MATH 251- Probability and Statistics I

Minitab Laboratory 2

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Section: 09

Date: 5/8/2017

Question 1 – All parts follow a normal distribution N(17, $(2.5)^2$)

A) If Speedy Lube gives discounts to services that take longer than 20 minutes then the percent of customers that receive service at half price is 12.5 %. To find this we let X be a RV that follows the normal distribution stated above, and we find P(X > 20).

$$P(X > 20) = 1 – P(X < 20)$$

$$P(X > 20) = 1 - .884930$$

$$P(X > 20) = .12507$$

B) If Speedy Lube does not want to give the discount to more than 3% of its customers they need to make the guaranteed time limit 12 minutes. This is found using a RV, X, and letting A equal the time limit. We find A by solving the equation P(X < A) = .03. Minitab allows for directly solving this problem instead of having to first find the Z score and then convert back to proper units for the problem. The result from minitab is A = 12.2980. Because we want 3% to be the max we round the fractional minutes down to the new guaranteed limit of 12 minutes.

C) The fraction of autos that take between 11 minutes and 16 minutes is 32.64 %. This is found by using RV X and calculating P(11 < X < 16).

$$P(11 < X < 16) = P(X < 16) - P(X < 11)$$

$$P(11 < X < 16) = .334578 - .008198$$

$$P(11 < X < 16) = .326380$$

Question 2 -

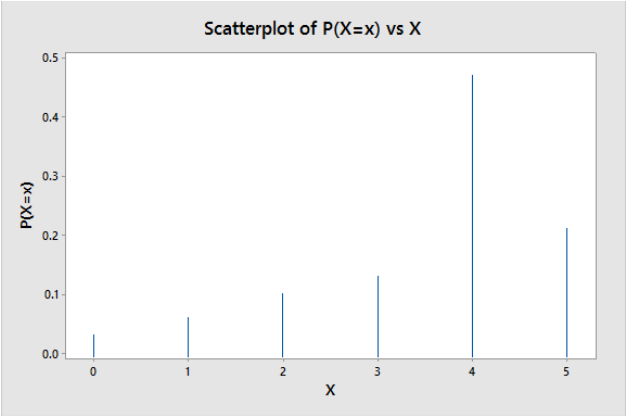

Figure 1: population distribution of number of toys played with

A) The shape of the population distribution of Figure 1 is both bell shaped and unimodal this tells us the data most likely follows a Poisson Distribution.

B)The mean of the distribution is 3.58 and the standard deviation is 1.892 these values were calculated in minitab following the formulas for the mean and standard deviation of Poisson Distribution, that is...

$$\mu = E(x) = \Sigma\ (X * P(X=x)\ ) \ = 3.58$$

$$\sigma = \ \mu^{.5} = 1.892$$

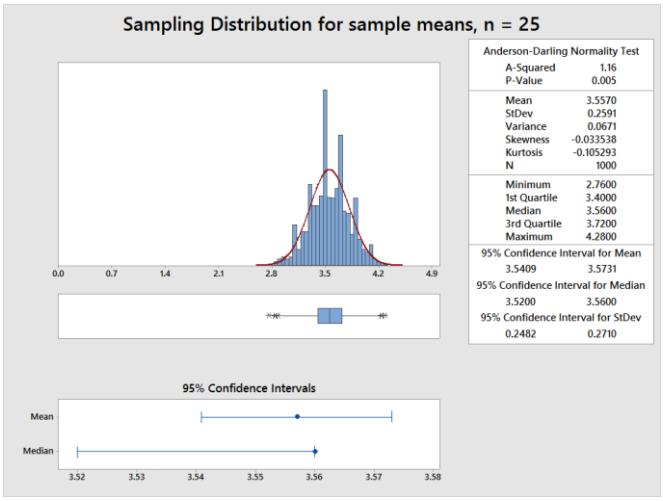

Figure 2: graph for sample means of sample size 25.

C) The histogram is both bell shaped and unimodal this suggests that it follows a normal distribution with a mean of approximately 3.5 .

D) The report generated by minitab that summarizes the graph calculated a mean = 3.5570 and a standard deviation = .2591.

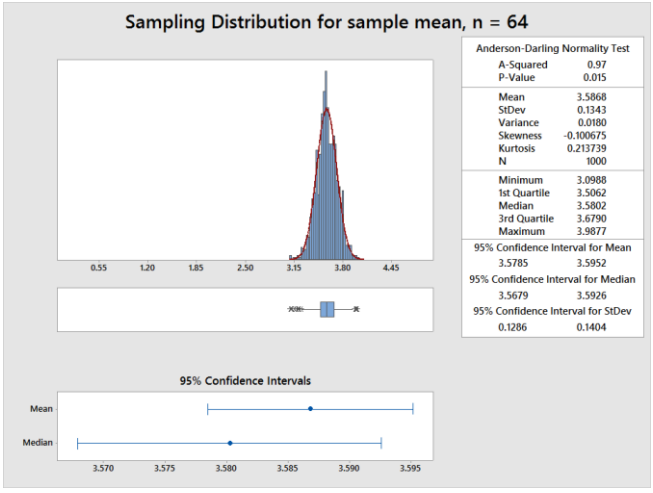

Figure 3: graph for sample means of sample size 64.

C) The histogram is both bell shaped and unimodal this suggests that it follows a normal distribution with a mean of approximately 3.5 .

D) The report generated by minitab that summarizes the graph calculated a mean = 3.5868 and a standard deviation = .1343.

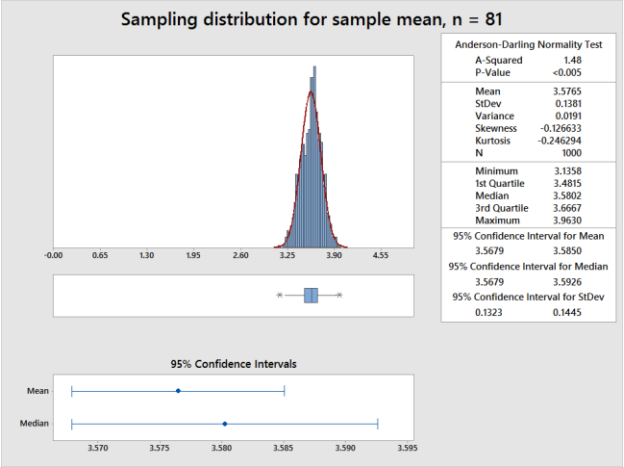

Figure 4: graph for sample means of sample size 81.

C) The histogram is both bell shaped and unimodal this suggests that it follows a normal distribution with a mean of approximately 3.5 .

D) The report generated by minitab that summarizes the graph calculated a mean = 3.5565 and a standard deviation = .1381.

Question 3-

Table 1: Mean and S.D of sample means

Experiment #	Sample Size	Mean of sample means	S.D. of sample means
1	25	3.5570	.2591
2	64	3.5776	.1594
3	81	3.5765	.1381

B)The population mean is 3.58 toys played with in a day with a standard deviation of 1.892. As the sample size increases the means of the sample means are approaching the population mean. Also as the sample size increases the standard deviation of the sample means is decreasing. For a sample size of n, as n approaches ∞ , the mean approaches the population mean and the standard deviation approaches 0. More accurately the std deviation is described as $\sigma/(n^{.5})$. This is in agreement with the Central Limit Theorem that states a population

distribution with a mean μ and a S.D. σ^2 will have sample means that follow a normal distribution with E(x)= μ and V(x) = σ^2/n.

C) We can tell something about the normality of each plot simply by looking at the histogram and the bell the curve plotted on it. For each sample size, 25, 64, and 81, the bell curve nicely models the frequencies of the data. This gives us insight that the data most likely follows a normal distribution... additionally as n increases a larger percent of the data fills the area under the curve furthering the likelihood that the data is normal(or Poisson if its discrete). Using a more rigorous method, we let minitab calculate the Ryan-Joiner number of the data. This results in a r = 1.0 , 1.0 , and .999 for n= 25, 64 and 81 respectively. Each of these numbers is greater than their corresponding critical value and therefore the normality of the data cannot be rejected. This is in agreement with the assumptions based on the shape of the graphs.