Hypothesis Test for the mean

What are you comparing?

A sample of data with a given mean

Is σ given?

- YES → One sample z test
- NO → Is n > 30?
  - YES → One sample z test
  - NO → One sample t Test

The difference between the mean of two samples

Paired t Test

$$\frac{\bar{d}-\mu}{\frac{s}{\sqrt{n}}} \sim t_{n-1}$$

The mean of two samples of data

Is σ given?

- YES → Two sample z test
- NO → Is n > 30?
  - YES → Two sample z test
  - NO → Two sample t Test

One sample z test

Use $\bar{x}$ as TS and inverse normal for CV

OR

$$\frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}} \sim N(0, 1)$$

One sample t Test

$$\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}} \sim t_{n-1}$$

Two sample t Test

$$\frac{(\bar{X}-\bar{Y})-(\mu_x-\mu_y)}{\sqrt{S_p^2\left(\frac{1}{n_x}+\frac{1}{n_y}\right)}} \sim t_{n+n-1}$$

where $S_p^2 = \frac{(n_x-1)S_x^2+(n_y-1)S_y^2}{n_x+n_y-2}$

Two sample z test

$$\frac{(\bar{X}-\bar{Y})-(\mu_x-\mu_y)}{\sqrt{\left(\frac{\sigma_x^2}{n_x}+\frac{\sigma_y^2}{n_y}\right)}} \sim N(0, 1)$$

Hypothesis Testing for the Mean

STEP / TEST	One Sample z Test	One Sample t Test	Two Sample z Test	Two Sample t Test	Paired t Test
1. Hypotheses	H_0: μ = value H_1: μ < value H_1: μ > value H_1: μ ≠ value	H_0: μ = value H_1: μ < value H_1: μ > value H_1: μ ≠ value	H_0: $\mu_A = \mu_B$ H_1: $\mu_A < \mu_B$ H_1: $\mu_A > \mu_B$ H_1: $\mu_A \neq \mu_B$	H_0: $\mu_A = \mu_B$ H_1: $\mu_A < \mu_B$ H_1: $\mu_A > \mu_B$ H_1: $\mu_A \neq \mu_B$	H_0: $\mu_d = 0$ H_1: $\mu_d < 0$ H_1: $\mu_d > 0$ H_1: $\mu_d \neq 0$
2. One or two tailed	If H_1 uses the '<' or '>' symbol then it is one tailed If H_1 uses the '≠' symbol then it is two tailed				
3. Significance level	Always 5% unless otherwise stated				
4. Test Statistic	METHOD A TS = $\bar{X}$ METHOD B (standardization) $\frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$	METHOD (standardization) $\frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$	Page 6 from the formula booklet $\frac{\bar{d} - \mu}{\frac{s}{\sqrt{n}}}$ where $\bar{d}$ is the mean of the differences between the pairs of data	Page 6 from the formula booklet $\frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{\left(\frac{\sigma_x^2}{n_x} + \frac{\sigma_y^2}{n_y}\right)}}$	Page 6 from the formula booklet $\frac{(\bar{X} - \bar{Y}) - (\mu_x - \mu_y)}{\sqrt{S_p^2\left(\frac{1}{n_x} + \frac{1}{n_y}\right)}}$ where $S_p^2 = \frac{(n_x - 1)S_x^2 + (n_y - 1)S_y^2}{n_x + n_y - 2}$
5. Critical Value & Critical Region	METHOD A Casio ClassWiz MENU 7: Distributions 3: Inverse Normal Area: α (1 tailed) α/2 (2 tailed) σ: $\sigma/\sqrt{n}$ μ: μ from H_0 METHOD B Table 4 gives us the CV from the percentage points 1- α (1 tailed) 1- (α/2) (2 tailed)	Table 5 gives us the CV from the percentage points 1- α (1 tailed) 1- (α/2) (2 tailed)	Table 4 gives us the CV from the percentage points 1- α (1 tailed) 1- (α/2) (2 tailed)	Table 5 gives us the CV from the percentage points 1- α (1 tailed) 1- (α/2) (2 tailed)	Table 5 gives us the CV from the percentage points 1- α (1 tailed) 1- (α/2) (2 tailed)
6. Compare and Conclude	If the test statistic lies within the critical region we REJECT H_0 Use the language from the question to help word your conclusion				