SIGNIFICANCE TESTING
CHEM 251 SDSU

DIFFERENT RESULTS

Two students (A & B) have made measurements of samples taken from the same population.
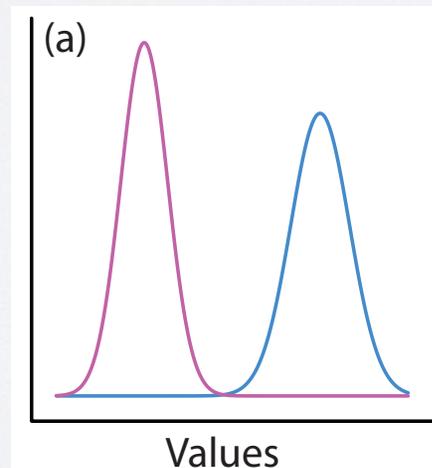
Determine the 95% confidence interval for each of their sample means.

Student A
14.555 to 14.746

Student B
14.331 to 14.518

(a)

Values

Trials	Student A	Student B
1	14.602	14.408
2	14.782	14.517
3	14.668	14.322
4	14.534	14.477
5	14.721	14.398
6	14.596	
Average	14.6505	14.4244
Std. Dev.	0.091	0.075

TESTING DIFFERENT RESULTS

- The question raised by the results of Students A & B is wether or not the difference in their values was due to **indeterminate errors** or not.

- To determine this a **null hypothesis** (H_0) and **alternative hypothesis** (H_A) must be tested.

- The <u>null hypothesis</u> proposes that the difference can be sufficiently explained by <u>indeterminate errors</u>.

- The <u>alternative hypothesis</u> proposes that the difference are too great to be attributed to indeterminate errors.

USING THE *T* TEST

- The *t* test is used as a null hypothesis test; that the reported mean represents the true value.

- The test compares t_{exp} to $t_{(\alpha,\nu)}$, where α is the desired confidence level and ν are the degrees of freedom for the sample.

- If $t_{exp} > t_{(\alpha,\nu)}$ the difference <u>cannot be explained</u> by indeterminate errors, and we **reject the null hypothesis**.

- If $t_{exp} \leq t_{(\alpha,\nu)}$ the difference <u>can be explained</u> by indeterminate errors, and we **accept the null hypothesis**.

$$\mu = \overline{X} \pm \frac{(t_{exp})s}{\sqrt{n}}$$

$$t_{exp} = \frac{|\mu - \overline{X}|\sqrt{n}}{s}$$

Table 4.15   Values of *t* for a 95% Confidence Interval

Degrees of Freedom	*t*	Degrees of Freedom	*t*
1	12.706	12	2.179
2	4.303	14	2.145
3	3.181	16	2.120
4	2.776	18	2.101
5	2.571	20	2.086
6	2.447	30	2.042
7	2.365	40	2.021
8	2.306	60	2.000
9	2.262	100	1.984
10	2.228	∞	1.960

SAMPLE PROBLEM

If student A and B were both measuring a solution that had a concentration of 14.512 do either of the students' measurements agree with this value at the 90% confidence level?

Values of *t* for…		
…a confidence interval of:	90%	95%
…an α value of:	0.10	0.05
Degrees of Freedom		
1	6.314	12.706
2	2.920	4.303
3	2.353	3.182
4	2.132	2.776
5	2.015	2.571
6	1.943	2.447
7	1.895	2.365
8	1.860	2.306

Trials	Student A	Student B
1	14.602	14.408
2	14.782	14.517
3	14.668	14.322
4	14.534	14.477
5	14.721	14.398
6	14.596	
Average	14.6505	14.4244
Std. Dev.	0.091	0.075