David Hwang Data Science → Take-Home 7

1): Use proper experiments with Independent variables known as "treatments" and ensure that participants/users are randomly assigned throughout these treatments.

2): Confounding variables are those that influence both the independent and dependent variable in a study.

3): A/B testing is a randomized controlled experiment where two treatments are tested simultaneously to see which one is better.

4): The Welch t-test compares the means of two independent groups. You use this when the variances of two groups are unequal.

5): $\mu_A = 6$ min, $n = 50$ calls with $\bar{x} = 6.5$ min, $\sigma = 1.2$ min

$\alpha = 0.05$

$SEM = \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ $\quad df = 50 - 1 = 49$

$= \frac{1.2}{\sqrt{50}} \approx 0.1697$

At $\alpha = 0.05$, $df = 49$, $t_0 \approx \pm 1.68$

$t = \frac{6 - 6.5}{0.1697} \approx -2.944$

Since t_0 or $-2.944 < -1.68$, there is not enough evidence to support the claim.

6): Group A: $n_A = 25$, $\mu_A = 75$, $\sigma_A = 8$

Group B: $n_B = 30$, $\mu_B = 78$, $\sigma_B = 7$

at $\alpha = 0.05$, $\sigma_A \neq \sigma_B$

Null: No difference between mean exam scores of A & B

Alt.: Difference between their scores

$$t = \frac{75 - 78}{\sqrt{\frac{8^2}{25} + \frac{7^2}{78}}} \approx -1.6802$$

Using n_B, $df = 30 - 1 = 29$

Crit. Value: $t_0 \approx \pm 1.699$

Since $-1.6802 > -1.699$, we reject the null and see that the new teaching style proves a difference in scores.