HW # 5: Due Thurs 10/3 by 11:59pm ET

● Graded

5 Minutes Late

Student

Ivan Wang

Total Points

13 / 15 pts

Question 1

Problem 1

3 / 3 pts

✔ **– 0 pts** Correct

Question 2

Problem 2

6 / 7 pts

✔ **– 1 pt** part (b): your values of $\overline{\overline{x}}$ and $\overline{R}$ are both incorrect.

Question 3

Problem 3

4 / 5 pts

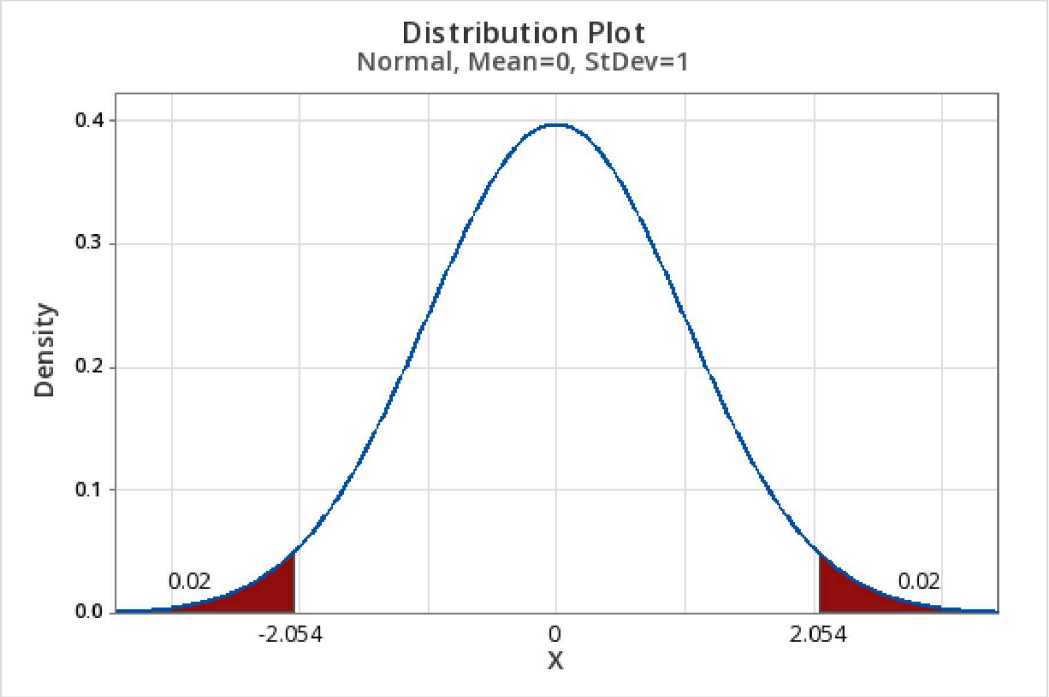
✔ **– 1 pt** part (b): you started off correctly in that you need to divide by d_2, but then you changed it to $\sqrt{n}$ and actually ended up dividing by $\sqrt{m}$.

Question assigned to the following page: 1

Directions: Submit through Gradescope by the due date and time. Show all work (if applicable) to be eligible for full credit. Unless otherwise specified, use an $\alpha = 0.05$ level of significance for all hypothesis tests. Include any relevant Minitab output.

Problem 1. Recall the general formulas for the upper and lower control limits (see slide 18 in the Chapter 5 notes). Determine the appropriate value of L to use in these formulas if we want the Type I error probability to be:

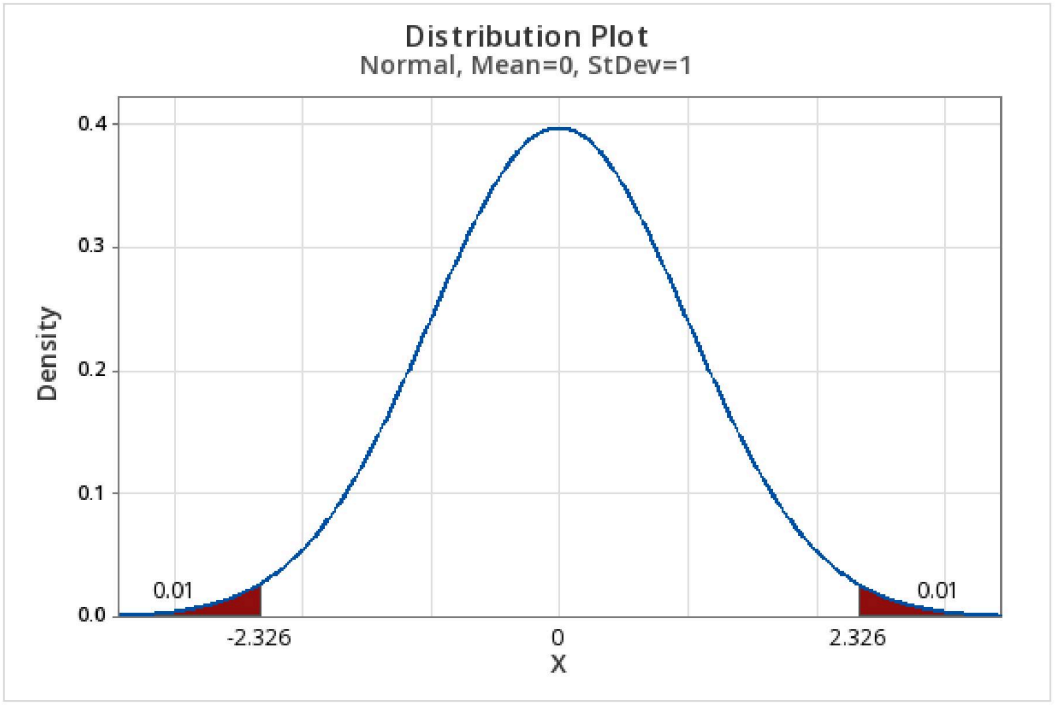
(a) $\alpha = 0.04$



The probability in each tail is $\alpha/2 = 0.02$ and $L = 2.054$

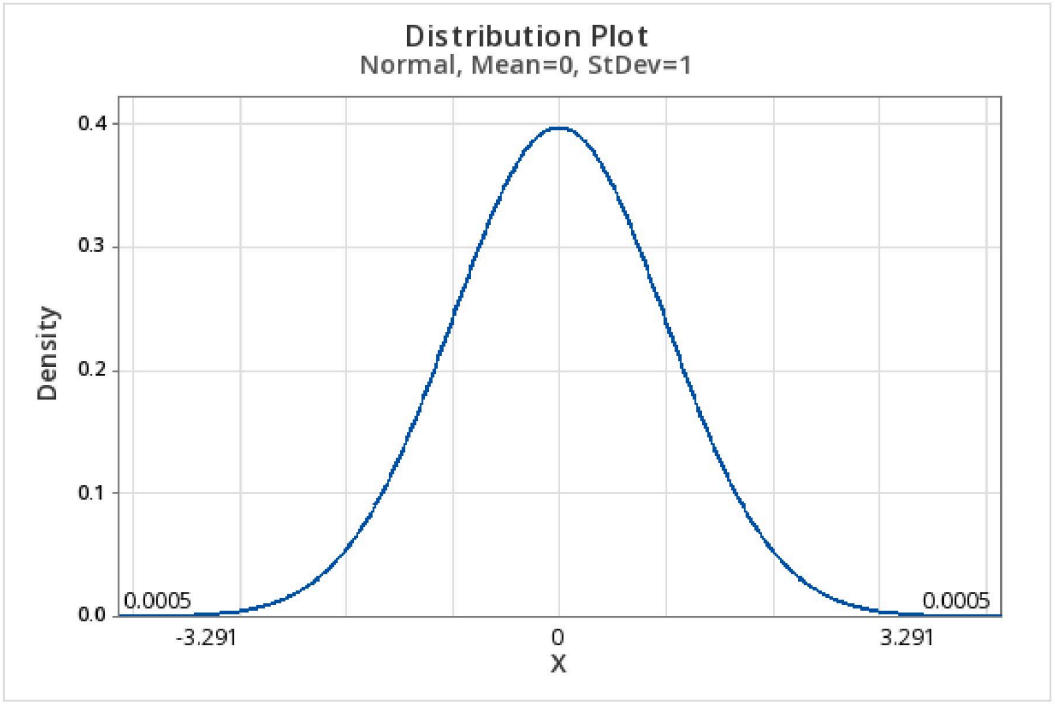
(b) $\alpha = 0.02$

Question assigned to the following page: 1



The probability in each tail is $\alpha/2 = 0.01$ and $L = 2.326$

(c) $\alpha = 0.001$

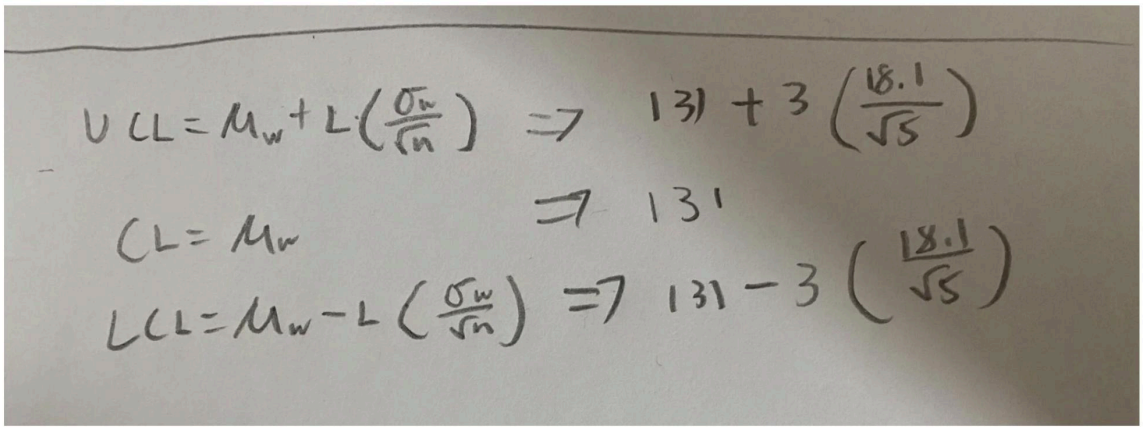


Question assigned to the following page: 2

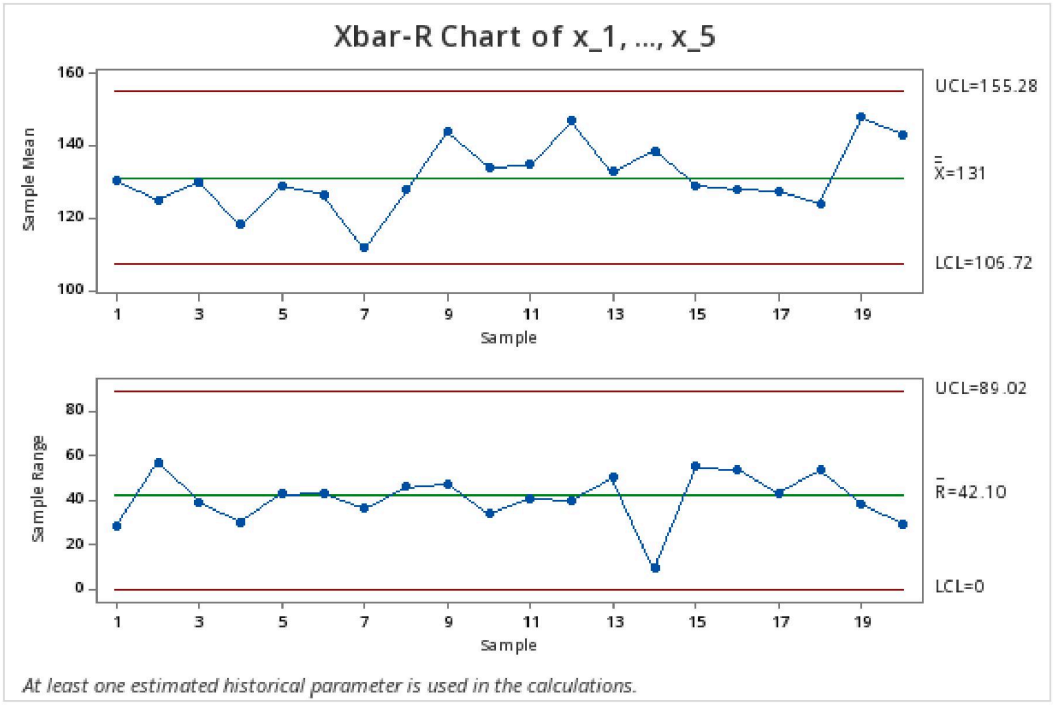
The probability in each tail is $\alpha/2 = 0.0005$ and $L = 3.291$

Problem 2. Suppose 20 random samples of size n = 5 were collected from some normally distributed process. The data is contained in columns G through K in the `hw_data.xlsx` file.

(a) Assume the population mean and standard deviation are known: $\mu = 131$, $\sigma = 18.1$. Use the appropriate formulas to compute the center line and the 3-sigma control limits for an x -control chart. Then use Minitab to create this control chart (include the chart, and make sure your computed limits agree with Minitab's).



Question assigned to the following page: 2



(b) Now assume that μ and σ are unknown. Use the appropriate formulas to compute the center line and the 3 -sigma control limits for an x-control chart using the R-bar method. Then use Minitab to create this control chart (include the chart, and make sure your computed limits agree with Minitab's).

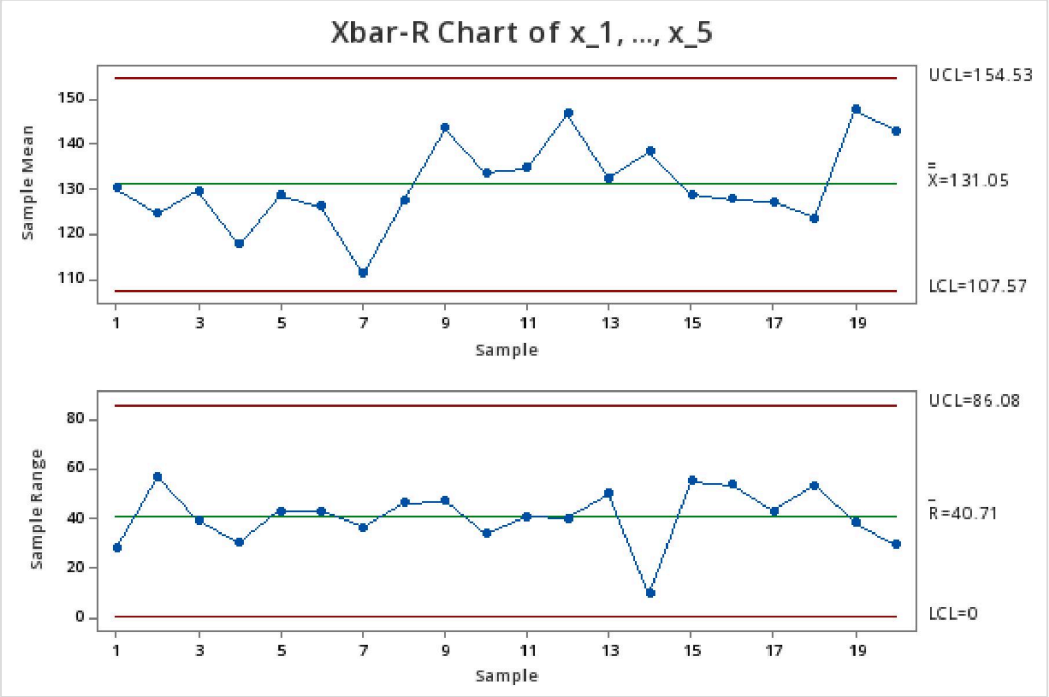
Question assigned to the following page: 2

$UCL = \bar{\bar{X}} + A_2 \cdot \bar{R} \Rightarrow 130.5 + 0.577 \cdot 7.2 =$
134.6544

$CL = \bar{\bar{X}} \Rightarrow 130.5$

$LCL = \bar{\bar{X}} - A_2 \cdot \bar{R} \Rightarrow 130.5 - 0.577 \cdot 7.2 =$
126.3456

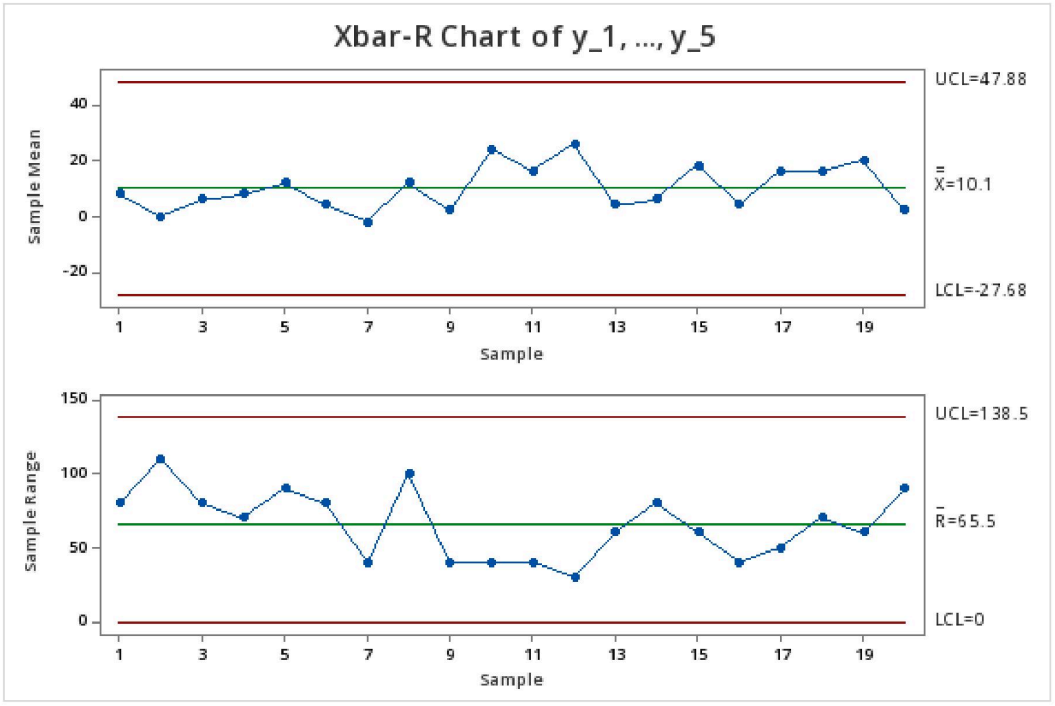
Question assigned to the following page: 3



Problem 3. Suppose 20 random samples of size n = 5 were collected from a normally distributed manufacturing process. The measurements collected represent deviations from the nominal (target) diameter (in ten-thousandths of an inch) for holes drilled in a material used in aerospace manufacturing. The data is contained in columns L through P in the `hw_data.xlsx` file.

(a) Set up an x-control chart using the R-bar method (you can use Minitab to determine the center line and control limits; include the chart).

Question assigned to the following page: 3



UCL = 47.88
CL = 10.1
LCL = -27.68

(b) Estimate the process standard deviation using the R-bar method.