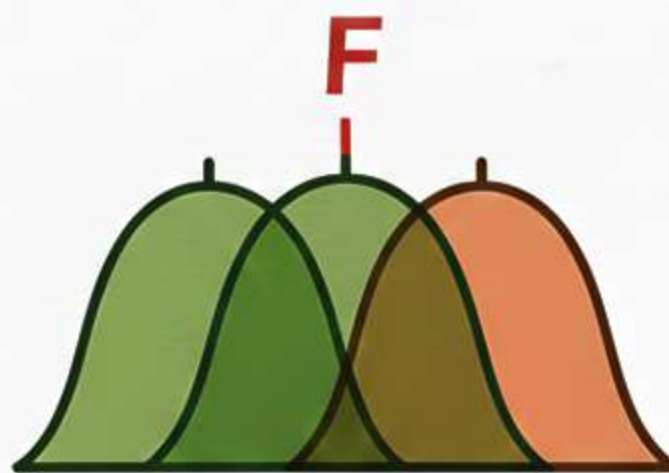
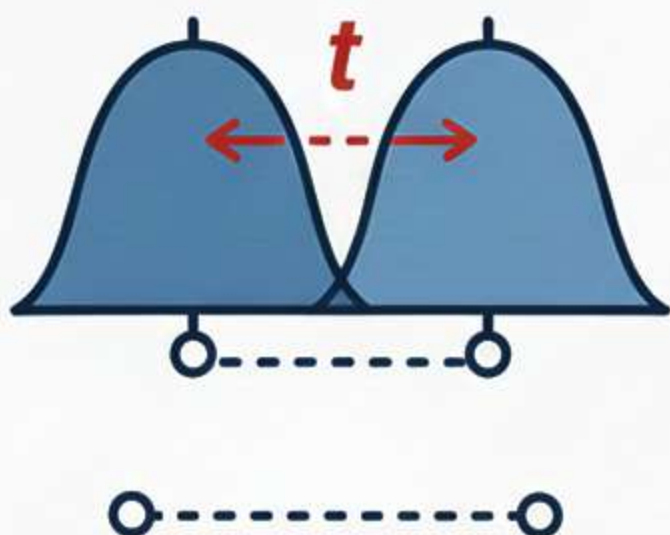




t-Test & ANOVA

Explained For Psychology Entrance Exams



Sample MCQs for Psychology Entrances

Q.1

A psychologist measures the stress levels of the same participants before therapy, after 4 weeks, and after 8 weeks. Which statistical test is most appropriate?

a

Independent-
samples t-test

b

Paired-samples
t-test

c

One-way
ANOVA

d

Repeated-
measures ANOVA

Q.2

Why is ANOVA preferred over multiple t-tests when comparing more than two group means?

a

ANOVA reduces measurement error

b

ANOVA eliminates sampling bias

c

ANOVA controls the inflation of Type I error

d

ANOVA increases statistical power in all cases

Read carefully, challenge yourself to guess first;
Answers are revealed in the final slide.

Understanding t-Tests

- **Purpose:**

t-tests help compare means between groups to see if differences are statistically significant.

- **Types:**

1. **Independent-samples t-test:** Compares two separate groups (e.g., males vs. females).

2. **Paired-samples t-test:** Compares two measurements of the same group (e.g., pre-test vs. post-test).

- **Key idea:**

Looks at the difference between means relative to variability within groups.



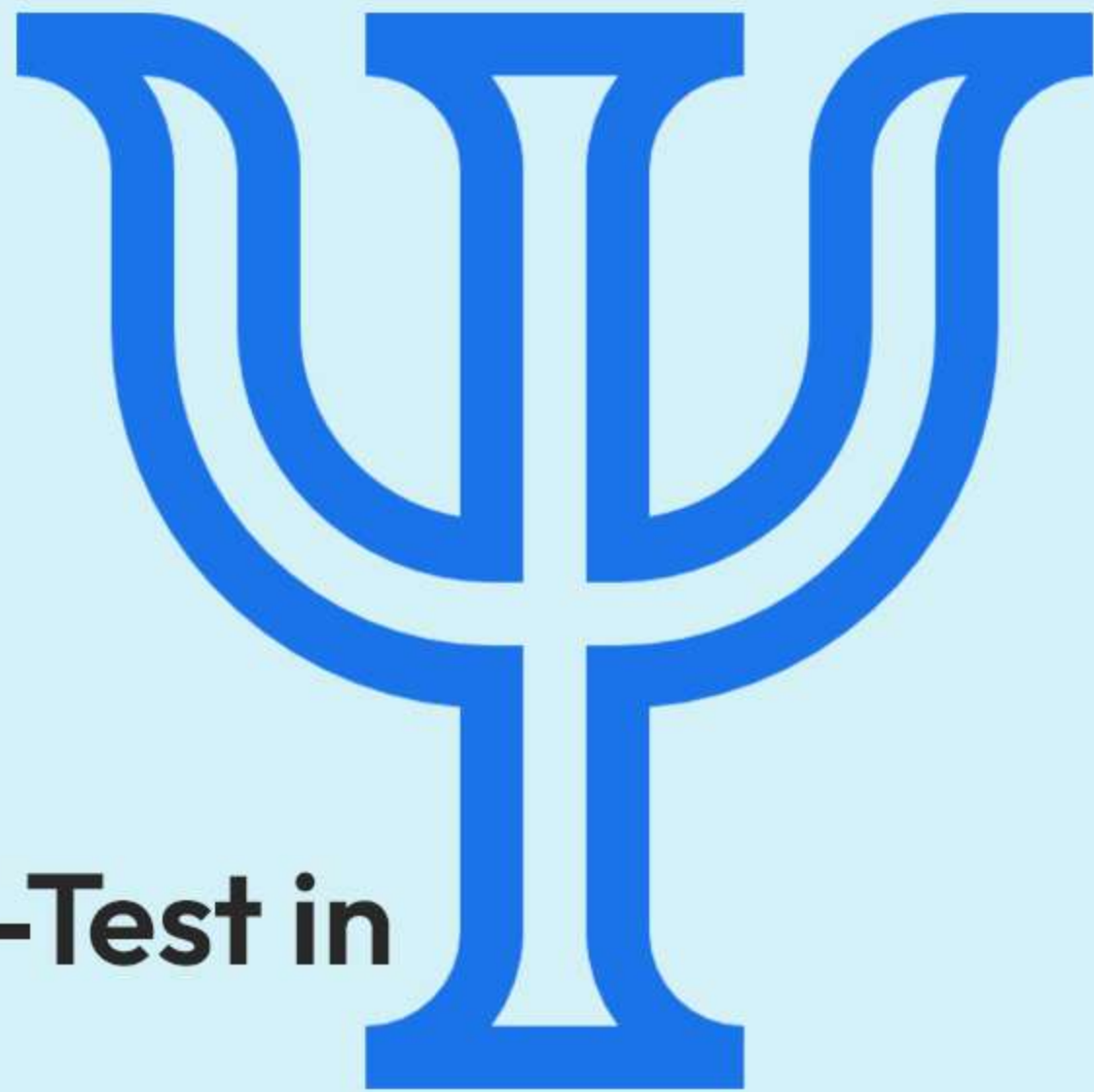
t-Test Formula & Intuition

- Formula:

$$t = \frac{\text{Difference between means}}{\text{Standard error}}$$

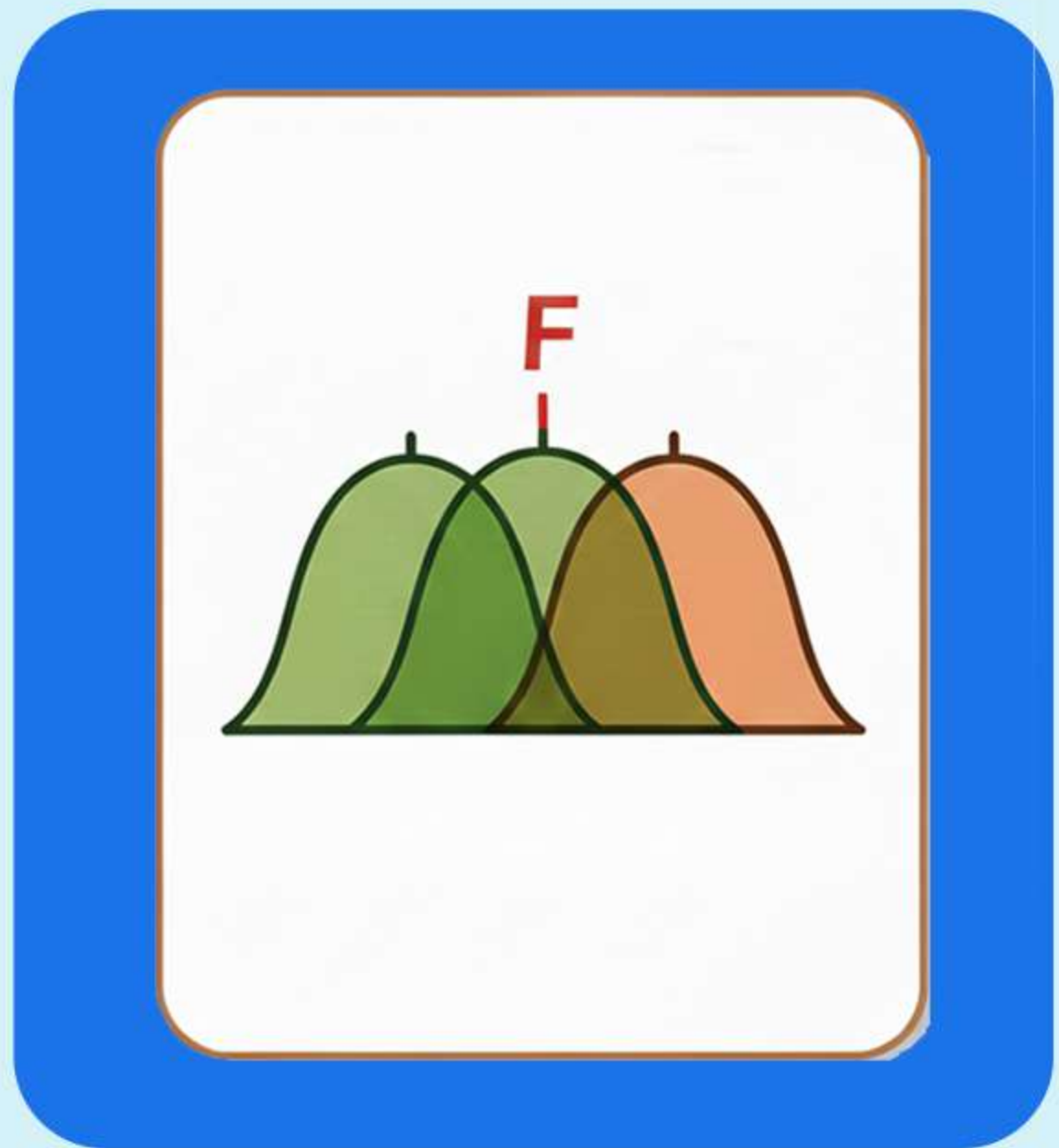
- **Intuition:** If the difference between group means is large compared to variability, the t-value increases → more likely a significant difference.
- **Assumptions to remember:**
 1. Normal distribution of data
 2. Independent observations (except paired t-test)
 3. Homogeneity of variance for independent t-test





When to Use t-Test in Psychology

- Comparing exam scores of two study techniques
- Measuring effect of therapy: pre-test vs. post-test scores
- Gender differences in stress levels
- **Important for exams:**
Always identify the type of t-test based on study design.



Understanding ANOVA

- **Purpose:** ANOVA (Analysis of Variance) is used to compare three or more group means.
- Instead of doing multiple t-tests (which increases error), ANOVA controls Type I error.
- **Key idea:** Examines variance between groups vs. within groups using F-ratio.

One-Way **vs.** Two-Way ANOVA

One-way ANOVA:

Single independent variable with 3+ levels (e.g., low, medium, high stress groups).

Two-way ANOVA:

Two independent variables, examines main effects & interaction (e.g., gender × therapy type).

- F-ratio:

$$F = \frac{\text{Variance between groups}}{\text{Variance within groups}}$$

- Higher F → greater likelihood of significant differences.

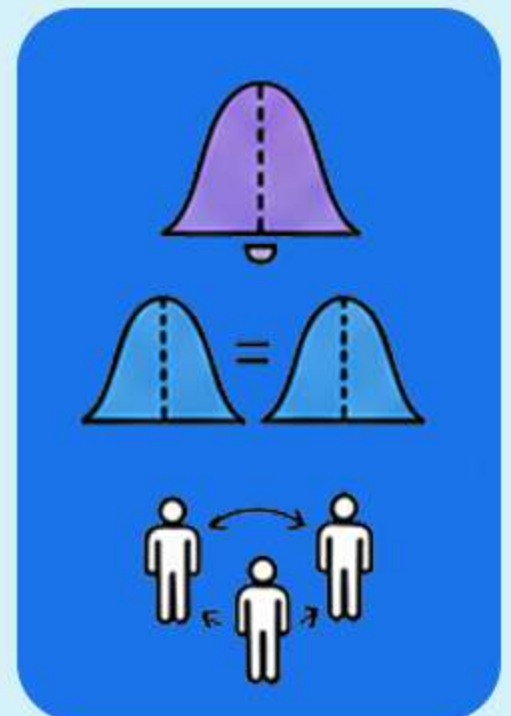
Post-Hoc Tests & Assumptions

- **Significant F?** → Need post-hoc tests (Tukey, Bonferroni) to identify which groups differ.



- **Assumptions:**

1. Normal distribution of residuals
2. Homogeneity of variance
3. Independent observations



- **Exam tip:**

Questions may ask about assumptions or how to interpret F-ratio and post-hoc tests.

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Q1. d) Repeated-measures ANOVA

**Q2. c) ANOVA controls the inflation of
Type I error**