PREP Statistics – Lecture 25–26 (Part 2): Question Plan & Rationale

This plan removes the 10 questions covered in Lecture 1 (Original Q# 4, 5, 1, 2, 3, 8, 9, 6, 7, 26) and sequences a new set of 10 questions to build from measurement validity into hypothesis testing, test selection, effect size, confidence intervals, and survival analysis.

# Part 1: Validity & Reliability (Measurement Foundations)

1. Question 11: Reliability vs Validity (Inter‑rater reliability)

We open Lecture 2 by tightening measurement foundations—how consistent are tools between raters—before talking about whether results generalize.

Key teaching hooks:

• Differentiate reliability (repeatability) vs validity (truth).

• Name three reliability types: test–retest, internal consistency, inter‑rater.

Where it appears in the deck: introduce as a clinical vignette, give think‑time, then reveal answer and teaching points.

1. Question 12: External Validity (Generalizability)

Immediately after reliability, we ask: do results apply to our patients? This sets up external vs internal validity trade‑offs.

Key teaching hooks:

• Contrast external vs internal validity; why RCTs may trade breadth for rigor.

• Map the vignette to generalizability limits (setting, eligibility).

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# Part 2: Hypothesis Testing & Error (What “significant” means)

1. Question 21: P‑values & Rejecting the Null

With validity in place, we revisit hypothesis testing—what a p‑value means and, critically, what it does not.

Key teaching hooks:

• P is P(Data | H0), not P(H0 | Data).

• P<0.05 ≠ effect size; bring up magnitude vs significance.

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1. Question 17: Power & Type II Error (β)

From p‑values to power: how study design choices (sample size/effect size) change the chance of missing a real effect (β).

Key teaching hooks:

• Power = 1−β; how low power inflates false‑negative risk.

• Levers: sample size, α, effect size, variance.

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1. Question 13: Type I vs Type II Errors—Null not rejected

A second look at Type I/II errors using a different vignette reinforces the error taxonomy residents will see in papers.

Key teaching hooks:

• Type II error when failing to reject H0 though a difference exists.

• Link to repeat‑study success with larger N.

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# Part 3: Choosing the Right Test

1. Question 28: Comparing >2 Means (ANOVA)

We move into test selection—when there are >2 groups and a continuous outcome, ANOVA is the workhorse.

Key teaching hooks:

• >2 groups + continuous outcome ⇒ ANOVA (normality assumption).

• When non‑parametric: Kruskal–Wallis.

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1. Question 34: Comparing Proportions (Chi‑square)

Then the parallel for categorical outcomes: chi‑square for independent groups and proportions.

Key teaching hooks:

• Independent groups + categorical outcome ⇒ χ² (or Fisher if small counts).

• Differentiate χ² vs McNemar (paired).

Where it appears in the deck: introduce as a clinical vignette, give think‑time, then reveal answer and teaching points.

# Part 4: Effect Size & Precision

1. Question 29: Effect Size: Absolute Risk Reduction & NNT

After significance, we teach clinical significance with effect size—ARR and the intuitive NNT.

Key teaching hooks:

• Compute ARR then NNT = 1/ARR.

• Discuss time horizon and patient‑important outcomes.

Where it appears in the deck: introduce as a clinical vignette, give think‑time, then reveal answer and teaching points.

1. Question 39: Confidence Intervals (Meaning & Misinterpretations)

Next, precision and practical significance: interpreting 95% CIs and avoiding common pitfalls.

Key teaching hooks:

• 95% CI = precision around estimate; overlapping CIs and significance.

• CI ≠ ‘95% of values’; avoid misreads.

Where it appears in the deck: introduce as a clinical vignette, give think‑time, then reveal answer and teaching points.

# Part 5: Time‑to‑Event Thinking

1. Question 37: Time‑to‑Event: Kaplan–Meier & Censoring

We finish with survival analysis—the right tool when outcomes occur over time with censoring.

Key teaching hooks:

• Kaplan–Meier steps, censoring types, log‑rank test.

• Hazard ratio vs risk ratio intuition.

Where it appears in the deck: introduce as a clinical vignette, give think‑time, then reveal answer and teaching points.