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

This problem is of Binomial Probability where the outcome of experiment is either ‘yes’ OR ‘ no’.

Here

n = 6

P = 0.551

x = 2

Then

b(x; n,p) = nCx \* Px \* (1-P)n-x

= 6C2 \* P2 \* (1-P) 6-2

= [6! / (2! \* 4!) ] \* 0.5512 \* (1-0.551) 4

= (6 \* 5\*4 \* 2\*1 / 2 \* 1 \* 4\* 3\*2\*1) \* 0.304 \* 0.449 4

= 15 \* 0.304 \* 0.041

= 0.185

Thus 0.185 (18.5 %) is the probability that exactly 2 voted for the proposition.

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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 data ( student and results) is arranged in table and below values have been calculated

1. Mean
2. Difference with mean
3. Square of difference with mean
4. Sum of Squares of difference with mean

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| STUDENT | RESULTS | MEAN | X- MEAN | SQR ( X- MEAN) |
| 1 | 20 | 23 | -3 | 9 |
| 2 | 15 | 23 | -8 | 64 |
| 3 | 26 | 23 | 3 | 9 |
| 4 | 32 | 23 | 9 | 81 |
| 5 | 18 | 23 | -5 | 25 |
| 6 | 28 | 23 | 5 | 25 |
| 7 | 35 | 23 | 12 | 144 |
| 8 | 14 | 23 | -9 | 81 |
| 9 | 26 | 23 | 3 | 9 |
| 10 | 22 | 23 | -1 | 1 |
| 11 | 17 | 23 | -6 | 36 |
|  | 253 |  |  | 484 |

Now, Standard Deviation = SQRT (sum of Squares of difference with mean / N )

= SQRT (484 / 11)

= SQRT (44)

= 6.63

Now score below one standard deviation from mean = Mean – Standard Deviation

= 23 – 6.63

= 16.37

Hence Students with scores below 16.37 will fail.

i.e. two Students with scores 15 and 14 will fail.