GARVIT SHH
F-24

EXPERIMENT: No. 02

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Date

- **Aim**: Study of probability distribution for two option system.

- **Apparatus**: Identical coins

- **Theory**:

A probability distribution is a statistical function that describes all the possible values and likelihoods that a random variable can take within a given range. This range will be bounded between the min. & max. possible values, but precisely where the possible value is likely to be plotted on the probability distribution depends on a no. of factors. These factors include the distribution mean, standard deviation, skewness.

For instance, if x is used to denote the outcome of a coin toss ("the experiment") then the probability distribution of x would take the value 0.5 for X = heads and 0.5 for x = tails (assuming that the coin is fair)

Perhaps the most common probability is the normal distribution or "bell curve" although several distributions exist that are commonly used.

Sundaram

Teacher's Sign. : _____

Typically, the data generating process of some phenomenon will dictate its probability distribution. The process is called the probability density function.

Probability distributions can also be used to create cummulative distribution functions (CDFs) which adds up the probability of occurences cummulatively and will always start at zero and end at 100%.

Probability function: describes the probability $P(x \in E)$ that the event E, from the sample space occurs.

Frequency distribution: a table that displays the frequency of various outcomes in a sample.

- Procedure:

1. First we have to take the 12 identical coins (assuming that the coin is fair)
2. Pick the coins in the hand and mix them, after mixing the coins throw them on the ground.
3. Observe the coins and note the no. of heads we get.
4. Make a column in the observation table for no. of heads we get.

5. Repeat the process 100 times.
6. After doing it, convert bar system into digit and find observed frequency F(r).
7. Now find the Theoretical Frequency (NP(r)) with the help of formula.
8. After all this, now plot the graph freq. (both) vs no. of heads up (r).

- Conclusion -

Observed & Theoretical Frequencies are in good agreement with each other.

EXP 02

## Observations :

- No. of trials (N) = 100
- No. of coins thrown together (n) = 12
- n! = 12! = 479,001,600

$$NP(r) = \frac{N.\ n!}{2^n\ (n-r)!\ r!}$$

## Observation Table :

| No. of Heads ↑ (r) | Observed Freq. F(r) | | r! | No. of Tails ↑ (n-r) | (n-r)! | Theoretical Freq. NP(r) |
|---|---|---|---|---|---|---|
| | Tally Marks | Nos. | | | | |
| 0 | | 0 | 0 | 12 | 479,001,600 | 0.02 |
| 1 | | 0 | 1 | 11 | 39,916,800 | 0.29 |
| 2 | I | 1 | 2 | 10 | 3,628,800 | 1.61 |
| 3 | 卌 II | 7 | 6 | 9 | 362,880 | 5.40 |
| 4 | 卌 III | 8 | 24 | 8 | 40,320 | 12.08 |
| 5 | 卌 卌 III | 18 | 120 | 7 | 5,040 | 19.33 |
| 6 | 卌 卌 III | 23 | 720 | 6 | 720 | 22.50 |
| 7 | 卌 卌 III | 24 | 5040 | 5 | 120 | 19.33 |
| 8 | 卌 II | 12 | 40,320 | 4 | 24 | 12.08 |
| 9 | IIII | 4 | 362,880 | 3 | 6 | 5.4 |
| 10 | II | 2 | 3,628,800 | 2 | 2 | 1.61 |
| 11 | I | 1 | 39,916,800 | 1 | 1 | 0.29 |
| 12 | | 0 | 479001600 | 0 | 0 | 0.02 |

## Calculations

For $r = 1 \Rightarrow NP(1) = \frac{100 \times 12!}{11! \times 1! \times 2^{12}} = \frac{1200}{4096} = 0.29$

For $r = 6 \Rightarrow NP(6) = \frac{100 \times 12!}{6!\ 6!\ 2^{12}} = \frac{92400}{4096} = 22.5$

## Exp - 02

SCALE
X axis 1 unit = 1 coin
Y axis 1 unit = 2 heads