INDIAN SCHOOL AL WADI AL KABIR

ARTIFICIAL INTELLIGENCE (SUBJECT CODE 417) CLASS IX

PART B
Unit 3- Data Literacy

AI Unit 3: Math for AI (Statistics & Probability)

Importance of Math for AI

Activity 1:

Purpose: observing and analyzing the numbers & Find the pattern.

- Find the missing number in the following series:

  2, 4, 6, 8, 10, 12, ?

  4, 10, 16, 22, 28, ?

  34, 31, 28, 25, 22, ?

- If Year 1 Profit was INR 1000; Year 2 Profit was INR 1500; Year 3 Profit was INR 2000; Year 4

 Profit was INR 2500, can you predict the profit for Year 5?

How are Math and AI related?
- **Math is the study of patterns**
- To solve the puzzles, you identify an order/arrangement in the list of numbers or the images.
- This arrangement is called a pattern.
- These patterns exist all around us.
- We have patterns in numbers, images, and language.

AI is a way to recognize patterns
- AI can learn to recognize patterns, like human beings.
- AI can see patterns in different types of data - numbers, images, and speech and text.
- These patterns help AI to solve puzzles – like identifying dogs and muffins, or predicting hurricanes!
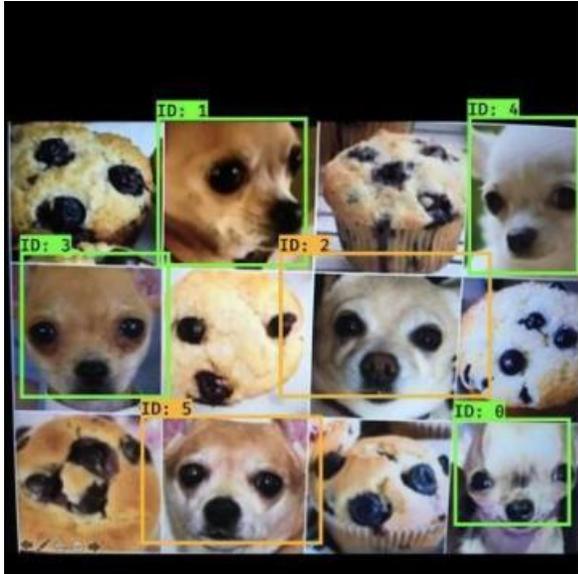
ID: 0
Type: Dog
Breed: Chihuahua (41.0%)
Emotion: Scared (98.0%)
Scared (98.0%), Angry (2.0%), Happy (0.0%),
Neutral (0.0%), Sad (0.0%)

Just like we can recognize patterns in numbers, words, pictures, etc., AI can also recognize similar patterns. Hence,
▪ Math is the study of patterns
▪ AI is a way to recognize patterns in order to take decisions
▪ AI needs Math to study and recognize patterns in order to take decisions

AI uses Math for:

▪ Statistics (Exploring data): Example – What is the middle value of the data? Which is the most common value in the data?

▪ Calculus (training and improving AI model): Example – which line is more slanted? Which figure covers more area?

▪ Linear Algebra (finding out unknown or missing values): Example – How many plants are there in total? How many cars are there in a city?

▪ Probability (predicting different events): Example – what will be the possible results of a coin toss? Will it rain tomorrow?
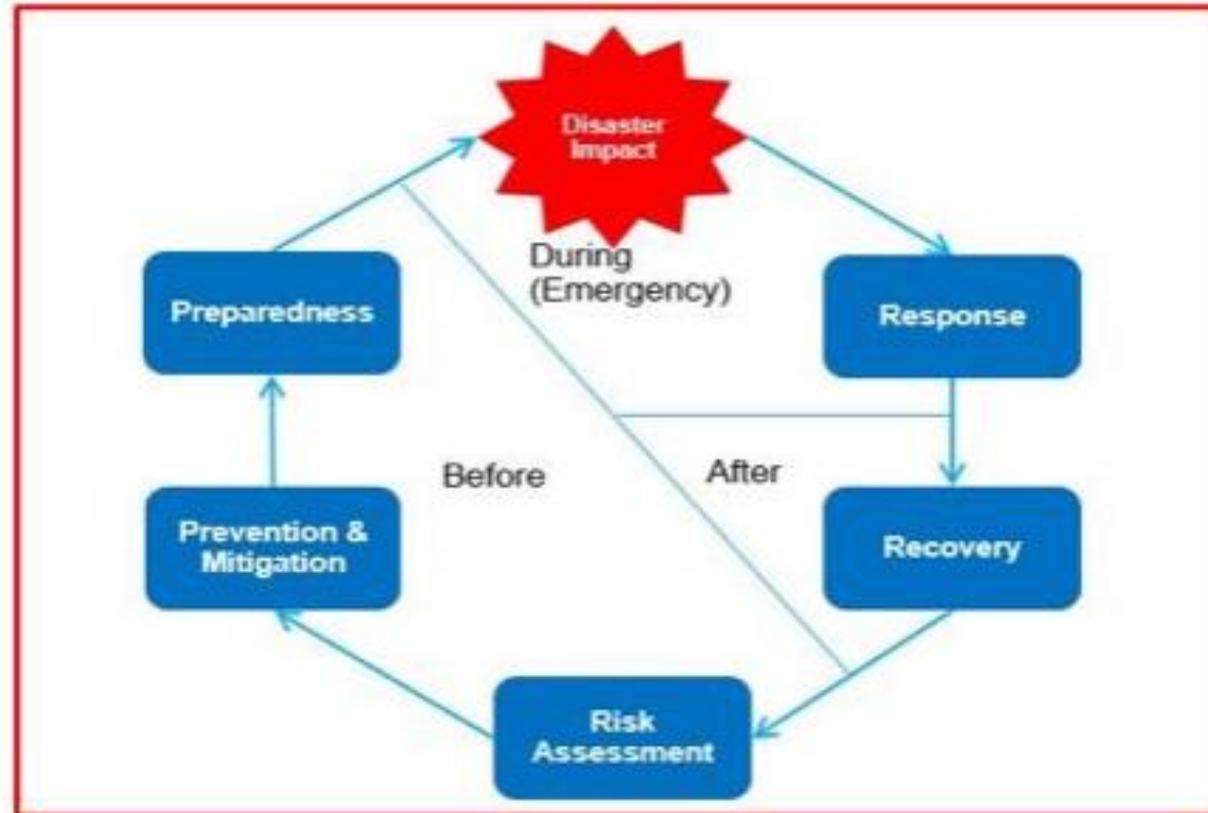
Statistics

Definition of Statistics:" Statistics is used for collecting, exploring, and analyzing the data. It also helps in drawing conclusions from data."

▪ Data is collected from various sources.

▪ Data is explored and cleaned to be used.

▪ Analysis of data is done to understand it better.

▪ Conclusions and decisions can be made from the data. Applications of Statistics:

▪ Predict the performance of sports teams

▪ It can be used to find out specific things such as:

- the reading level of students
- the opinions of voters
- the average weight of a city's resident

Some more applications of Statistics Disaster Management

▪ Authorities use statistics to alert the citizens residing in places that might be affected by a natural disaster in near future.

▪ The disaster management teams use statistics to know about the population, and about the services and infrastructure present in the affected area.

Sports

▪ The Tokyo 2020 Olympics were postponed due to the developing global situation in light of the Covid-19 pandemic.
▪ Statistics revealed that COVID cases sharply increased in Japan during the planned period of Olympics.

COVID-19 pandemic in Japan [6]
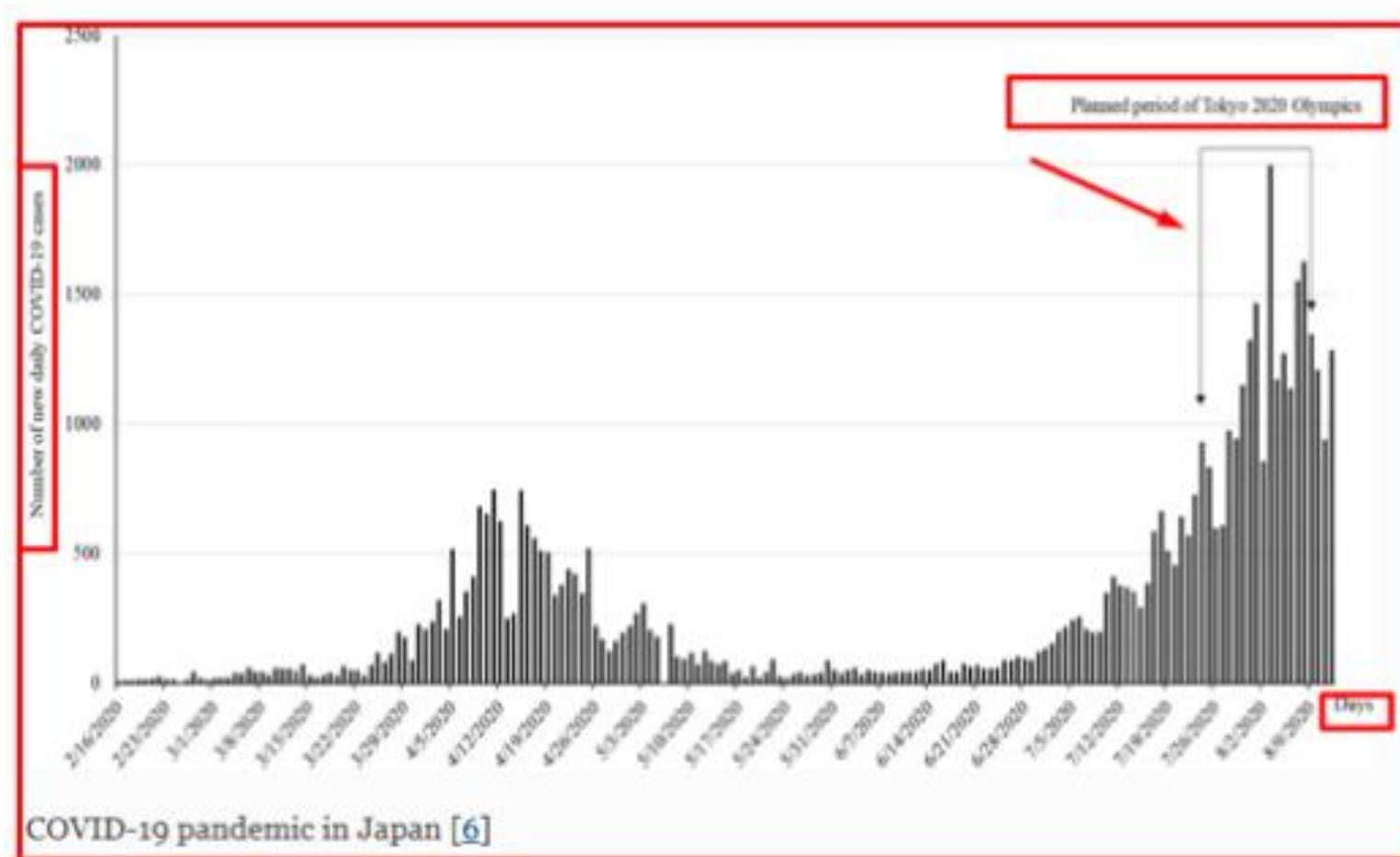
Disease prediction
▪ US government uses statistics to understand which disease is affecting the population the most.

▪ This helps them in curing these diseases more effectively.

▪ Example - government can analyze the areas where COVID cases are increasing, or where the vaccination drive needs to be improved.
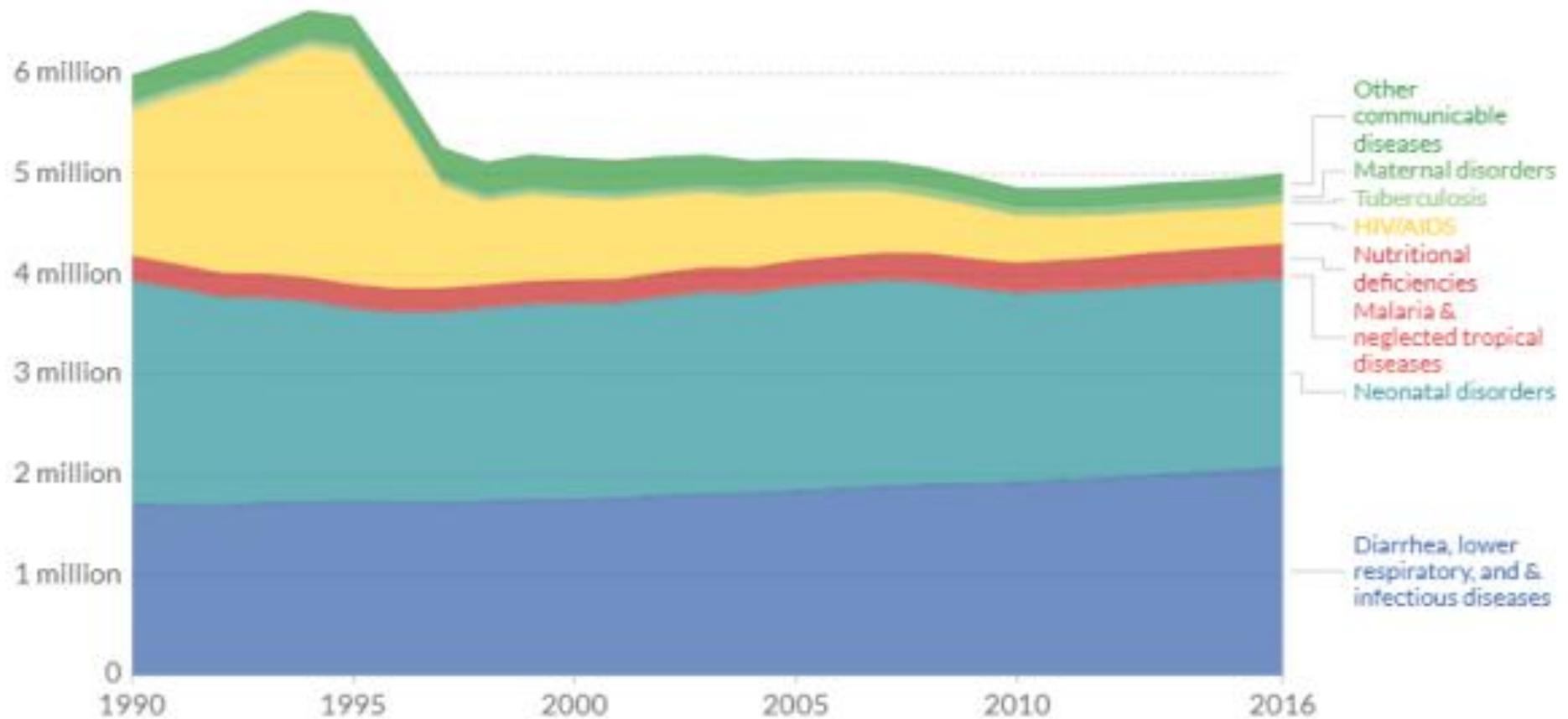
Weather forecast

- Computers use statistics to forecast weather.
- They compare the weather conditions with the information about past seasons and conditions.

Day	Max.	Min.	Forecast
Sun	36°C	24°C	Sunny and hot
Mon	34°C	22°C	Sunny
Tue	30°C	20°C	Dry and cloudy
Wed	32°C	21°C	Cloudy
Thu	27°C	16°C	Rain
Fri	30°C	20°C	Light showers
Sat	32°C	21°C	Cloudy

Few more facts :

• Kids watch around 1.5-3 hours of TV per day while being in childcare.

• 72% of teens often (or sometimes) check for messages or notifications as soon as they wake up, while roughly four-in-ten feel anxious when they do not have their cellphone with them.

• 77% of children don't get enough physical exercise.

• Almost a quarter (23%) of children aged five to 16 believe that playing a computer game with friends is a form of exercise.

• 69% of all children experience one or more sleep-related problems at least a few nights a week.

• Only 54% of US children aged 3 to 5 years attend full-day preschool programs.

Probability

Probability is a way to tell us how likely something is to happen.
For example – When a coin is tossed, there are two possible results or outcomes: heads (H) or tails (T) The probability equation defines the likelihood of the happening of an event. It is the ratio of favorable outcomes to the total favorable outcomes.
The probability formula can be expressed as,

$$P(A) = \frac{\text{Number of favorable outcomes to A}}{\text{Total number of possible outcomes}}$$

Probability of an Event = Number of Favorable Outcomes / Total Number of Possible Outcomes

Probability can be expressed in the following ways:
▪ Certain events: An event will happen without a doubt
▪ Likely events: The probability of one event is higher than the probability of another event
▪ Unlikely events: One event is less likely to happen than another event
▪ Impossible events: There's no chance of an event happening
▪ Equal Probability events: Chances of each event happening is same

The probability of an event occurring is somewhere between impossible and certain.
• If an event is certain or sure to happen, it will have a probability of 1.
For example, the probability that it will rain in the state of Florida at least once in a specific year is 1.

• If an event will never happen or is impossible, it will have a probability of 0.
For example, the probability that you can pick a red ball from a bag containing only blue balls is 0.

impossible   unlikely   even chance   likely   certain

0

1 in 6 chance

4 in 5 chance
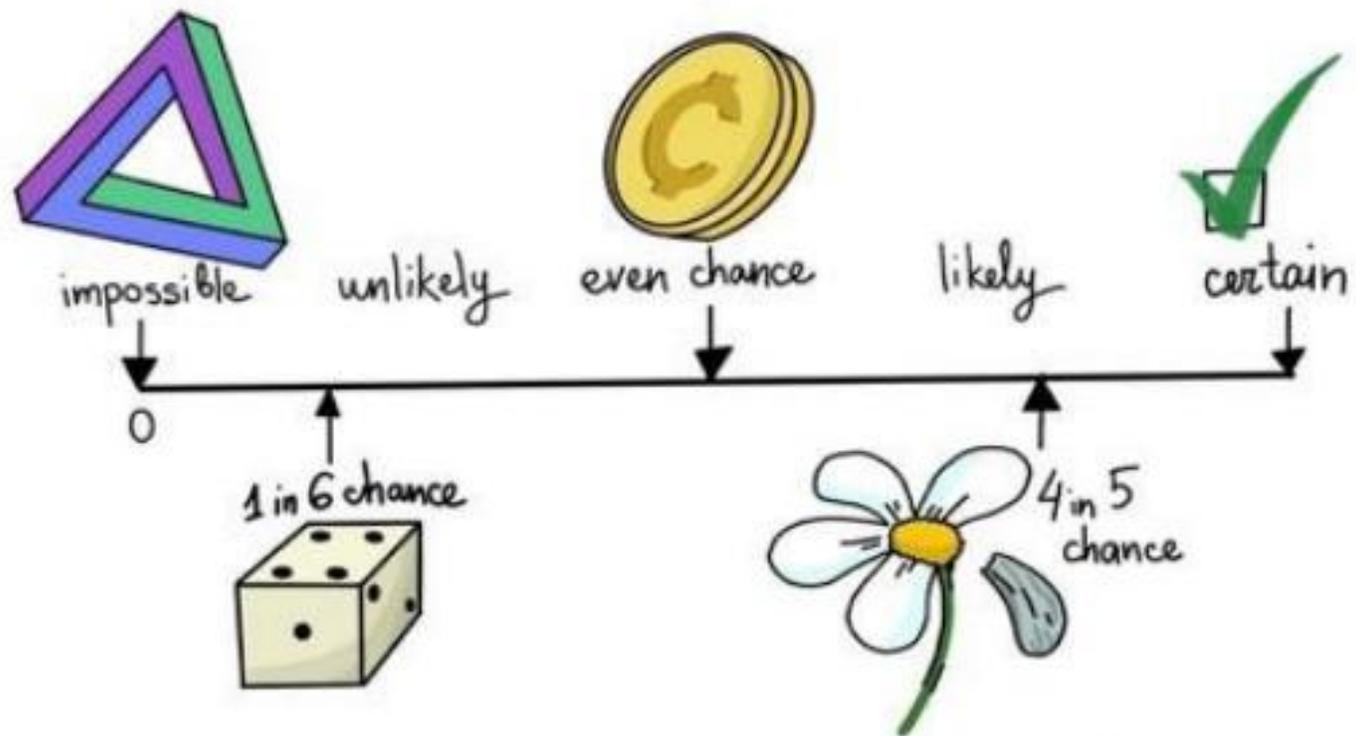
Imagine you have a bag full of stars where 7 stars are ☆ and 3 stars are ⭐

Try to fill in the blanks with – likely, unlikely, certainly, impossible, equal probability

1. If you pick a star from the bag without looking, it is _____ that you will pick ☆.

2. If you pick a star from the bag without looking, it is _____ that you will pick a ⭐.

3. If you pick a star from the bag without looking, it is _____ that you will pick a ✦.

4. If you remove 4 ☆ from the bag, and pick a star without looking, there is an _____ that you will pick either ☆ or ⭐.

5. If you pick an object from the bag without looking, you will _____ pick a star.

To understand the concept of Probability using a relatable example.
Consider a relatable scenario! You want to go to your best friend's birthday party next Saturday.
Your parents decide to make a deal with you.
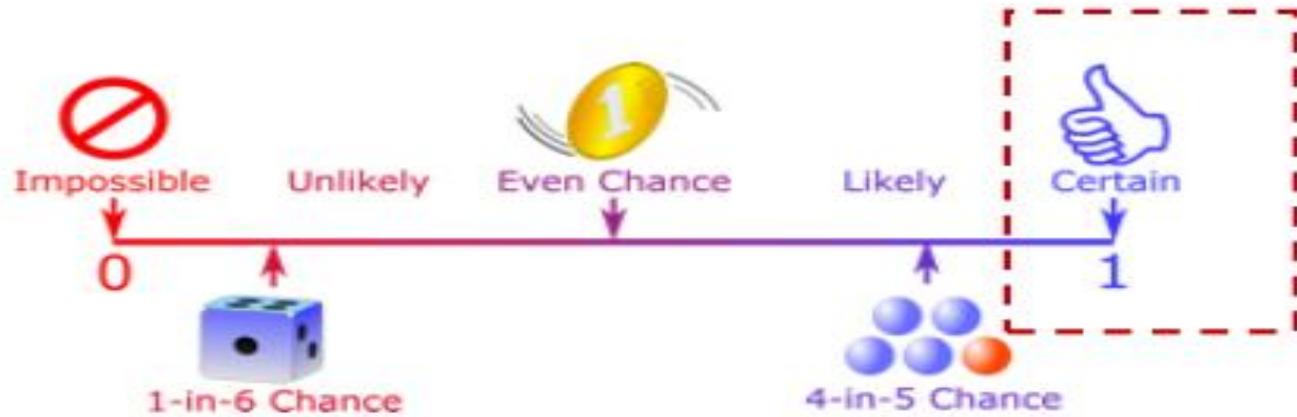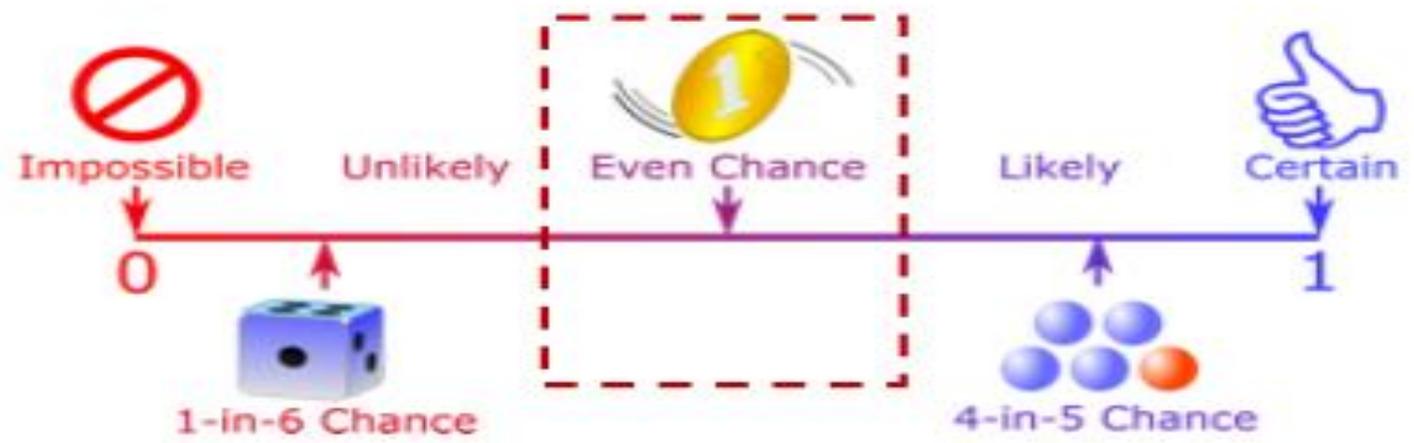
Scenario 1

Scenario 2

It is certain you will go to the party if you pass your test on Friday.

In other words, if you pass that test, you will go. No doubt about it!

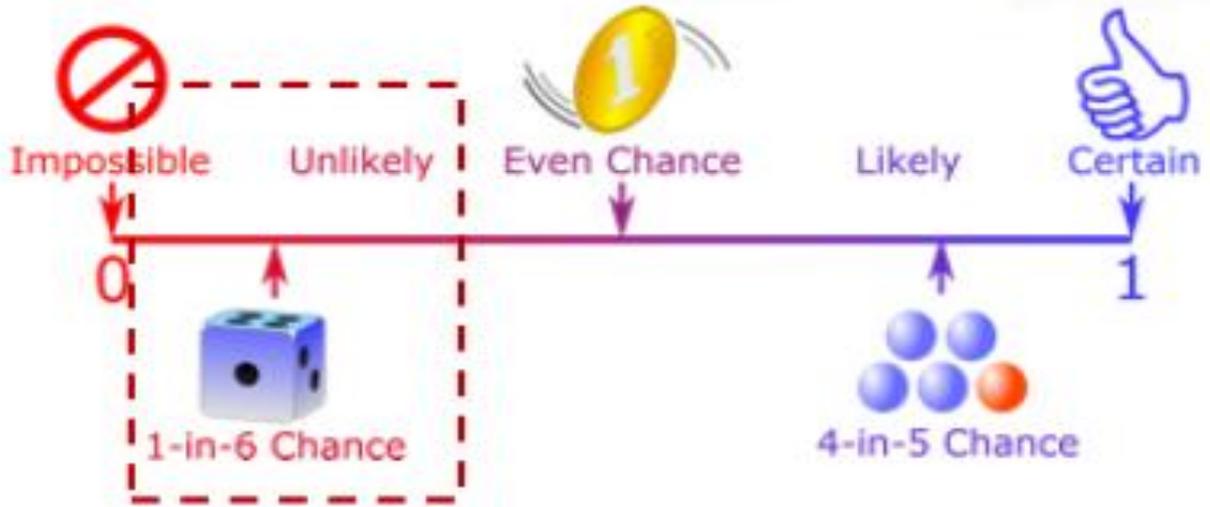Impossible   Unlikely   Even Chance   Likely   Certain

0   1

1-in-6 Chance   4-in-5 Chance

Scenario 4

Probability – Applications:

Sports
▪ Probability can be used in estimating batting average in Cricket.

• Batting average in Cricket represents how many runs a batsman would score before getting out.

▪ For instance, if a batsman had scored 45 runs out of 100 from only boundaries in the last match. Then, there is a chance that he will score 45% of his runs in the next match from boundaries.

Weather Forecasting
▪ One of the most common real-life examples of using probability is weather forecasting.

▪ It is used by weather forecasters to assess how likely it is that there will be rain, snow, clouds, etc., on a given day in a certain area.

▪ Forecasters may say things like "there is a 70% chance of rain today between 4 PM and 6 PM" to indicate a medium to high likelihood of rain during certain hours.

AI

Traffic Estimation

▪ Regular people often use probability when they decide to drive to someplace.

▪ Based on the time of day, location in the city, weather conditions, etc. people tend to make probability predictions about how bad traffic will be during a certain time.

• For example, if you think there's a 90% probability that traffic will be heavy from 6 PM to 7:30 PM in your vicinity then you may decide to wait during that time.