Student Information

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Answer 1

a)

We can calculate the minimal sample size of Monte Carlo simulation as follows:

$N \geq 0.25 * (\frac{z_{a/2}}{\varepsilon})^2$

$N \geq 0.25 * (\frac{z_{.0.05}}{0.02})^2$

$N \geq 0.25 * (\frac{2.5758}{0.02})^2$

$N \geq 4146.71$

So, the minimum sample size can be 4147.

b)

The expected value of Gamma variable is $(\frac{a}{\lambda})$. Therefore,

The expected value of the weight of an automobile is $\frac{190}{0.15}$ = 1266.66 kg.

The expected value of weight of truck is $\frac{110}{0.01}$ = 11000 kg.

The expected value of Poisson variable is λ. Therefore,

The expected value of total weights of all automobiles is 50 * 1266.66 = 63333 .

The expected value of total weights of all trucks is 11000 * 10 = 110.000 .

Answer 2

For constructing a Monte Carlo study ;

1. We must first choose the minimum sample size (N) number.
2. Next, we must generate a sample to count the number of cars and trucks.
3. Next, using a Matlab method, we use those counts to determine the weights of cars and trucks.
4. Following that, we add the weights of the cars and trucks and list them for each trial.
5. Then, we calculate the mean of that list to estimate the total weight, and we apply the formula mean (TotalWeight>200000) to calculate the likelihood that the total weight of all the vehicles that cross the bridge in a given day.
6. Lastly, to find the standard deviation, we utilize std(TotalWeight).

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Probability that the total weight of all the vehicles that pass over the bridge on a day = 0.226188
Total weight of all the vehicles that pass over the bridge on a day = 173762.932873
Standard deviation = 35826.666289
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The expected total weight of all the vehicles that pass over the bridge on a day is between

(110,000 + 63,333) * ε = (173,333) * 0.02 = 3466.66

Interval = [173,333 - 3466.66, 173,333 + 3466.66] = [169866.34 , 176799.66]

Since, our estimation value (173762.932) is between the interval, we can conclude that our estimation is accurate.