

Post-lab 2 Problem 1

Using the Q-test, determine whether there is an outlier in the following data set: 38.741, 37.160, 39.540, 40.555, 37.842, 34.052, 38.000, and 38.452. Discard the outlier if there is one, and then calculate the average and standard deviation to the correct number of significant figures. How would you report your results?

1. 39 ± 1
2. 38.613 ± 1.137 ← (These two are obviously wrong because
3. 38.61286 ± 1.13684 ← (there is more than 1 digit in the s.d.
4. 38 ± 1

First identify the minimum and maximum points. If there is an outlier, it will be one of these points.

Minimum = 34.052

Maximum = 40.555

Which of these points is closest to another point?

Nearest point to 34.052 = 37.160 (3.108 away)

Nearest point to 40.555 = 39.540 (1.015 away)

So the minimum point is the one that is farthest from the group, and that's the one we'll test as outlier.

$$Q = \left| \frac{\text{outlier-neighbor}}{\text{max-min}} \right| = \left| \frac{34.052-37.160}{40.555-34.052} \right| = 0.4779$$

There are 8 data points, so $n = 8$. The Q_{table} value on page A-3 of the lab manual for 8 data points is 0.47. Since $Q > Q_{\text{table}}$, we should discard the outlying data point. It is now gone as if it never existed.

The average of the remaining seven points (calculated using Excel) is 38.61286. The standard deviation of those same seven points is 1.13684.

Round the standard deviation to one digit (1) and round the average to that same decimal place (the one's place, or 39).

Correct answer: 39 ± 1

Make sure you know how to use the Q-test! You may need to use it on the lab data this week, and you will see it again on the quiz next week.