

Calculating Averages & Significant Differences.

When people conduct experiments (scientific, or otherwise), how can they be certain the results are accurate? The short answer is that they can never be certain the results are accurate. This is why experiments are usually performed multiple times, and then analyzed to determine the amount of the error. The error is estimated by calculating the largest difference between the average and a measured value. Once you know the amount of error, it can be used to determine whether two results can be considered the same. If two measurements or results differ by an amount that is less than or equal to the amount of error, they are considered to be the same.

1. A toy car and a toy truck of about the same size are started down identical ramps. The distance traveled by each vehicle on each of four attempts is recorded below. Is it true that the truck will always travel farther than the car?

Toy Car (m)	Toy Truck (m)
1.57	1.77
1.45	1.90
1.55	1.85
1.48	2.00
Average	Average
Error	Error

Bathroom Sink (seconds)	Kitchen Sink (Seconds)
3.42	3.12
3.50	3.15
3.45	3.12
3.49	3.10
3.47	3.13
Average	Average
Error	Error

2. The water pressure in the sinks at Sean's house is constant. Sean wants to compare the water pressure in the kitchen sink with the water pressure in the bathroom sink. He does this by recording the amount of time it takes to fill a 1-cup measure with water from each sink. He performs this experiment a total of five times. Is it possible to determine which sink has the greatest water pressure (fills the cup the quickest)? If so, which sink has the greater water pressure?

3. After school one day, Antonio and Earnest were playing with a slingshot. Antonio's mother said it would be OK as long as they stayed in the back yard, and used only pencil erasers for ammunition. Antonio had a pink, rectangular eraser, while Earnest had a smaller white, square one. The table below shows the distance traveled by each eraser on 8 attempts. From only the given data, can you support (scientifically) Earnest's claim that his eraser will always go farther? Explain why or why not.

Antonios' eraser Distance (m)	Earnest's Eraser Distance (m)
3.12	3.20
3.20	3.75
3.55	3.22
3.04	3.05
3.48	3.58
3.60	3.63
3.16	3.18
3.35	3.41

4. While cleaning the kitchen sink one Saturday, Joanne noticed that her yellow sponge seemed to be a little heavier than the pink one when they were both saturated with water, even though when the sponges were dry, they seemed to have the same mass. Joanne found the mass of both sponges when they were dry. She was right, each sponge had a mass of 31.50 grams. She saturated each sponge with plain water several times, and recorded the data below. Does the data show (scientifically) that the yellow sponge absorbs more water than the pink one? Explain why or why not.

Yellow Sponge (g)	Pink Sponge (g)
94.25	75.62
93.45	75.60
92.40	75.55
92.22	75.50
92.20	75.00

5. At Valley View Middle School, the girls' 4 100 m relay team is set. Coach Davis still needs to determine who the fastest runner is, so she can decide in what order they should run. The four girls on the relay team run time trials twice each day for three days. Their times are given in the table below. Is it possible (scientifically speaking) to determine who is the fastest? If so, which girl is the fastest?

Tara (sec)	Sammie (sec)	Joan (sec)	Lexy (sec)
12.70	12.59	13.02	12.77
12.99	12.45	13.01	12.80
13.00	12.40	13.00	12.78
12.88	12.60	12.95	12.99
12.75	12.54	13.05	12.94
12.80	12.42	13.11	12.90