

Business Statistics – E&E

Student ID: _____

Midterm 1

December 2016

Surname – Name: _____

1/12/2016

Time Limit: 90 Minutes

GRADE _____

This exam contains 3 pages (including this cover page) and 11 questions. Check to see if any pages are missing. Enter all requested information on the top of this page (except Grade), and put your initials on the top of every page, in case the pages become separated. **You can use only a pocket calculator.**

Grade table (for teacher use only)

Question	Points	Score
1	3	
2	2	
3	1	
4	3	
5	6	
6	1	
7	4	
8	4	
9	6	
10	1	
11	1	
Total:	32	

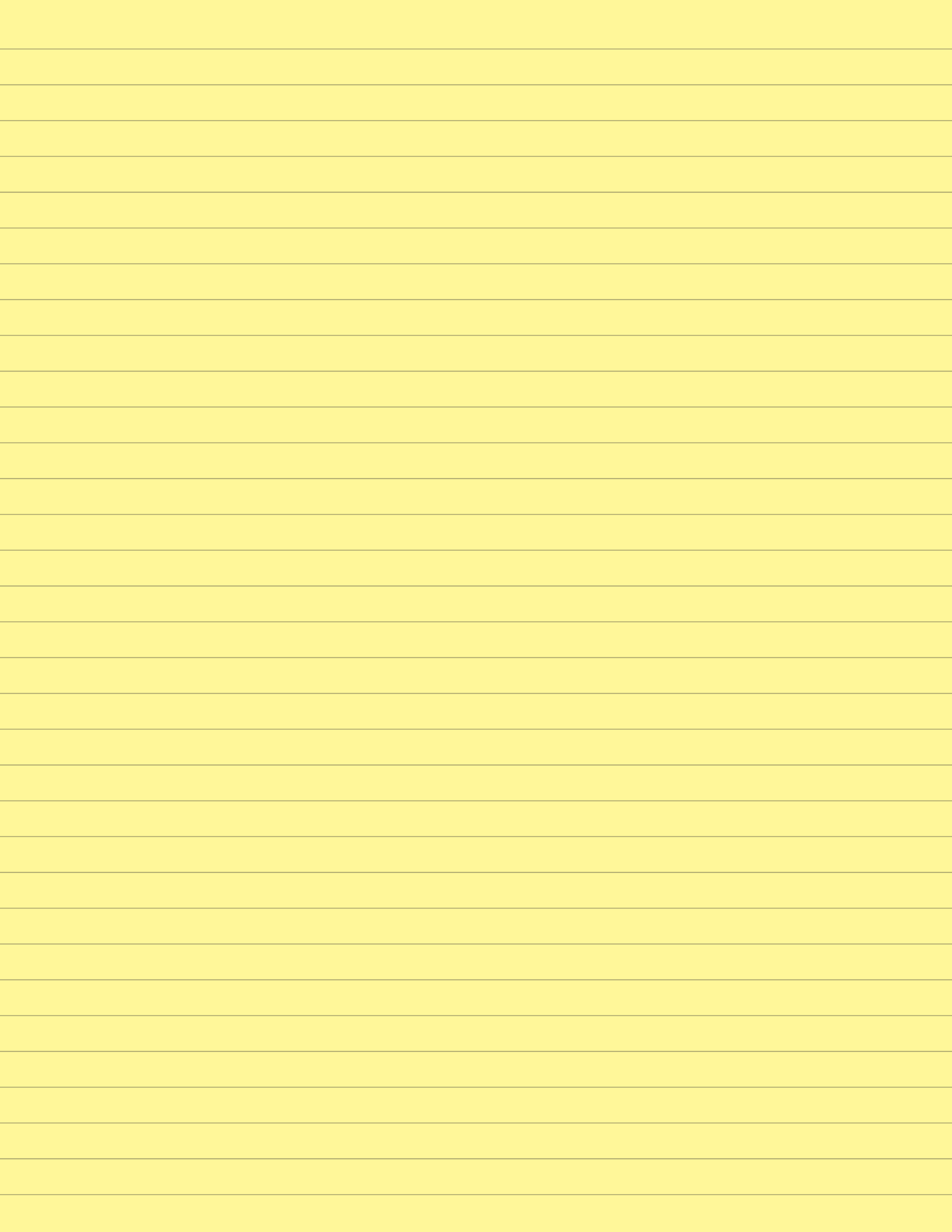
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- (3 points) Suppose you have a 95% confidence interval for the mean.
 - (1 point) Is the interval for the sample mean or for the population mean? Why?
 - (2 points) Suppose the point estimate for the mean is 1, and the confidence interval is $[0, 2.3]$. Do you think it is a “classical” parametric confidence interval or a “bootstrap-percentile” confidence interval? Why?
 - (2 points) Let E and F be two mutually exclusive events, for which $P(E) = 0.3$ and $P(F) = 0.25$. Compute $P(E|F)$ detailing the method you use for the calculation.
 - (1 point) A coin is tossed 1000 times. Suppose it lands heads 529 times. Find the expected value for the number of heads.

1. Your interest is in estimating the (unknown) population mean.
You know the sample mean: it is the statistic computed on the available sample



we have extensively tested confidence intervals and their interpretation in lect

4. (3 points) Let us suppose we have a State where 60% of the people vote for candidate A, and the others vote for candidate B. Indicate with 1 each of the votes for candidate A, and with 0 each of the votes for candidate B.
- (1 point) What is the mean of the distribution of the votes?
 - (1 point) What is the variance?
 - (1 point) Is the distribution symmetric?
5. (6 points) Suppose that the above population units are independent and that the proportion of voters for A does not change across the regions of the State. Suppose we interview the people in the main cities and ask them which candidate they voted for.
- (2 points) What is the probability that we have to wait for the fifth person interviewed in order to have a voter for B?
 - (2 points) What is the probability that we have to wait for the fifth person interviewed in order to collect 2 voters for B?
 - (2 points) Why should we make the assumption that the proportion of voters for A does not change across the regions?
6. (1 point) You are testing the equality between the variances of two Normal populations. Suppose that the test gives a p -value of 0.09. Check the correct statement(s).
- At a level of significance of 10%, we reject the null hypothesis that the two variances are different.
 - At a level of significance of 5%, we reject the null hypothesis that the two variances are equal.
 - The probability that the null hypothesis is not true is 9%.
 - The probability that the alternative hypothesis is not true is 9%.
 - The probability of observing under the null hypothesis a value of the test statistic less extreme than the value we have observed is 91%.
 - The distribution of the test statistic under the null hypothesis is a Chi-square distribution with n_1 and n_2 degrees of freedom, where n_1 are the degrees of freedom of numerator and n_2 are the degrees of freedom of denominator.
7. (4 points) Let us consider a portfolio composed a portfolio composed of two investment funds F_1 and F_2 , with quotas 0.6 and 0.4, respectively. If the expected return of F_1 is equal 65, the expected return of F_2 is equal 35, and the two standard deviations are $\sigma_{F_1} = 120$ and $\sigma_{F_2} = 80$, what is the smallest value that the standard deviation of the portfolio can assume?
8. (4 points) A company that sells products through mail-order catalogs wants to evaluate whether the mean sales for their most recent catalog were different from the mean of \$ 15 from past catalogs. For a random sample of 100 customers, the mean sales were \$ 10, with a standard deviation of \$ 10. Find a P-value to provide the extent of evidence that the mean differed with this catalog. Interpret.



9. (6 points) Suppose we have a sample of independent units which do not look Normally distributed. However, we still want to make inference on its mean.
- (a) (2 points) We opt for parametric inference. In the specific, we perform a standard “t-test”: is there any particular requirement to perform the test? Why?
 - (b) (2 points) We opt for nonparametric inference. In the specific we exploit the bootstrap method. Is there any particular assumption to perform the test? Why?
 - (c) (2 points) Briefly explain the idea and the use of the bootstrap method.
10. (1 point) You are testing the equality between the variances of two Normal populations. Suppose that the test gives a p -value of 0.09. Check the correct statement(s).
- At a level of significance of 10%, we reject the null hypothesis that the two variances are different.
 - At a level of significance of 5%, we reject the null hypothesis that the two variances are equal.
 - The probability that the null hypothesis is not true is 9%.
 - The probability that the alternative hypothesis is not true is 9%.
 - The probability of observing under the null hypothesis a value of the test statistic less extreme than the value we have observed is 91%.
 - The distribution under the null hypothesis is a Chi-square distribution with n_1 and n_2 degrees of freedom, where n_1 are the degrees of freedom of numerator and n_2 are the degrees of freedom of denominator.
11. (1 point) Check the correct answer among the following and briefly motivate your choice:
- To draw the likelihood curve, we put the parameter on the x-axis, and the probability of the data given the parameter on the y-axis.
 - To draw the likelihood curve, we put the parameter on the x-axis, and the probability of the parameter given the data on the y-axis.
 - To draw the likelihood curve, we put the parameter on the x-axis, and the probability of the parameter on the y-axis, without caring about the data we have.

