PRODUCT ANALYTICS

Topic

Hypothesis Testing & A/B Testing

- Null Hypothesis (H_0)
- Alternative Hypothesis (H_1)
- Statistical test used and justification
- Test statistic value
- p-value
- Final conclusion

- Assume significance level $\alpha = 0.05$ unless stated otherwise.

Question 1: Checkout Time Reduction

A product manager at a food delivery app wants to evaluate whether a new checkout flow reduces the time taken to place an order. The same 10 users were observed before and after the checkout redesign.

Data Collected (Time in Seconds)

User	Old Checkout	New Checkout
1	120	95
2	98	80
3	150	140
4	110	90
5	135	100

6	160	150
7	140	115
8	125	100
9	155	130
10	145	120

Tasks

- State the null and alternative hypotheses.
- Identify the appropriate statistical test and justify your choice.
- Perform the test using Excel.
- Report:
  - Mean of both conditions
  - t-statistic
  - p-value
- Conclude whether the new checkout significantly reduces time.

Question 2: Device Type vs Purchase Intention

An e-commerce company wants to determine whether device type influences purchase intention. The following data was collected for users who added items to the cart.

Observed Data

Device Type	Purchased	Did Not Purchase
Mobile	180	220
Desktop	140	160

Tasks

- Define the null and alternative hypotheses.
- Explain why the Chi-Square test is appropriate.
- Calculate using Excel:
  - Expected frequencies
  - Chi-square statistic
  - Degrees of freedom
  - p-value
- Interpret the results:
  - Is purchase behavior dependent on device type?
  - Based on observed proportions, which device performs better?

Question 3: Watch Time Comparison

A streaming platform tests whether premium users watch more content per day compared to free users. Daily watch time (in minutes) was recorded for two independent groups.

Data Collected

Free Users: 35, 40, 38, 42, 36, 39, 41, 37, 34, 40
Premium Users: 55, 58, 60, 62, 57, 59, 61, 56, 60, 58

Tasks

- Write the null and alternative hypotheses.

- Justify the choice of an independent samples t-test.
- Perform the test using Excel.
- Report:
  - Mean of both groups
  - t-statistic
  - p-value
- Conclude whether premium users watch significantly more content.

Question 4: Landing Page A/B Test

A SaaS company is testing a new landing page to improve signup conversion rate. An A/B test was conducted for one week.

Experiment Data

Variant	Visitors	Signups
A (Old Page)	4,000	320
B (New Page)	4,500	405

Tasks

- Define the null hypothesis.
- Define the alternative hypothesis (directional).
- Explain why a Z-test for proportions is appropriate.
- Compute in Excel:

  - Conversion rates
  - Pooled proportion
  - Z-statistic
  - p-value

- Determine whether Variant B performs significantly better.
- Provide a recommendation on whether the company should roll out the new landing page.