Probability of Simple Events
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- Life is full of random events!
- You need to get a "feel" for them to be a smart and successful person.
- The toss of a coin, throw of a dice and lottery draws are all examples of random events.
Probability of Simple Events

Objective:
Students will be able to find the probability of a simple event.
Students will be able to understand the distinction between simple events and compound events.

Essential Question:
(1) How do I find the probability of a simple event?
(2) How can I distinguish between a simple and compound event?
Probability of Simple Events

**Vocabulary:** Some words have special meaning in Probability

**Experiment or Trial:** an action where the result is uncertain.

**Outcome:** one possible result of an experiment.

**Simple Event:** a specific outcome, just one of the possible outcomes.

**Sample Space:** the list of possible outcomes

**Random:** outcomes that occur at random if each outcome is equally likely to occur.

**Complementary Events:** the events of one outcome happening (E) and that outcomes not happening (not E) are complimentary or opposite; the sum of the probabilities of complementary events is 1.
Probability of Simple Events

Definition:

*Probability is the measure of the likelihood that an event will occur.*

Probability does not tell us exactly what will happen, it is just a guide.

It is the ratio of

*number of favorable outcomes* to the

*total number of possible outcomes*
CLASSICAL PROBABILITY

\[ P(\text{Event}) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}} \]

**Two Hypothesis:**

- Equally likely outcomes *and* Finished outcomes

**Property**

- The probability is a number between 0 and 1
- The probability of the certain event is 1
- The probability of the impossible event is 0

in symbols:

\[ 0 \leq P(E) \leq 1 \quad P(\text{CertainE}) = 1 \quad P(\text{IMPossibleE}) = 0 \]
**Classical PROBABILITY**

The probability of an Event can be expressed:

- as a FRACTION : $\frac{1}{4}$
- as Unitary PERCENTAGE between 0 and 1 : 0.25
- as a PERCENTAGE between 0% to 100% : 25%
### Probability of Simple Events

**Probability Line**

<table>
<thead>
<tr>
<th>0%</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impossible</td>
<td>Not Very Likely</td>
<td>Equally Likely</td>
<td>Somewhat Likely</td>
<td>Certain</td>
</tr>
<tr>
<td>0</td>
<td>(\frac{1}{4}) or .25</td>
<td>(\frac{1}{2}) or .5</td>
<td>(\frac{3}{4}) or .75</td>
<td>1</td>
</tr>
</tbody>
</table>
Examples that use Probability

1) Flip a Coin,
2) Roll a Dice,
3) Spinners
4) Pick a card from a deck of 52 Cards
5) Choose at random a ball from a box
Example 1: Flip a coin - Tossing a Coin

What is the probability of flipping a tail?

When a coin is tossed, there are two possible outcomes: head (H) or tail (T)

\[ P(\text{event}) = \frac{\# \text{ favorable outcomes}}{\# \text{ possible outcomes}} \]

\[ P(\text{tail}) = \frac{1}{2} = \frac{1}{2} \]

The probability is 1 out of 2 or .5 or 50%

Also... the probability of flipping a HEAD is \( \frac{1}{2} \).
The sample space of events can be represented by a tree diagram:

There are two "branches" (Head and Tail).

The probability of each branch is written on the branch.

The outcome is written at the end of the branch.

Notes: the **SUM** of the probabilities of the individual events is **ONE** (Total Probability).
Here is a tree diagram for the toss of a coin:
Example 2: Roll a dice - Throwing Dice

a) What is the probability of rolling a 4?

$$P(\text{event}) = \frac{\text{# favorable outcomes}}{\text{# possible outcomes}}$$

$$P(\text{rolling a 4}) = \frac{1}{6}$$

The probability of rolling a 4 is 1 out of 6.

When a single dice is thrown, there are six possible outcomes. The probability of any one of them is 1/6!
Example 2: Roll a dice.

b) What is the probability of rolling an even number? (or an odd number)

\[
P(\text{event}) = \frac{\# \text{ favorable outcomes}}{\# \text{ possible outcomes}}
\]

\[
P(\text{even \#}) = \frac{3}{6} = \frac{1}{2}
\]

The probability of rolling an even number (or an odd number) is 3 out of 6 or .5 or 50%.
Example 2

TREE DIAGRAMM
ROLL A DICE

Notes: the SUM of the probabilities of the individual events is 1 (Total Probability)
Spinners

Example 3:
What is the probability of spinning green?

\[ P(\text{event}) = \frac{\text{# favorable outcomes}}{\text{# possible outcomes}} \]

\[ P(\text{green}) = \frac{1}{4} = \frac{1}{4} \]

The probability of spinning green is 1 out of 4 or .25 or 25%
Pick a card from a Deck of 52 Cards

Example 4:
A deck of 52 cards includes thirteen ranks of each of the four suits:
- hearts (♥)
- diamonds (♦)
- spades (♠)
- clubs (♣)

Each suit has 10 numbered cards and 3 figures: jack, queen, and king.
Pick a card from a Deck of 52 Cards

What is the probability of picking a heart?

\[
P(\text{heart}) = \frac{\# \text{ favorable outcomes}}{\# \text{ possible outcomes}} = \frac{13}{52} = \frac{11}{4}
\]

The probability of picking a heart is 1 out of 4 or .25 or 25%

What is the probability of picking a not heart?

\[
P(\text{nonheart}) = \frac{\# \text{ favorable outcomes}}{\# \text{ possible outcomes}} = \frac{39}{52} = \frac{3}{4}
\]

3 out of 4 or .75 or 75%

“heart” and “Not heart” are complementary (opposite) events!

\[
P(\text{notE}) = 1 - P(\text{E})
\]
Choose at random a ball from the box

**Example 5:**
A box contains 5 red balls, 3 green balls and 2 yellow balls. What is the probability of:

a) choose at random a green ball?

\[
P(\text{green}) = \frac{\# \text{favorable outcomes}}{\# \text{possible outcomes}} = \frac{3}{10}
\]

3 out of 10 or .3 or 30%

b) choose at random a red ball?

\[
P(\text{red}) = \frac{\# \text{favorable outcomes}}{\# \text{possible outcomes}} = \frac{5}{10}
\]

or .5 or 50%
Example 5: TREE DIAGRAMM

Chose at random a ball from the bag

Notes: the SUM of the probabilities of the individual events is ONE (Total Probability)