**Task 1:**

**1. Blood glucose levels for obese patients have a mean of 100 with a standard deviation of 15. A**

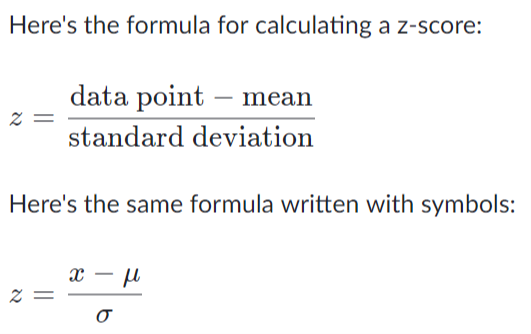
**researcher thinks that a diet high in raw cornstarch will have a positive effect on blood glucose**

**levels. A sample of 36 patients who have tried the raw cornstarch diet have a mean glucose**

**level of 108. Test the hypothesis that the raw cornstarch had an effect or not.**

**Solution:**

Given data: Mean= 100, Standard deviation = 15, sample = 36, and level = 108.



Here, σmean = σ / √N = 15 / √36 =2.5

z = 108-100/2.5 = 3.2

So it Rejects the null hypothesis.

**2. In one state, 52% of the voters are Republicans, and 48% are Democrats. In a second state, 47% of the voters are Republicans, and 53% are Democrats. Suppose a simple random sample of 100 voters are surveyed from each state. What is the probability that the survey will show a greater percentage of Republican voters in the second state than in the first state?**

## Solution:

## State\_1\_ Republicans 52

## State\_1\_Democrats 48

## State\_2\_Republicans 47

## State\_3\_Democrats 43

## The mean of difference in sample proportion is 0.05.

## Standard deviation of the differences

## 1\_Value 0.00249600

## 2\_Value 0.00249100

## Standard Deviation both = 0.07061869

## Probability of P1 is less than P2 by -0.708

## Using Normal Distribution calculator

## P(z < = 0.7082) = 0.24

## The probability of a z-score being -0.7082 or less is 0.24

**3. You take the SAT and score 1100. The mean score for the SAT is 1026 and the standard deviation is 209. How well did you score on the test compared to the average test taker?**

## Solution:

|  |  |
| --- | --- |
| SCORE | 1100.00 |
| SAT | 1026.00 |
| STD | 209.00 |
| Z-Score | 0.35 |

Now, check the z-value from z table for the percentage of test – seeker scored.

A z-score of .354 is .1368 + .5000\* = .6368 or 63.68%.

# **TASK 2**

**4. Is gender independent of education level? A random sample of 395 people were surveyed**

**and each person was asked to report the highest education level they obtained. The data that**

**resulted from the survey is summarized in the following table:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **High School** | **Bachelors** | **Masters** | **Ph.d.** | **Total** |
| **Female** | **60** | **54** | **46** | **41** | **201** |
| **Male** | **40** | **44** | **53** | **57** | **194** |
| **Total** | **100** | **98** | **99** | **98** | **395** |

**Question: Are gender and education level dependent at 5% level of significance? In other**

**words, given the data collected above, is there a relationship between the gender of an**

**individual and the level of education that they have obtained?**

**Solution:**

## H0: Gender and education independent

## H1: Gender and education dependent

## The Expected frequency under the null hypothesis is given

E = row total \* column total / sample size

Row totals and column totals are given above sample size = 395

Therefore, we have expected frequencies as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **High School** | **Bachelors** | **Masters** | **Ph.d.** |
| **Female** | **50.886** | **49.868** | **50.377** | **49.377** |
| **Male** | **49.114** | **48.132** | **48.623** | **48.132** |

Therefore, Χ2 = 1.632 + 0.342 + 0.38 + 1.577 + 1.691 + 0.355 + 0.394 + 1.634 = 8.006

Χ20.95 for degrees of freedom 3 = 7.815.

Since 8.006 > 7.815, we reject the null hypothesis. Therefore, gender and education are dependent.

**5. Using the following data, perform a one-way analysis of variance using α=.05. Write up the**

**results in APA format.**

**[Group1: 51, 45, 33, 45, 67]**

**[Group2: 23, 43, 23, 43, 45]**

# **[Group3: 56, 76, 74, 87, 56]**

## Solution:

H0:μ1 =μ2 =μ3   
H1: Population means are not equal

Sum of squares between Treatments = Σ nj(X̄j - X̄)2

Sum of squares (Error) = ΣΣ (X - X̄j)2

Test-statistic = Σ nj(X̄j - X̄)2 / (k - 1) / ΣΣ (X - X̄j)2 / (N-k) where k = 3, N = 15

Source of Variation Sums of Squares Degrees of Freedom Mean Squares F between

Treatments: 3022.93 21511.47 9.75   
Error or Residual 1860.8 12 155.07

F0.5(2,12)=3.885

Since, 9.75>3.885, We Reject the null hypothesis.

Therefore, the population means are not equal.

In APA format, A one-way between subjects ANOVA was conducted to compare the effect of the group on values in group 1, group 2 and group 3. There was a signficant effect of group on values at α = 0.05 level for group 1, group 2, group 3.

**6.Calculate F Test for given 10, 20, 30, 40, 50 and 5,10,15, 20, 25.**

## Solution:

Sample variance s2 = Σ(X - X̄)2/ N-1

s12 = (400.0 + 100.0 + 0.0 + 100.0 + 400.0)/4 = 250.0

s22 = (100.0 + 25.0 + 0.0 + 25.0 + 100.0)/4 = 62.5

F-statistic = s12/s22 = 250/62.5 = 4