Name: ______________________________

I.D. Number: ______________

1	/0.5
2	/1
3	/4
4	/3
5	/4.5
6	/5
7	/4
8	/3

ECON 222

1. MIDTERM EXAMINATION

March 14, 2013

- This is a closed book exam.
- You are not allowed to exchange calculators during the exam.
- You must show your computations to receive any credit.
- In each hypothesis testing problem state the null and alternative hypothesis explicitly. Define the test statistic and name its distribution. State the decision rule and your conclusions to get full credit.

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1) For the following sample:

$$2, \quad 3, \quad 4, \quad 5, \quad 6$$

find the sample mean, i.e., $\bar{x}$, and the sample variance, i.e., s^2 (an estimate for the population variance).

2) It is claimed that, among the people who drinks at least 2 liters of water every day, the percentage of those with a kidney problem is less than 5%. We suspect the truth of this statement and would like to test it: Write, in plain English, the null and alternative hypotheses that you would use for this test :

H_0 : ______________________________________

H_1 : ______________________________________

Now write the null and alternative hypotheses using mathematical notation:

H_0 : _________________________

H_1 : _________________________

State what the variable(s) you used in the above statements represent:

3) We would like to test $H_1 : \mu \neq 4$ against $H_0 : \mu = 4$. The population is know to be normally distributed but the population variance is not known. In order to conduct the test, take a sample of size 9 from this population.

(a) What is the test statistic that you would use?

(b) What is the distribution of the test statistics (explain)?

(c) What is the decision rule (let $\alpha = 0.05$)?

(d) What would your conclusion be (at a significance level of 0.05), if a sample yielded a sample mean of 1 and a sample variance of 9?

4) For a normally distributed population of variance 4 we test $H_1 : \mu < 10$ against $H_0 : \mu \geq 10$. In order to conduct the test we take a random sample of size 16 and use $(\bar{x} - \mu)/(\sigma/\sqrt{n})$ as our test statistic. Based on the sample we failed to reject H_0 at a significance level of 0.01 but rejected H_0 at a significance level 0.04.

What can you say about the value of the sample mean that led to these conclusions?

5) Independent random samples selected from two normally distributed populations yielded the following summary:

	Sample 1	Sample 2
Mean	70	65
Variance	150	50
Sample size	9	8

Test if the variance of the first population is greater than the variance of the second population at a significance level of 0.05.

6) We would like to test if more than 30% of the Turkish working population earns the minimum wage allowed by the government. For this purpose we take a random sample of size 20 and ask them their wage.

(a) What are the hypotheses that we should be using to conduct the test?

(b) What is the test statistic you would use to test this hypothesis?

(c) What is the distribution of the test statistic (do not use approximate distributions)?

(d) What is the decision rule (let $\alpha = 0.05$)?

(e) If only 40% of the workers in the sample earned the minimum wage what would your conclusion be at a significance level of 0.05?

7) We would like to test $H_1 : \sigma^2 \neq 20$ against $H_0 : \sigma^2 = 20$. The population is know to be normally distributed. In order to conduct the test we take a sample of size 5 from this population.

(a) What is the test statistic that you would use?

(b) What is the distribution of the test statistics (explain)?

(c) What is the decision rule (let $\alpha = 0.1$)?

(d) Based on the sample given in Question 1, what would your conclusion be (at a significance level of 0.1)?

8) We would like to test $H_1 : \rho > 0$ against $H_0 : \rho = 0$, where ρ is the proportion of all workers in Turkey who earn more than 6000 TL/month in the first job that they work in. For this purpose we take a random sample of size 6 from the population of workers and ask then how much they earned in their first job.

(a) What is the test statistic that you would use to conduct this test?

(b) What is the distribution of the test statistics (you can graph or describe mathematically)?

(c) What is the decision rule (let $\alpha = 0.05$)?

(d) If the sample is as follows (all number are in TL/month): 2300, 1000 , 1500, 900, 3000, and 1100, what is the value of the test statistics and what would your conclusion be (at a significance level of 0.05)?

Cumulative Probabilities for the Binomial Distribution with $n = 20$

	Probability of Success				
k	0.1	0.2	0.3	0.4	0.5
0	0.122	0.012	0.001	0.000	0.000
1	0.392	0.069	0.008	0.001	0.000
2	0.677	0.206	0.035	0.004	0.000
3	0.867	0.411	0.107	0.016	0.001
4	0.957	0.630	0.238	0.051	0.006
5	0.989	0.804	0.416	0.126	0.021
6	0.998	0.913	0.608	0.250	0.058
7	1.000	0.968	0.772	0.416	0.132
8	1.000	0.990	0.887	0.596	0.252
9	1.000	0.997	0.952	0.755	0.412
10	1.000	0.999	0.983	0.872	0.588
11	1.000	1.000	0.995	0.943	0.748
12	1.000	1.000	0.999	0.979	0.868
13	1.000	1.000	1.000	0.994	0.942
14	1.000	1.000	1.000	0.998	0.979
15	1.000	1.000	1.000	1.000	0.994
16	1.000	1.000	1.000	1.000	0.999
17	1.000	1.000	1.000	1.000	1.000
18	1.000	1.000	1.000	1.000	1.000
19	1.000	1.000	1.000	1.000	1.000
20	1.000	1.000	1.000	1.000	1.000