

A teacher wants to summarize the exam scores of a class of 50 students. The scores (out of 100) are as follows:

75	85	92	88	73	95	80	77	85
76	86	93	89	74	96	81	78	86
73	83	90	86	71	93	78	75	83
77	78	75	85	86	83	90	91	88
82	97	79	77	75	80	86	84	85

Measures of central tendency

Mode:

Median:

Population mean:

Measures of variability

Range:

Population variance

Population standard deviation

nts to understand the overall performance and variability.

90
91
88
90
82

class	the upper limit of the class	frequency
(70;75>		
(75;80>		
(80;85>		
(85;90>		
(90;95>		
(95;100>		

A company wants to know if customer preferences for three types of products are as expected. They believe that 50% of customers prefer Product A, 30% prefer Product B, and 20% prefer Product C. They conduct a survey of 200 customers to test this hypothesis.

From the survey, the company records the following **observed counts**:

Product A: 90 customers

Product B: 70 customers

Product C: 40 customers

Test at the alpha significance level 0.05

Null hypothesis (H0): Customer preferences match the expected distribution.

Alternative hypothesis (H1): Customer preferences do not match the expected distribution.

	O_i (Observed)	E_i (Expected)
Product A	90	
Product B	70	
Product C	40	

products—Product A, Product B, and Product C—match the market's expected distribution (50% for Product A, 30% for Product B, and 20% for Product C).

S:

distribution (50% for Product A, 30% for Product B, and 20% for Product C).
The expected distribution.

Test criterion

cted preference distribution.

A researcher wants to determine if there is an association between gender and movie preference. The researcher surveys 200 people, and the data collected is summarized in the following table:

	Action	Comedy	Drama
Male	40	30	20
Female	10	50	50
Total			

The goal is to test if there is a significant association between gender and movie preference. Test at the alpha significance level 0.05.

Null hypothesis (H_0): Gender and movie preference are independent.

Alternative hypothesis (H_1): Gender and movie preference are not independent.

Expected frequencies

	Action	Comedy	Drama
Male			
Female			

gender and preference for three types of movies: Action, Comedy, and Drama, summarized in the table below:

Total

gender and movie preference.

independent (no association).

not independent (there is an association).

Test criterion

	Action	Comedy
Male		
Female		

and Drama.

Drama

A nutritionist wants to test whether three different diets—Diet A, Diet B, Diet C. To do this, they assign a group of people to each diet and measure their weight loss. The nutritionist wants to determine if the diet type significantly affects weight loss.

Null hypothesis (H0): The mean weight loss is the same for all diets, i.e.

Alternative hypothesis (H1): At least one diet leads to a different mean weight loss.

Test at the alpha significance level 0.05

The weight loss (in kg) for participants in each diet group is as follows:

DIET A	4	5	6	5	7
DIET B	8	7	9	8	10
DIET C	3	2	4	3	3

and Diet C—lead to different average weight loss outcomes.
weight loss (in kilograms) after 8 weeks.
weight loss.

there is no dependance
weight loss. **(There is dependance)**

Suppose a researcher wants to test how two factors—type of fertilizer affect plant growth (measured in centimeters).

Each combination of fertilizer type and sunlight level is tested on one p

Test at the alpha significance level 0.05

Main Effect of Fertilizer: Whether different types of fertilizer lead to d

H0: No significant difference in plant growth between Fertilizer X and

Main Effect of Sunlight Level: Whether different levels of sunlight lead

H0: No significant difference in plant growth across different sunlight

The researcher collects the following growth measurements (in cm) for

Sunlight Level	Fertilizer X	Fertilizer Y
Low	12	14
Medium	20	22
High	30	25

(Fertilizer X and Fertilizer Y) and sunlight level (Low, Medium, High)—

plant (hence, no replication for each combination).

different average growth.

Fertilizer Y.

to different average growth.

levels.

for each combination of **fertilizer type** and **sunlight level**:

