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Framing statistical hypothesis (steps statistical test, p-value)

BioCEP - 621

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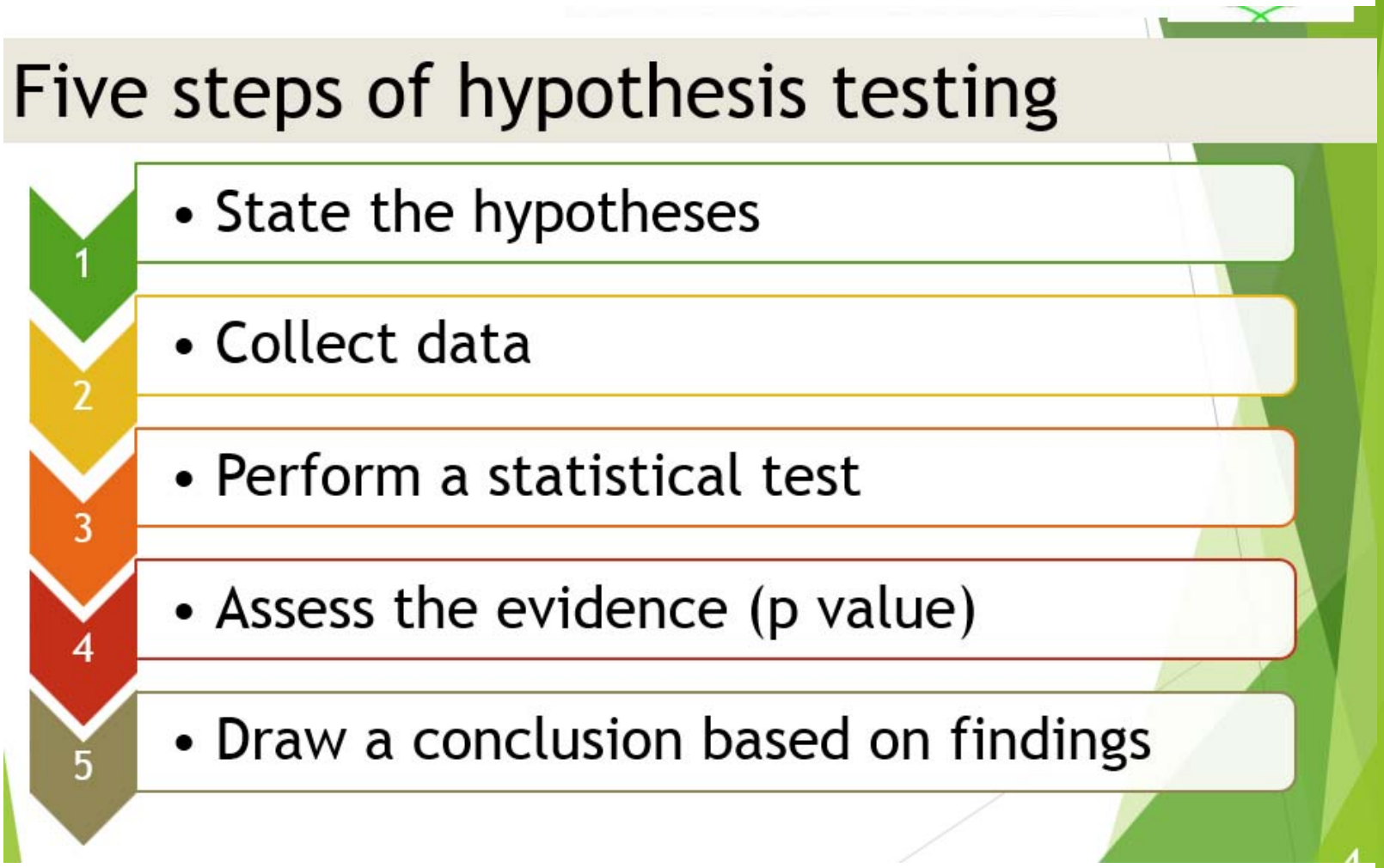
Part 1

Part 2

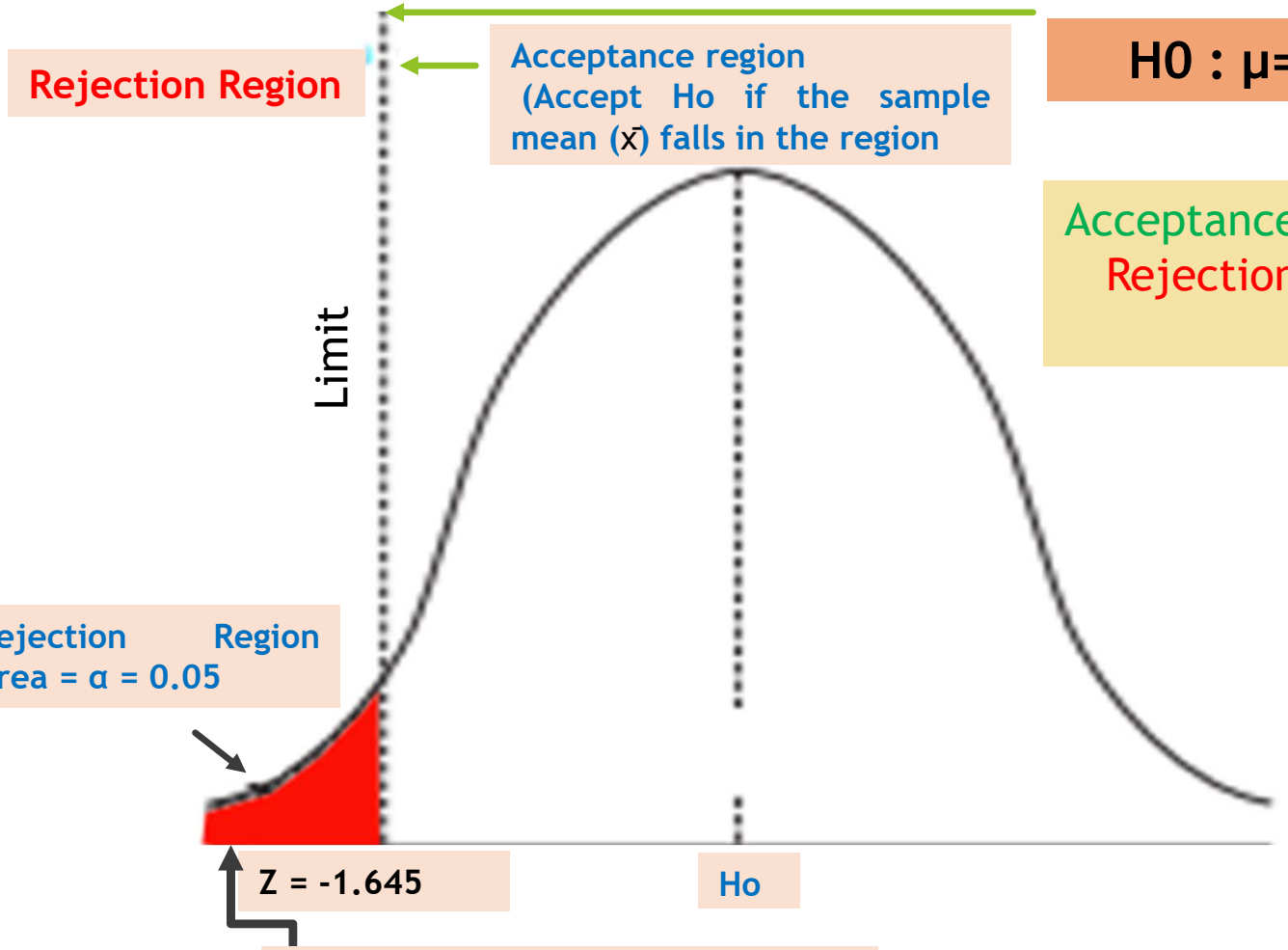

Five steps of hypothesis testing
1
• State the hypotheses
2
• Collect data
3
• Perform a statistical test
4
• Assess the evidence (p value)
5
• Draw a conclusion based on findings

Step 3 **Perform a statistical test**

- Use a statistical model
- Many statistical models
- Model assumption
- Determine a test statistic, a value derived from data that is used to decide whether to reject or fail to reject the null hypothesis.

One-tailed Test

Acceptance and rejection regions in case of a one tailed test (left tail) with 5% significant level



$H0 : \mu = \mu_{H0}$ and $Ha : \mu < \mu_{H0}$

Acceptance Region *A* : $Z > -1.645$

Rejection Region *R* : $Z \leq -1.645$

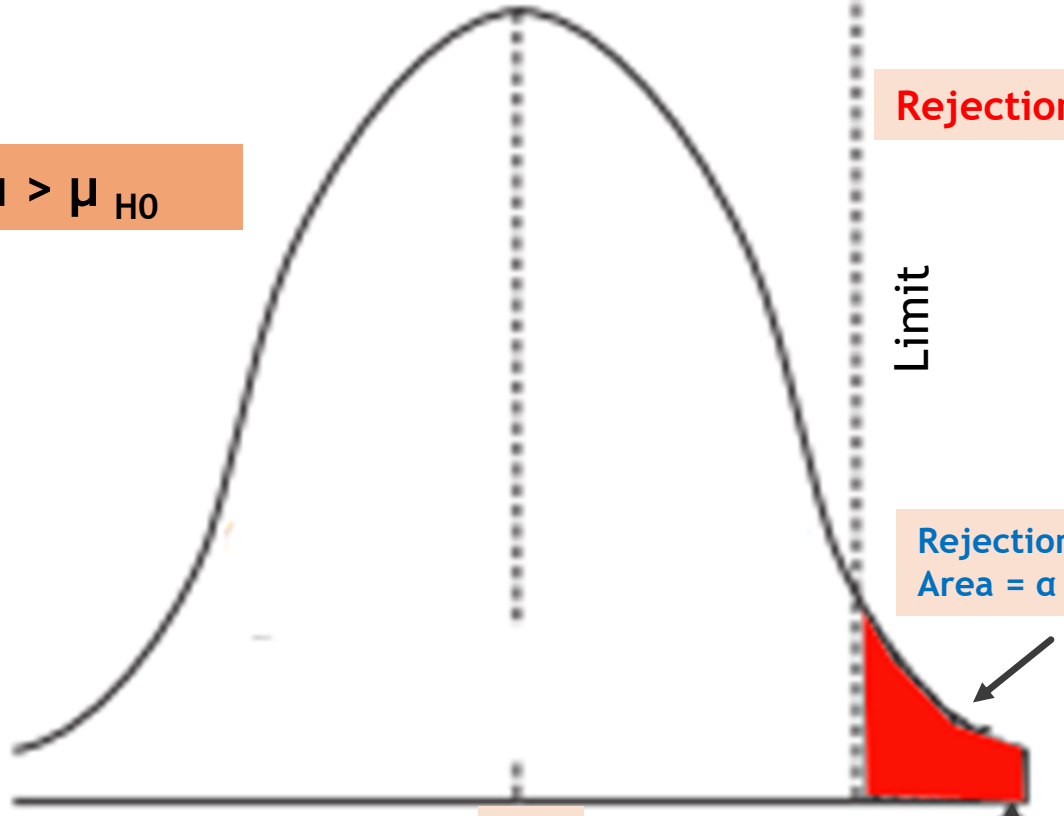
One-tailed Test

Acceptance and rejection regions in case of a one tailed test (right tail) with 5% significant level

Acceptance region (Accept Ho if the sample mean ($\bar{x}$) falls in the region

Rejection Region

$H0 : \mu = \mu_{H0}$ and $Ha : \mu > \mu_{H0}$



Reject Ho if the sample mean ($\bar{x}$) falls in this region

Acceptance Region *A* : $Z \leq 1.645$

Rejection Region *R* : $Z > 1.645$

Two-tailed test

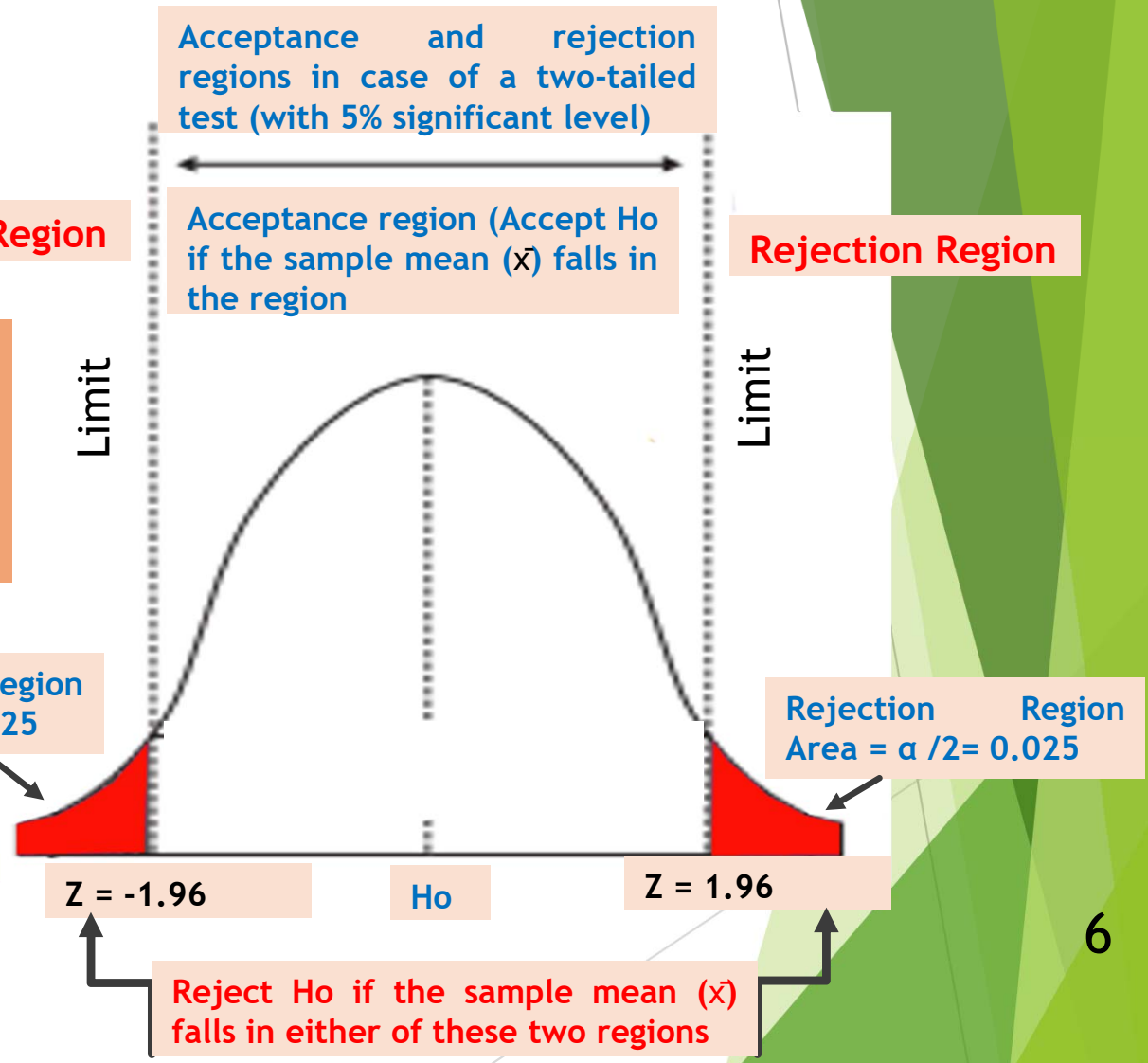
Two-tailed Test

$\alpha = 0.05$

$H0 : \mu = \mu_{H0}$

$Ha : \mu \neq \mu_{H0}$

$(\mu > \mu_{H0}$ or $\mu < \mu_{H0})$



Acceptance Region *A* :/Z/ ≤ 1.96

Rejection Region *R* :/Z/ ≥ 1.96

Step 4

Assess the evidence (p value)

- **p-value:** the probability, assuming that the null hypothesis is true, of getting a value of the test statistic at least as extreme as the computed value for the test.

- If the p-value is smaller than the significance level α, *Ho* is rejected.
- If the p-value is larger than the significance level α, *Ho* is accepted.

p-value	evidence
<0 .01	Very strong evidence against *Ho* (reject Ho)
0.01 -0.05	Strong evidence against *Ho* (reject Ho)
0 .05 - 0.10	Weak evidence against *Ho* (accept Ho)
>0.1	little or no evidence against *Ho* (accept Ho)

Example- In the analysis of the difference in average height between men and women,

Ho : Men are, on average, not taller than women.

Ha : Men are, on average, taller than women.

Ans : p = 0.02 (<0.05) *Ho* = reject

Step 5 Draw a conclusion based on findings

- Based on step 3 and 4
- draw a conclusion about the null hypothesis
- Explain whether the null hypothesis was supported or refuted
- If null hypothesis was refuted, this result is interpreted as being consistent with alternate hypothesis.

Read and Study

- Let's see the link http:// www. pdf drive engine and look for the references of statistics books below as:

1. **Maurice A. G. 2018.** Inferential Statistics and Probability. A Holistic Approach. De Anza College department of mathematics. 324pp.
2. **Dharmaraja Selvamuthu and Dipayan Das. 2018.** Introduction to Statistical Methods, Design of Experiments and Statistical Quality Control. SBN 978-981-13-1735-4 ISBN 978-981-13-1736-1 (eBook). https://doi.org/10.1007/978-981-13-1736-1.
3. **Kothari, C. R.** 2004. Research methodology, methods and techniques. Published by New Age International (P) Ltd., Publishers. **ISBN (13) : 978-81-224-2488-1.**

Homework

Instruction

- Download the file under the topics of Assignment from Google classroom. **(File name – Hypothesis testing- part 2)**
- Do your assignment and submit it before deadline.
- When you submit your assignment, you have to type **your full name** in your assignment folder.

See you next class