Experimental and Theoretical Probability

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What is Theoretical Probability?

It is the probability that a certain outcome will occur as determined through reasoning or calculation.

What is the Formula for Theoretical Probability?

$$P(E) = \frac{\text{number of ways the event can happen}}{\text{total number of possible outcomes}} = \frac{n(E)}{n(S)}$$

Example

A 52-card pack is well shuffled and then one card is drawn from the top of the pack. Determine that it is a black number card.

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$$P(\text{black number card}) = \frac{18}{52}$$

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n(black number card) = 18
n(S) = 52

$$P(\text{black number card}) = \frac{\text{n(black number card)}}{\text{n(S)}}$$

$$P(\text{black number card}) = \frac{18}{52}$$

$$P(\text{black number card}) = \frac{9}{26}$$

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n(two heads) = 1
n(S) = 4

$$P(\text{two heads}) = \frac{\text{n(two heads)}}{\text{n(S)}}$$

$$P(\text{two heads}) = \frac{1}{4}$$

What is Experimental Probability?

It is the probability of an outcome of an event based on an experiment. The more trials done in an experiment, the closer the experimental probability gets to the theoretical probability.

What is the Formula for Experimental Probability?

$$P(E) = \frac{\text{number of events}}{\text{total number of trials}} = \frac{f}{\sum f}$$

Example

A pair of coin is tossed 300 times and the results are:

Result	Two heads	Two tails	A head and a tail
Frequency	117	103	80

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$$P(\text{two heads}) = \frac{f}{\sum f} = \frac{117}{300}$$

$$P(\text{two heads}) = \frac{39}{100}$$

Practice

Determine whether experimental or theoretical probability is used in each case.

1. Cyril and Alyssa played a Pinoy game 20 times. Cyril won 12 times. The probability that Alyssa will lose the next game is 0.4.

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2. The probability getting a sum of 8 in throwing a pair of dice is $\frac{5}{36}$.

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Theoretical Probability

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3. Bernadette tossed a coin 150 times and got 81 heads and 69 tails. The probability of getting a head is 0.54.

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Experimental Probability

Practice

Determine whether experimental or theoretical probability is used in each case.

4. Anita surveyed 200 families in the barangay and recorded the number of children in each family. The survey results showed that 110 families had 2 children and 90 families had more than 2 children. The probability that the number of families with 2 children is 0.55.

Practice

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Experimental Probability

Practice

Determine whether experimental or theoretical probability is used in each case.

5. The probability of getting at least 3 heads in tossing a coin thrice is $\frac{1}{8}$.

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Theoretical Probability

Practice

Determine whether experimental or theoretical probability is used in each case.

6. The probability of drawing a red ball from a jar that contains 12 red balls, 15 blue balls and 7 white balls is 0.353.

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Theoretical Probability

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Determine whether experimental or theoretical probability is used in each case.

7. The probability of choosing a senior from 25 seniors and 25 juniors is $\frac{1}{2}$.

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7. The probability of choosing a senior from 25 seniors and 25 juniors is $\frac{1}{2}$.

Theoretical Probability

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Determine whether experimental or theoretical probability is used in each case.

8. A 7-year old boy is insured and his policy matures when he becomes 25 years old. A statistical record shows that 95,956 persons are alive at 7 years and 94,565 persons are alive at 25. With these figures, the probability that a 7-year old boy will reach the maturity of his insurance is 0.9855 or 98.55%.

Practice

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Experimental Probability

Practice

Determine whether experimental or theoretical probability is used in each case.

9. If a pair of dice is drawn, the probability of getting a sum of at most 12 is 1.

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Theoretical Probability

Practice

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10. If the probability that a 50-year old man will still live at 70 is 37%, then the probability that the man will die before the age of 70 years is 63%.

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Solve each problem completely.

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1. A coin was tossed 100 times. It fell on tails 43 times. What is the probability that a tail shows up?

$$P(tail) = \frac{f}{\sum f}$$

$$P(tail) = \frac{43}{100}$$

Practice

Solve each problem completely.

2. A coin was tossed 100 times. It fell on tails 43 times. What is the probability that a head shows up?

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2. A coin was tossed 100 times. It fell on tails 43 times. What is the probability that a head shows up?

$$P(head) = \frac{f}{\sum f}$$

$$P(head) = \frac{57}{100}$$

Practice

3. A pair of coin is tossed 300 times and the results are:

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Result	Two heads	Two tails	A head and a tail
Frequency	117	103	80

What is the probability of getting a head and a tail?

$$P(\text{a head and a tail}) = \frac{f}{\sum f} = \frac{80}{300}$$

Practice

3. A pair of coin is tossed 300 times and the results are:

Result	Two heads	Two tails	A head and a tail
Frequency	117	103	80

What is the probability of getting a head and a tail?

$$P(\text{a head and a tail}) = \frac{f}{\sum f} = \frac{80}{300}$$

$$P(\text{a head and a tail}) = \frac{4}{15}$$

Practice

4. A pair of coin is tossed 300 times and the results are:

Result	Two heads	Two tails	A head and a tail
Frequency	117	103	80

What is the probability of getting two tails?

Practice

4. A pair of coin is tossed 300 times and the results are:

Result	Two heads	Two tails	A head and a tail
Frequency	117	103	80

What is the probability of getting two tails?

$$P(\text{two tails}) = \frac{f}{\sum f}$$

Practice

4. A pair of coin is tossed 300 times and the results are:

Result	Two heads	Two tails	A head and a tail
Frequency	117	103	80

What is the probability of getting two tails?

$$P(\text{two tails}) = \frac{f}{\sum f}$$

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n(red ace) = 2
n(S) = 52

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$$P(\text{red ace}) = \frac{\text{n(red ace)}}{\text{n(S)}}$$

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5. A 52-card pack is well shuffled and then one card is drawn from the top of the pack. Determine that it is a red ace.

n(red ace) = 2
n(S) = 52

$$P(\text{red ace}) = \frac{\text{n(red ace)}}{\text{n(S)}}$$

$$P(\text{red ace}) = \frac{2}{52}$$

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5. A 52-card pack is well shuffled and then one card is drawn from the top of the pack. Determine that it is a red ace.

n(red ace) = 2
n(S) = 52

$$P(\text{red ace}) = \frac{\text{n(red ace)}}{\text{n(S)}}$$

$$P(\text{red ace}) = \frac{2}{52}$$

$$P(\text{red ace}) = \frac{1}{26}$$

Thank you for attending the virtual class.