

Math 202: Statistics for Social Sciences**Spring 2011 FINAL EXAM****Calculator OK, 2 hrs.**

Instructions: There are six parts to this exam I-VI. Please inspect the exam and make sure you have all six pages of questions. Do all your work on these pages. If you use the back of a page, make sure to indicate that.

Remember: *You must show your work to get proper credit. In hypothesis testing questions, show all steps of the test and state your conclusion in plain English.*

Academic Honesty Code: Koç University Academic Honesty Code stipulates that “copying from others or providing answers or information, written or oral, to others is cheating.” By taking this exam, you are assuming full responsibility for observing the Academic Honesty Code.

NAME: _____

Formulas:

Part I:	/15
Part II:	/20
Part III:	/20
Part IV:	/15
Part V:	/15
Part VI:	/15
Total:	/100

1) Confidence interval (CI) : $\bar{X} \pm z SE$ with $SE = \frac{SD}{\sqrt{n}}$

or $\bar{X} \pm t SE$ or $\hat{p} \pm z \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ or

$(\hat{p}_1 - \hat{p}_2) \pm z SE_{2-sample}$ or

$(\bar{X}_1 - \bar{X}_2) \pm z SE_{2-sample}$

or $(\bar{X}_1 - \bar{X}_2) \pm t SE_{2-sample}$

where $SE_{2-sample} = \sqrt{(SE_1)^2 + (SE_2)^2}$,

and $SE = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ for percentages.

2) Binomial formula:

$$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k} \quad k = 0, 1, 2, \dots, n$$

3) Chi-squared: $\chi^2 = \text{sum of } \frac{(\text{observed frequency} - \text{expected frequency})^2}{\text{expected frequency}}$

4) ANOVA: Between group variance: $s_B^2 = \frac{\sum n_i (\bar{x}_i - \bar{x}_{GM})^2}{k-1}$

Within group variance: $s_W^2 = \frac{\sum (n_i - 1) s_i^2}{\sum (n_i - 1)}$ and $F = \frac{s_B^2}{s_W^2}$

Here s_i is SD of i^{th} sample and s_i^2 is the variance, namely SD^2 (the square of SD).

Part I. (15 points) Consider the following data for the number of telephone calls that 20 salespeople reported.

72	81	82	82	83	86	88	89	91	93	93	97
100	102	102	103	106	107	119					

1. (10 points) Draw a histogram of the data.
2. (5 points) Find the 25th, 50th and 95th percentiles.

Part II. (20 points) Turkish Statistical Institute (TURKSTAT) has reported that 40% of all women in Turkey are employed outside the home.

1. (5 points) Find the probability that in a sample of 13 women at least 3 are employed.
2. (9 points) A recent data set from 95 women shows that 31% are employed outside the home. Has the percentage of women employed outside the home decreased recently?
3. (6 points) Construct a 90% confidence interval for the percentage of women employed outside the home in view of the data set in question 2.

Part III. (20 points) A sample of 22 students in psychology was divided into two for an experiment on the strength of arguments in a debate. In a debate there are two groups which favour one of two opposing positions (ideas). An argument in this debate attempts either “to strengthen the favored position” or “to weaken the nonfavored (opposing) position”. Group 1 was given ten arguments which always attempt to strengthen the favored position and Group 2 was given ten arguments which always attempt to weaken the nonfavored position. The students rated each argument on a 1 to 5 scale from very weak to very strong. The total score of ten arguments was recorded for each student in each group. The summary statistics are as follows (that is, the average and SD of all students’ ratings in each group).

	Mean	Standard Deviation
Group 1	28.6	11.5
Group 2	24.9	12.2

1. (14 points) Is there a significant difference between the strengths of the two types of arguments? If so, which type of argument is stronger?
2. (6 points) Assume the total score for ten arguments which attempt to strengthen the favored position (as in Group 1) is normally distributed with mean 29 and standard deviation 15. Suppose a randomly selected student rates ten arguments of this type. What is the chance that s/he will give a total rating of 25 or more?

Part IV. (15 points) The following table reports the results of the previous election in a hypothetical country.

	Party A	Party B	Party C	Party D
Percentage of Votes	46%	23%	14%	17%

1. (12 points) For the upcoming elections, a polling company conducts a survey and finds the following frequency distribution among 50 eligible voters selected randomly.

	Party A	Party B	Party C	Party D
Number of supporters	20	11	9	10

Conduct a hypothesis test at $\alpha=1\%$ to predict if the results of the new election will be different from the previous election.

2. (3 points) Fill in the blanks with “first, or second, or population, or sample.”

The distribution of the elections in the _____ is given by _____ table and the distribution in the _____ is put in the _____ table.

Part V. (15 points) A pizza shop owner wishes to determine if the type of pizza a person selects is related to the age of the individual. The frequency table obtained from a simple random sample are shown here.

Age Group	Pizza		
	Plain	Pepperoni	Mixed
Young	12	21	39
Old	52	30	12

1. (12 points) Does the type of pizza ordered depend on the age of the customer?

2. (3 points) Find the percentage of “Plain pizza” preference in the older age group.

Part VI. (15 points) Three types of pain relief medications are given to randomly selected patients. The time it takes to relieve the pain (in minutes) is shown here for each medication.

	A	B	C
Mean	4	8	7
Standard Deviation	2	3	3
Sample Size	5	6	4

Can one conclude that there is a difference in the pain relief ability of the medications?