A/B Testing:

→ It is a statistical method used to compare two versions of a product or service to determine which one performs better.

- **Version A:** current layout of the product page.
- **Version B:** A modified layout of the product page.

V_A conversion rate = 30 out of 500 (6%)

V_B conversion rate = 45 out of 500 (9%)

⇒ we want to determine whether the difference between 2 versions is statistically significant.

→ **Hypothesis Test:** specifically a two-sample portion z-test to compare the conversion rates.

H_0: no difference in conversion rates b/w A & B $p_A = p_B$

H_a: difference between version A and B $p_A \neq p_B$

$$Z = \frac{(P_A - P_B)}{\sqrt{\frac{S_A^2}{n_A} + \frac{S_B^2}{n_B}}}$$

$$Z = \frac{(P_A - P_B)}{\sqrt{\frac{P_A(1-P_A)}{n_A} + \frac{P_B(1-P_B)}{n_B}}}$$

$$Z = \frac{(0.06 - 0.09)}{\sqrt{\frac{0.06\,(1-0.06)}{500} + \frac{0.09(1-0.09)}{500}}}$$

$$Z = \frac{-0.03}{\sqrt{\frac{0.0564}{500} + \frac{0.0819}{500}}}$$

$Z = -1.806$

↳ two-tailed p-value is approximately $= 0.071$

$\alpha = 0.05$ p-value $> \alpha$

↳ fail to reject H_0

χ^2 - Test:

same way we can test:

→ T-test
→ χ^2- test
→ Fisher's Exact Test

	Converted	Not converted	T
Layout A	20	80	100
Layout B	30	70	100
T	50	150	200

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

$$E_i = \frac{(\text{row total})(\text{column total})}{\text{grand total}}$$

25	75
25	75

$$\chi^2 = \frac{(20-25)^2}{25} + \frac{(80-75)^2}{75} + \frac{(30-25)^2}{25} + \frac{(70-75)^2}{75}$$

$$= 1 + \frac{1}{3} + 1 + \frac{1}{3} = 2 + \frac{2}{3}$$

$$= 2.67$$

$$df = (r-1) * (c-1)$$
$$= (2-1) * (2-1) = 1$$

Now gate values from χ^2 - table and compare with $\alpha = 0.05$