1500$
(b) $\mu_{\bar{x}} = 36, \sigma_{\bar{x}} = 250$
(c) $\mu_{\bar{x}} = 30000, \sigma_{\bar{x}} = 1500$
(d) $\mu_{\bar{x}} = 30000, \sigma_{\bar{x}} = 250$
(e) None of the above
17. What is the probability that the sample mean annual salary \bar{x} is greater than \$29,400?
- (a) .6554 (b) .3446 (c) .0082 (d) .9918 (e) .5000
-

18. A random sample of 100 observations produced a mean $\bar{x} = 50$ and a standard deviation $s = 5$. Find a 97% confidence interval for the population mean μ (round off to two decimal places).

- (a) (49.06, 50.94)
- (b) (48.92, 51.09)
- (c) (49.18, 50.82)
- (d) (45.00, 55.00)
- (e) (40.00, 60.00)

Using the following information to answer questions 19 and 20.

In a survey of 1000 people, 700 people said that they voted in the last presidential election. let p denote the proportion of all people who voted.

19. Find a point estimate for p and also construct a 90% confidence interval for p .

- (a) 0.700, (0.642, 0.767)
- (b) 0.300, (0.276, 0.324)
- (c) 700, (0.676, 0.724)
- (d) 700, (0.642, 0.767)
- (e) 0.700, (0.676, 0.724)

20. Which of the following actions would result in a confidence interval narrower than the 90% confidence interval computed above?

- (a) Decreasing the sample size
- (b) Computing a 95% confidence interval rather than a 90% confidence interval
- (c) Computing a 99% confidence interval rather than a 90% confidence interval
- (d) Computing a 80% confidence interval rather than a 90% confidence interval
- (e) None of the above

21. Given that the population standard deviation is $\sigma = 1$, determine the minimum sample size needed in order to estimate the population mean so that the margin of error is $E = .2$ at 95% level of confidence.

- (a) 271 (b) 68 (c) 97 (d) 385 (e) 121
-

Using the following information to answer questions 22–24.

It is generally agreed that a certain standard treatment yields a mean survival period of 4.2 years for cancer patient. A new treatment is administered to 60 patients and their duration of survival is recorded. The sample mean and standard deviation of the duration is 4.5 years and 0.8 years, respectively.

22. Does the new treatment increase the mean survival period? Choose the appropriate hypotheses to test the claim.
- (a) $H_0 : \mu = 4.2$ versus $H_a : \mu \neq 4.2$
 - (b) $H_0 : \bar{x} \geq 4.2$ versus $H_a : \bar{x} > 4.2$
 - (c) $H_0 : \mu \leq 4.5$ versus $H_a : \mu > 4.5$
 - (d) $H_0 : \mu \leq 4.2$ versus $H_a : \mu > 4.2$.
 - (e) $H_0 : \mu \geq 4.2$ versus $H_a : \mu < 4.2$.
23. Find the value of the standardized test statistic.
- (a) -2.90
 - (b) 2.90
 - (c) -1.85
 - (d) 1.85
 - (e) 3.53
24. Find the P-value for the test and state your conclusion at $\alpha = .01$.
- (a) The p-value is 0.0014; The decision: Reject H_0 .
 - (b) The p-value is 0.9981; The decision: Accept H_0 .
 - (c) The p-value is 0.9981; The decision: Reject H_0 .
 - (d) The p-value is 0.0019; The decision: Accept H_0 .
 - (e) The p-value is 0.0019; The decision: Reject H_0 .

The following information is used for questions 25 and 26.

In an experiment, the pulse rates of a randomly selected sample of 6 adults were recorded before and after they were given a certain medicine. The table below summarizes the result.

Patient	1	2	3	4	5	6
Before	82	81	83	80	85	81
After	78	80	76	81	79	75

The difference in the pulse rates ($d = \text{pulse rate before} - \text{pulse rate after}$) for this sample results in $\bar{d} = 3.83$ and $s_d = 3.19$. Assume that the pulse rates are approximately normally distributed.

25. Does the medicine reduce the pulse rate? 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 $H_a : \mu_d \geq 0$.

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

- (a) Rejection Region: $z > 1.645$; Decision: Reject H_0 .
- (b) Rejection Region: $z < -1.645$; Decision: Reject H_0 .
- (c) Rejection Region: $t > 2.015$; Decision: Reject H_0 .
- (d) Rejection Region: $t > 1.943$; Decision: Accept H_0 .
- (e) Rejection Region: $t < -2.015$; Decision: Accept H_0 .

Using the following information to answer questions 27–29.

A government agency claims that 35% of adults in the United States do volunteer work. A random sample of 500 adults shows that 190 do volunteer work.

27. Set up the null and alternative hypotheses to test the claim.
- (a) $H_0 : p \leq 0.38$ versus $H_a : p > 0.38$
 - (b) $H_0 : p = 0.38$ versus $H_a : \mu \neq 0.38$
 - (c) $H_0 : p = 0.35$ versus $H_a : p \neq 0.35$
 - (d) $H_0 : p \leq 0.35$ versus $H_a : p > 0.35$
 - (e) $H_0 : \bar{x} \leq 0.38$ versus $H_a : \bar{x} > 0.38$
28. Find the value of the standardized test statistic (round off to two decimal places).
- (a) -0.04
 - (b) -1.40
 - (c) 1.31
 - (d) 1.28
 - (e) 1.41
29. Find the P-value for the above mentioned test.
- (a) 0.0793
 - (b) 0.9207
 - (c) 0.1586
 - (d) 0.8997
 - (e) 0.2006

30. The equation of the regression line between two variables x (independent variable) and y (dependent variable) is given by $\hat{y} = -3x + 2$; and the correlation coefficient is $r = -.95$. The possible x -values range from 1 to 10. Which of the following statements are correct?
- I. The variable y is strongly positive correlated to the variable x .
 - II. The variable y is strongly negative correlated to the variable x .
 - III. If $x = 5$, one would predict that $y = 17$.
 - IV. If $x = 5$, one would predict that $y = -13$.
- (a) Only I is true.
(b) Only II is true.
(c) Only II and III are true.
(d) Only I and IV are true.
(e) Only II and IV are true.

End of Multiple Choice Section

1. 10 families were randomly selected. The heights(ft) of the father x and the eldest child y in each family showed that

$$\sum x = 56, \quad \sum x^2 = 366, \quad \sum y = 58, \quad \sum y^2 = 385, \quad \sum xy = 371.2.$$

- (a). (3 pts.) Calculate the correlation coefficient, r , between the heights of the father and his eldest child.

- (b). (5 pts.) Test the significance of the correlation coefficient at $\alpha = 0.05$.

- (c). (5 pts.) Find equation of the regression line.

- (d). (2 pts.) Use the equation in part (c) to predict y when $x = 6.4$ ft.

2. Given the following data:

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 science teacher claims that the mean scores on a science assessment test for nine-year-old boys and girls are equal. Random samples of 13 nine-year-old boys and 15 nine-year-old girls yield the means and standard deviations shown in the following table. Assume the population variances are equal.

Boys	Girls
$n_1 = 13$	$n_2 = 15$
$\bar{x}_1 = 232.2$	$\bar{x}_2 = 230$
$s_1 = 1.3$	$s_2 = 1.4$

- (a) (3 pts.) State the null and the alternative hypotheses to the teacher's claim.

$H_0 :$

$H_a :$

- (b) (2 pts.) In the context of the problem, explain Type I error.

- (c) (4 pts.) Find the value of the standardized test statistic.

- (d) (4 pts.) Find the rejection region and state your decision at $\alpha = 0.01$.