TOPIC: CHI-SQUARE INDEPENDENCE TEST

Independence Test

◆ Recall: Two variables are **Independent** if neither one affects the other.

► An **Independence Test** is a G.O.F. Test where "claimed" dist. = E's of the ___ variables (assumed *independent*).

EXAMPLE

Using the following data of the heights of students at a local high school, you find $\chi^2 = 3.32$. Test if height & grade are independent using $\alpha = 0.05$.

	5'1-5'6	5'7-6'0	6'1-6'6
9th	$O = 40$ $E = 34.43$	$O = 27$ $E = 29.17$	$O = 10$ $E = 12.91$
10th	$O = 32$ $E = 37.12$	$O = 34$ $E = 31.45$	$O = 17$ $E = 13.92$

Recall: Goodness of Fit Test | **New: Independence Test**

1) Hypothesis

H_0: Obs. freq's match claimed dist.

H_a: Obs. freq's DO NOT match claimed dist.

H_0: Variables are _____.

H_a: Variables are _____.

2) Test Stat

$E = \frac{n}{k}$ *(claimed prob's SAME)*

$E = np$ *(claimed prob's DIFF)*

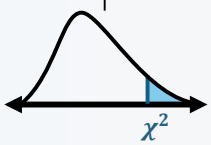
$\chi^2 = \sum \frac{(O-E)^2}{E}$

$E = \frac{row\ total \cdot col\ total}{Grand\ Total}$

$\chi^2 = 3.32$

3) P-value

$df = k - 1$



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

P-value = Area "beyond" χ^2

df = ___

r = # of rows

c = # of columns

P-value = _____

4) Conclusion

Because P-value **[< | >]** α, we **[REJECT | FAIL TO REJECT]** H_0.

There is **[ENOUGH | NOT ENOUGH]** evidence that the variables are dependent.

Criteria

Random Samples? ☐

Observed freq. for each category? ☐

$E \geq 5$ for each category? ☐

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EXAMPLE

A retail store is testing two different promotional strategies **(Discount Coupon & Free Shipping)** to see which is more effective at encouraging purchases. Customers were randomly offered one of the two promotions. The store recorded whether each customer made a purchase or did not. At the 0.05 level of significance, is there evidence to suggest that customer response (purchase or not) is dependent on the type of promotion offered?

Random Samples? ☐

Observed freq. for each category? ☐

$E \geq 5$ for each category? ☐

H_0:

H_a:

$\chi^2 =$

$r = \#rows =$ ___ $c = \#col's =$ ___ $df =$ _____ = ___

P-value = _____

Because P-value **[< | >]** α, we **[REJECT | FAIL TO REJECT]** H_0.

There is **[ENOUGH | NOT ENOUGH]** evidence to support H_a.

The variables appear to be **[INDEPENDENT | DEPENDENT]**.

		Purchased?		
		Yes	**No**	**Total**
Promotion	**Coupon**	52	48	**100**
	Free Shipping	45	55	**100**
	Total	**97**	**103**	**200**

Recall

$$E = \frac{row\ total \cdot col\ total}{Grand\ Total}$$

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

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

(Independence Test)