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MATH 341

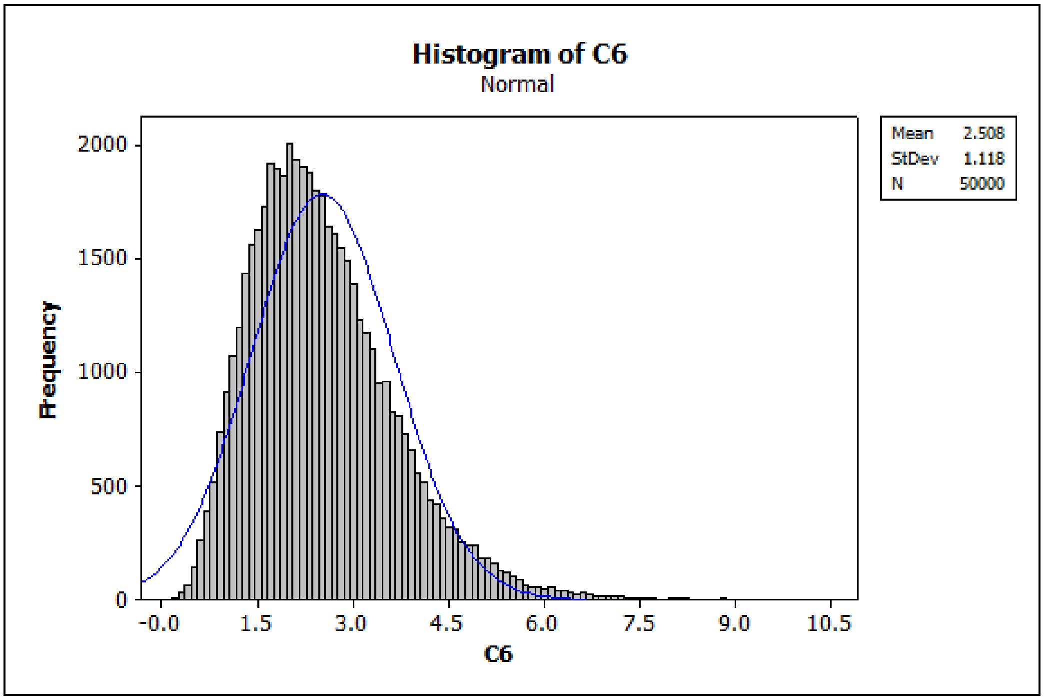
Minitab Assignment

1. a) $P(Y \leq 47) = 0.480804$
   b) $P(Y > 59) = 1 - P(Y \leq 59) = 1 - 0.947672 = .052328$
   c) $P(Y \leq m) > .8; m = 54$

2. X is a random variable distributed by a binomial distribution with parameter $p = .35$.
   a) $P(X \geq 30) = 1 - P(X < 30) = 1 - 0.416755 = 0.583245$
   b) 1) I know this is distributed Binomial with parameters $p = .35$ and $n = n$.
      $P(x \geq 10) = 1 - P(X < 10) = .95$
      $\therefore P(X < 10) = .95 - 1 = .05$
      I will now use inverse CDF to calculate what values of n will give me the desired probability.
      Binomial $p = .35$ and $n = 90$. $P(X < x) = .05$, $x \approx 23$
      Binomial $p = .35$ and $n = 40$. $P(X < x) = .05$, $x \approx 9$
      Binomial $p = .35$ and $n = 45$. $P(X < x) = .05$, $x \approx 10$ $P(X < 10) = 0.0468694$
      Binomial $p = .35$ and $n = 44$. $P(X < x) = .05$, $x \approx 10$ $P(X < 10) = 0.0573040$
      I choose $n = 45$ because the probability of that event is a little bit lower, therefore it is more likely that at least 10 people will recover.
      2) Binomial $p = .35$ and $n = 45$.
      $P(X \geq 10) = 1 - P(X < 10) = 1 - 0.0468694 = 0.9531306$

3. a) $P(X \leq 1.2) = 0.874974$
   b) $P(-.5 \leq X \leq 2.0) = P(X \leq 2.0) - P(X \leq -.5) = 0.967356 - 0.312421 = .654935$
   c) $P(X > x) = .8;\ x = 0.868055$

4. a)



The distribution appears to be somewhat normal but is skewed to the right.

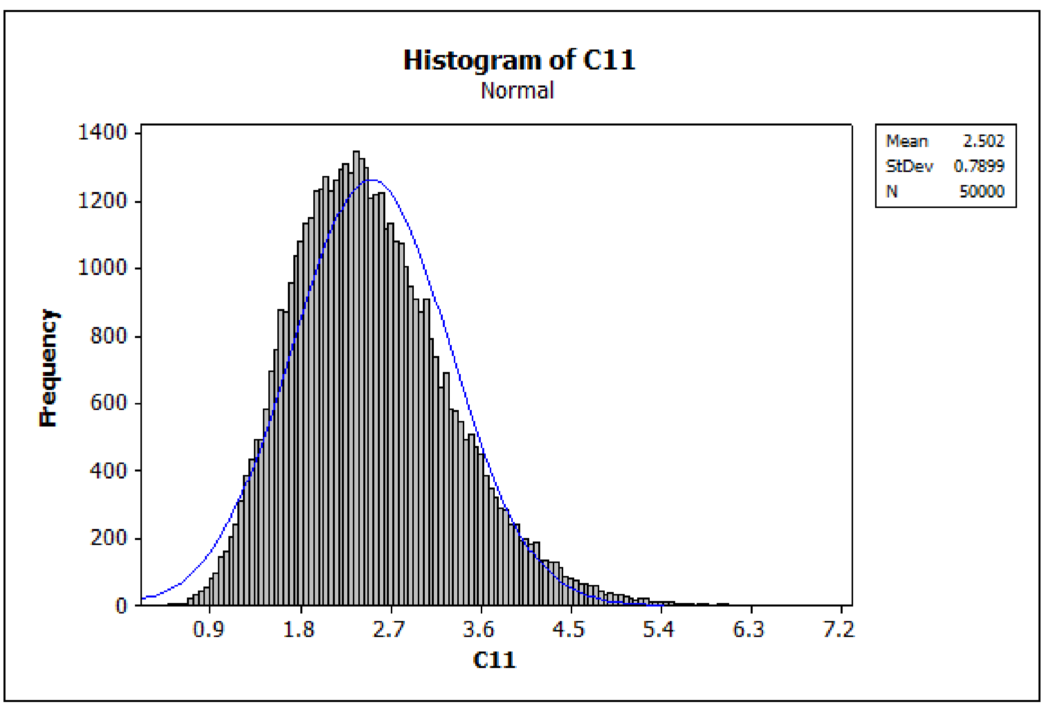
b) Theoretical: $\mathrm{E}\left(\bar{X}\right) = \theta = 2.5$, $\mathrm{Var}\left(\bar{X}\right) = \frac{\theta^2}{n} = \frac{2.5^2}{5} = \frac{6.25}{5} = 1.25$

Sample: $\mathrm{E}\left(\bar{X}\right) = 2.508$, $\mathrm{Var}\left(\bar{X}\right) = 1.118$

The sample mean and standard deviation are close to the theoretical mean and standard deviation. The sample mean is only off by $2.508 - 2.5 = .008$ and the sample variance is only off by $1.25 - 1.118 = .132$.

c)

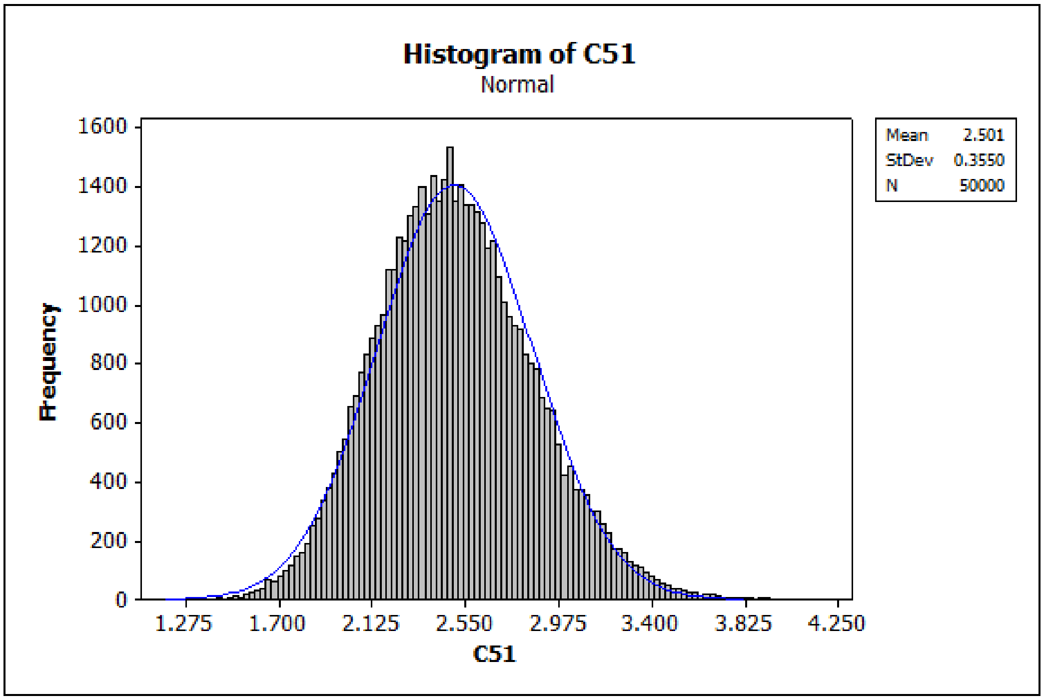
d) a)



This histogram appears to be more normal than the one with sample size of 5.

b) Theoretical: $\mathrm{E}\left(\bar{X}\right) = \theta = 2.5$, $\mathrm{Var}\left(\bar{X}\right) = \frac{\theta^2}{n} = \frac{2.5^2}{10} = \frac{6.25}{10} = .625$
Sample: $\mathrm{E}\left(\bar{X}\right) = 2.502$, $\mathrm{Var}\left(\bar{X}\right) = .7899$
The mean got closer to 2.5 with the larger sample size, but the sample variance was off by more than the sample variance was in with the sample size of 5. The sample mean is off by $2.502 - 2.5 = .002$ and the sample variance was off by $.7899 - .625 = .1649$.

e) a)



This histogram appears to be the most normal out of the three histograms.

b) Theoretical: $\mathrm{E}\left(\bar{X}\right) = \theta = 2.5$, $\mathrm{Var}\left(\bar{X}\right) = \frac{\theta^2}{n} = \frac{2.5^2}{50} = \frac{6.25}{50} = .125$
Sample: $\mathrm{E}\left(\bar{X}\right) = 2.501$, $\mathrm{Var}\left(\bar{X}\right) = .3550$
The mean got even closer to 2.5 but the difference in theoretical and sample variance increased again. The sample mean was off by $2.501 - 2.5 = .001$ and the sample variance was off by $.3550 - .125 = .23$.