

**STAT 1220
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.

Part I consists of 30 multiple choice questions. Each correct answer is scored 2 points; each incorrect (or blank) answer is scored 0, so there is no penalty for guessing. You may do calculations on the test paper, but your answers must be marked on the OPSCAN sheet with a soft lead pencil (HB or No. 2 lead). Any question with more than one choice marked will be counted as incorrect. If more than one choice seems correct, choose the one that is most complete or most accurate. Make sure that your name and ID number are written and correctly bubbled on the OPSCAN sheet.

PART II.

Part II consists of 3 free response questions, with values as indicated. You must show all work in the space provided or elsewhere on the exam paper in a place that you clearly indicate. Work on loose sheets will not be graded.

FOR DEPARTMENT USE ONLY:

Part II.

Question	1	2	3
Score			

Part I	Part II	TOTAL

Part I

Problems 1 through 3 pertain to the following sample data:

3, -2, 4, 3, 0, 1, -2, 2

1. The sample mean computed from this data set is about:

- (a) 2.1 (b) 1.1 (c) 1.3 (d) 1.7 (e) 1.8

2. The sample median computed from this data set is about:

- (a) 1.3 (b) 2.6 (c) 3.0 (d) 1.5 (e) 2.0

3. The sample standard deviation computed from this data set is about:

- (a) 2.3 (b) 5.3 (c) 2.1 (d) 1.5 (e) 3.2

4. The *standard deviation* of a numerical data set measures the _____ of the data.

- (a) average
(b) most frequent value
(c) variability
(d) size
(e) range

5. Heights in inches of 13 year old boys have a bell-shaped distribution with mean 61.5 and standard deviation 1.5. The proportion of all 13 year old boys who are at least 63 inches tall is about:

- (a) .84 (b) .68 (c) .32 (d) .50 (e) .16

6. A mother is told that her 13 year old son's height is the 85th percentile. This implies that:

- (a) Her son's height is less than that of 85% of all 13 year old boys.
(b) Her son has attained 85% of his adult height.
(c) Her son's height is 85% of the average height of all 13 year old boys.
(d) Eighty-five percent of all 13 year old boys have the same height as her son.
(e) Her son's height is more than that of 85% of all 13 year old boys.

Problems 7 through 10 pertain to the following situation:

A random sample was taken of 3600 adults who were either employed or actively looking for employment. People were classified according to education and employment status. Under level of education “degree” means college or professional degree or higher.

	unemployed	employed	total
no diploma	46	494	540
high school diploma	105	1947	2052
degree	29	979	1008
total	180	3420	3600

Suppose a person is selected at random.

7. The probability that he is unemployed is about:

- (a) .05 (b) .18 (c) .46 (d) .95 (e) .35

8. The probability that he is either unemployed or has no high school diploma is about:

- (a) .01 (b) .09 (c) .26 (d) .20 (e) .19

9. The probability that he is unemployed, given that he has no high school diploma, is about:

- (a) .26 (b) .32 (c) .34 (d) .09 (e) .01

10. The events “ U : unemployed” and “ N : has no diploma” are:

- (a) independent because education and employment status are unrelated
(b) independent because $P(U \text{ and } N) \neq P(U)P(N)$
(c) independent because $P(U) + P(N) \neq 1$
(d) dependent because $P(U \text{ and } N) \neq P(U)P(N)$
(e) dependent because $P(U) + P(N) \neq 1$

11. A researcher wishes to estimate the average number of hours of sleep working adults get each night, at 90% confidence and to within 10 minutes ($1/6$ hour). On the assumption that the population standard deviation is 1.5 hours, the minimum size of the sample needed is about:

- (a) 220 (b) 312 (c) 48 (d) 152 (e) 439

12. Fifty randomly selected individuals were timed completing a tax form. The sample mean was 23.6 minutes; the sample standard deviation was 2.4 minutes. A 99% confidence interval for the mean time required by all individuals to complete the form is about:

(a) $23.6 \pm .87$ (b) $23.6 \pm .91$ (c) $23.6 \pm .82$ (d) $23.6 \pm .92$ (e) $23.6 \pm .85$

Problems 13 and 14 pertain to the following situation:

The number x of bottles of garden plant fungicide sold by a garden center each day was recorded with the following results:

x	0	1	2	3	4	5	6	7
$P(x)$.135	.141	.150	.143	.134	.122	.101	.074

13. The probability that at most two bottles will be sold on a randomly selected day is about:

(a) .724 (b) .150 (c) .574 (d) .276 (e) .426

14. The average number of bottles sold per day is about:

(a) 3.50 (b) 2.15 (c) 3.14 (d) 1.72 (e) 2.86

15. Forty percent of passengers with a certain airline prefer a window seat. The probability that exactly two of the next ten person buying a ticket with this airline will prefer a window seat is about:

(a) .12 (b) .80 (c) .01 (d) .36 (e) .40

16. If z denotes the standard normal random variable, then $P(-0.57 \leq z \leq 0.22)$ is about:

(a) .7900 (b) .5871 (c) .3500 (d) .3028 (e) .8714

17. Personal best finishing times for a particular race in high school track meets are normally distributed with mean 24.6 seconds and standard deviation .64 seconds. If the qualifying time for this event for the regional championship is set so that the top 15 percent of all runners qualify, then that qualifying time in seconds is about:

(a) 23.6 (b) 23.9 (c) 22.9 (d) 25.3 (e) 25.6

Problems 18 and 19 pertain to the following information:

The number of gallons of carbonated soft drink consumed per person annually is normally distributed with mean 47.5 and standard deviation 3.5.

18. The probability that a randomly selected person consumes between 45 and 50 gallons of carbonated soft drink per year is about:

(a) .7100 (b) .2611 (c) .9222 (d) .7611 (e) .5222

19. Twenty-five people are selected at random. The probability that the average number of gallons of carbonated soft drink they each consume per year is between 45 and 50 gallons is about:

(a) .5222 (b) .6723 (c) 1.0000 (d) .7611 (e) .3571

20. In order to estimate the proportion of office workers who listen to streamed music on a work computer on a regular basis, a sample of 1200 office workers who work at a computer was taken. Of them, 543 listen to streamed music on the computer at work. A 99% confidence interval for the proportion of all office workers who listen to streamed music at work is about:

(a) $.453 \pm .001$ (b) $.453 \pm .037$ (c) $.453 \pm .028$ (d) $.453 \pm .044$ (e) $.453 \pm .033$

21. A study to compare the mean level of LDL cholesterol in male and female students who do not exercise regularly gave the data shown in the table. We may assume that the populations of LDL level are normally distributed with approximately equal standard deviations.

	n	\bar{x}	s
male	35	109	31
female	60	96	26

A 90% confidence interval for the difference in mean LDL cholesterol level between men and women is:

(a) 13 ± 9.8 (b) 13 ± 11.6 (c) 13 ± 8.3 (d) 13 ± 10.0 (e) 13 ± 7.6

22. In a test of hypotheses of the form $H_0 : p = .64$ vs. $H_1 : p \neq .64$ a sample of size 3750 produced the test statistic $z = 2.21$. The p -value (observed significance) of the test is about:

(a) .6400 (b) .0136 (c) .4420 (d) .0272 (e) .2210

23. In a test of hypotheses $H_0 : \mu = 456$ versus $H_1 : \mu < 456$, the rejection region is the interval $(-\infty, -1.796]$, the value of the sample mean computed from a sample of size 12 is $\bar{x} = 453$, and the value of the test statistic is $t = -2.598$. The correct decision and justification are:
- (a) Do not reject H_0 because the sample is small.
 - (b) Do not reject H_0 because $-2.598 < -1.796$.
 - (c) Reject H_0 because 453 is less than 456.
 - (d) Reject H_0 because -2.598 is negative.
 - (e) Reject H_0 because -2.598 lies in the rejection region.
24. In the test of hypotheses $H_0 : \mu = -28$ versus $H_1 : \mu \neq -28$ at the 1% level of significance, when the sample size is 40 and σ is unknown the rejection region will be the interval or union of intervals:
- (a) $[2.426, \infty)$
 - (b) $(-\infty, -2.708] \cup [2.708, \infty)$
 - (c) $(-\infty, -2.426]$
 - (d) $(-\infty, -2.576] \cup [2.576, \infty)$
 - (e) $(-\infty, -2.326] \cup [2.326, \infty)$
25. A charitable organization sends out 25,000 solicitations each month. The probability that a randomly selected solicitation will yield a contribution is .02 or 2%. The average number of contributions that result from solicitations each month is about:
- (a) 500 (b) 2,000 (c) 250 (d) 1,500
 - (e) Impossible to tell (not enough information given)
26. How large a sample is required to obtain a 99% confidence interval for the proportion of all newborns who are breast-fed exclusively in the first two months of life to within 2 percentage points?
- (a) 8295 (b) 3220 (c) 166 (d) 64 (e) 4148

Problems 27 and 28 pertain to the following situation.

In a survey of 1120 new college graduates 281 had a professional job on graduation day.

27. One year ago the proportion of graduates with a professional job on graduation day was .24 or 24%. The setup of the null and alternative hypotheses to test whether there is sufficient evidence to conclude that the proportion of graduates with a professional job is higher now than it was one year ago is:

- (a) $H_0 : p = .24$ vs. $H_1 : p < .24$
- (b) $H_0 : p = .24$ vs. $H_1 : p \neq .24$
- (c) $H_0 : p = .24$ vs. $H_1 : p > .24$
- (d) $H_0 : p = .25$ vs. $H_1 : p < .25$
- (e) $H_0 : p = .25$ vs. $H_1 : p > .24$

28. The value of the test statistic is:

- (a) 2.109
- (b) .011
- (c) .841
- (d) 28.141
- (e) .854

Problems 29 and 30 pertain to the following information.

A sample of 11 bears in a certain region was taken to investigate the relationship between length x (in centimeters) and weight y (in kilograms). Lengths ranged from 121 to 152 cm. The data yielded $r = .71$, $s_e = 21.75$, and the regression equation $\hat{y} = -148.5 + 1.736x$.

29. The predicted weight in kilograms of a bear whose length is 135 cm is about:

- (a) 76.2
- (b) 111
- (c) 383
- (d) 85.9
- (e) 135

30. For each additional centimeter in length the average weight of bears in this region

- (a) increases by about .71 kg
- (b) increases by about 1.74 kg
- (c) increases by about 21.8 kg
- (d) increases by about 1.48 kg
- (e) changes by an amount that cannot be determined from the information given

Part II

1. To investigate the effective of a medication on total cholesterol level in patients with a condition for which the medication is indicated, the cholesterol level in five patients was measured at the beginning and end of a three month regimen on the drug. Results are shown in the table. Test the null hypothesis that the mean of the difference in cholesterol level is zero versus the alternative that the medication *changes* cholesterol level, as directed below. Use $\alpha = .01$. Assume a normal distribution of differences.

Patient	Start	End
1	105	113
2	121	127
3	115	114
4	134	136
5	128	131

- (a) State the null and alternative hypotheses for the test. [2 points]
- (b) State the correct formula for the test statistic. Justify your answer. [2 points]
- (c) Construct the rejection region. [2 points]
- (d) Compute the value of the test statistic, and make a decision. [4 points]
- (e) State a conclusion, in the context of the problem, about the mean of the difference in premiums for all policies, based on the test you performed. [2 points]

2. Age x and resting heart rate y were sampled for 25 randomly selected children from age 2 to 9. Summary information is:

$$n = 25, \Sigma x = 140.5, \Sigma x^2 = 903.75, \Sigma y = 2567, \Sigma y^2 = 264,457, \Sigma xy = 14,171.5$$

- (a) Compute SS_{xx} , SS_{xy} , and SS_{yy} . [3 points]
- (b) Compute the least squares regression line. [4 points]
- (c) Find the coefficient of determination r^2 and explain what it means in the context of this problem. [3 points]
- (d) Assuming that $s_e = 3.656835$, compute a 90% confidence interval for the average resting heart rate of six year old children. [2 points]

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3. The value used for the mean amount of fat in one portion of a prepackaged food item is 19 grams. With the introduction of a new production process the manufacturer must investigate whether this value needs to be changed (upward or downward). A sample of ten portions sample mean 19.2 grams with sample standard deviation .26 grams. Assume the population is normally distributed.
- (a) State the null and alternative hypotheses for the test. [2 points]

 - (b) State the correct formula for the test statistic. Justify your answer. [2 points]

 - (c) Construct the rejection region for $\alpha = .05$. [4 points]

 - (d) Compute the value of the test statistic, and make a decision. [4 points]

 - (e) State a conclusion about the mean amount of fat in single portions, based on the test you performed. [2 points]

 - (f) Compute a 95% confidence interval for the mean fat content of portions. [2 points]