

This is a bonus homework. The score you get on this homework will be used to replace your lowest homework score from the semester *after* the lowest homework grade is dropped. If your score on this assignment is lower than any other homework grade you received this semester, then this no score will be replaced. Notice: this assignment can only improve your grade and if you wish not to do it it can not directly hurt you. However, the material covered by this homework will be covered on the final exam.

Show **all** of your work on this assignment and answer each question fully in the given context.

Please staple your assignment!

1. Metro Construction Analytics (MCA) is a firm specializing in analyzing data for major construction companies. One of their clients is interested in determining the true average time it takes to build a specific style of a three bedroom, two-and-a-half bathroom home, called an Average Design Rural Occupant Construction (or ADROC). The client provides MCA with the number of days from start of construction to completion for 40 houses in the ADROC style. The client also promises MCA that they know the standard deviation for construction of such a house is 80 days.

The 40 construction times are reported below and have an average of 193.8 days.

192	188	208	300	191	140	185	242	176	238
124	184	171	181	198	161	221	171	178	156
225	193	178	163	183	230	210	179	138	159
296	146	233	239	179	304	163	138	184	207

In this problem, let μ represent the true average time it takes to build an ADROC style home.

- (a) Provide a 90% confidence interval for the true mean μ .
 - (b) Provide a 95% confidence interval for the true mean μ .
 - (c) Provide a 99% confidence interval for the true mean μ .
 - (d) Comparing the intervals, does it seem like they are very different in a practical sense? Explain.
2. The “treadwear warranty” of a tire is often used as a tool to communicate to consumers some idea of the tire’s treadlife. Assuming that the conditions of the warranty are met (for instance, that the tires are regularly rotated), the warranty may allow the tire purchaser to be reimbursed for lost mileage if the tire does not last as long as the warranty indicated. For instance, if an \$80.00 tire has a tread wear warranty of 60,000 miles and is sufficiently worn down at 45,000 miles, the manufacturer may be required to pay for the remaining 15,000 - in other words, to reimburse the customer \$20.00. In light of this, consider the following scenario:

An engineer working for a tire company has developed a very cheap tire - the cost of production is \$20.00. 40 of these tires are sampled in order to determine the lifetime of the tire in terms of miles it it can be driven until the tread depth is $2/32$ of an inch (the legal minimum tread depth). The sampled tire lifetimes are recorded below (in thousands of miles):

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40.0 40.0 36.8 40.4 27.8 32.7 29.2 31.5 36.0 38.1
33.1 38.2 41.3 38.4 32.2 35.4 35.7 35.6 33.7 35.3
37.1 27.9 38.5 43.8 35.7 34.0 36.1 30.9 32.0 32.3
34.3 32.6 40.6 33.0 30.2 40.6 28.5 36.7 29.1 33.1
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The average lifetime of the 40 tires $\bar{x} = 34.96$ thousand miles and the sample variance is $s^2 = 16.19$ thousand miles squared.

- (a) Provide a 90% confidence interval for the mean lifetime of this type tire.
- (b) Provide a 95% confidence lower bound for the mean lifetime of this type tire.
- (c) Suppose market research suggests the tire could be sold with a 60,000 mile treadwear warranty for \$60.00. If the company reimburses mileage \$1.00 for every thousand miles short of 60,000 the tire travels, is there evidence they could make money on this tire?