**ASSIGNMENT 3.1**

**Problem Statement-1:**

As voters exit the polls, you ask a representative random sample of 6 voters if they voted for proposition 100. If the true percentage of voters who vote for the proposition is 55.1%, what is the probability that, in your sample, exactly 2 voted for the proposition and 4 did not?

**Solution:**

Probability(True)=55.1/100=0.551

Probability(False)=1-0.551=0.449

Using Binomial Distribution as,

* Total number of trails is fixed
* Only 2 possible outcomes, True or False
* Outcomes are statistically Independent
* All the trails have same probability of success

P(X=x) = (nCx )\*(p^x)\* ((1-p)^ (n-x))

Here,

P(X=2) = nCx\*(P(True)^x)\*(P(False)^(n-x))

Therefore,

P(X=2) = (6C2) \* (0.551^2) \* (0.449^4)

= 15 \* 0.303601 \* 0.0406429362

= 0.1850886

Therefore,

Probability(Exactly 2 Voted for the proposition) = 0.1850886

**Problem Statement-2:**

Professor Willoughby is marking a test.

Here are the students’ results (out of 60 points):

20, 15, 26, 32, 18, 28, 35, 14, 26, 22, 17

Most students didn't even get 30 out of 60, and most will fail.

The test must have been really hard, so the Prof decides to standardize all the scores and only fail people 1 standard deviation below the mean. So who will fail?

**Solution:**

The Test Results are: 20, 15, 26, 32, 18, 28, 35, 14, 26, 22, 17

Mean of the results = ((20+15+26+32+18+28+35+14+26+22+17)/11) = 23 Marks

Standard Deviation of the results = 6.633249581

Standardising marks using Z-Score,

Z-score= (x-μ)/σ

Here,

μ= 23 and σ= 6.633249581

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S. No** | **Marks** | **Mean** | **Standard Deviation** | **Z-Score** | **Test Result** |
| 1 | 20 | 23 | 6.633249581 | -0.452267017 | Pass |
| 2 | 15 | -1.206045378 | Fail |
| 3 | 26 | 0.452267017 | Pass |
| 4 | 32 | 1.356801051 | Pass |
| 5 | 18 | -0.753778361 | Pass |
| 6 | 28 | 0.753778361 | Pass |
| 7 | 35 | 1.809068067 | Pass |
| 8 | 14 | -1.356801051 | Fail |
| 9 | 26 | 0.452267017 | Pass |
| 10 | 22 | -0.150755672 | Pass |
| 11 | 17 | -0.904534034 | Pass |

Therefore,

Students who scored 15 marks and 14 marks fall below one standard deviation away from the mean and therefore declared as “Fail” and the rest all students are declared as “Pass”.