

Math Fundamentals 100

You've taken a series of hourly measurements on a manufacturing process. The rule at work is to recalibrate if during your shift the process measured results in a measurement more than 1 SD from the mean. Did it do this during your shift? You will need a calculator for this one!

1. Determine the range of 12, 15, 42, 37, 14, 9, 25, 27, 32 and 30
2. Determine the mean = total / n = 243 / 10 = 24.3
3. Variance = $\frac{\text{Sum of (measurement - mean)}^2}{\text{Number of measurements} - 1}$ or $\frac{n(\text{Sum of } x^2) - \text{Sum}(x)^2}{n(n - 1)}$

Standard deviation is a measure of how spread out the numbers are from the mean

Step 1

<u>X</u>	<u>X²</u>
12	144
15	225
42	1764
37	1369
14	196
9	81
25	625
27	729
32	1024
<u>30</u>	<u>900</u>
243	7057

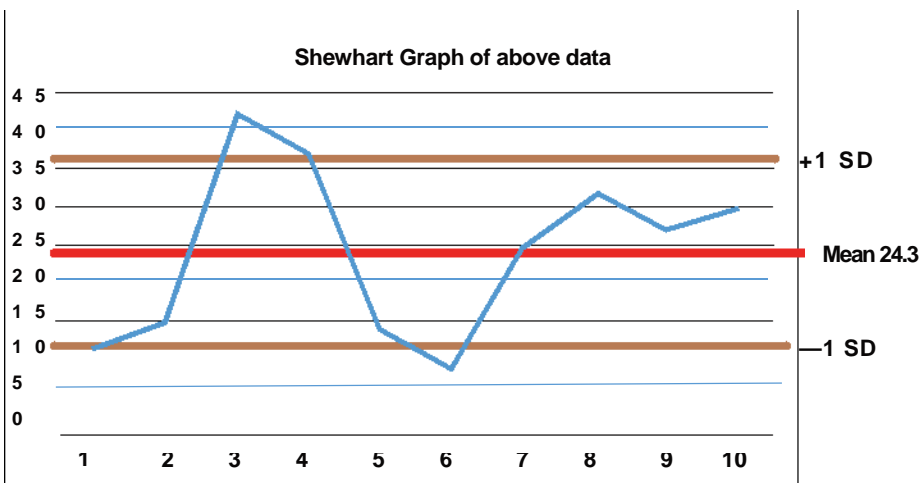
$$\text{Step 2 Variance} = \frac{10(7057) - 243^2}{10(10-1)}$$

$$= \frac{70,570 - 59049}{90}$$

$$= 128.011$$

$$\text{Step 3 Standard Deviation} = \sqrt{\text{Variance}} = \pm 11.3$$

Step 4 to return back to the Quality discussion. Maybe bring in a process control chart (Shewhart charts). Have them plot the data around the mean and ± 1 SD and determine at what data points the machine was out.



Graph illustrated by author

Notice, we used addition, subtraction, multiplication and division, as well as throwing in a twist at the end. We did it in a way that students view the math as part of a skill needed in manufacturing work, not as just a math problem.

Your turn

1. Determine the range of 17, 21, 42, 37, 19, 29, 15, 29, 38 and 30
2. Determine the mean
3. Determine the Variance

4. Determine the Standard Deviation

5. Plot your data on a Shewhart chart.



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