SNEHADEEP DAS

CLASS – X

CHANDRA A2 BATCH

MATHS ACTIVITY

15TH OCTOBER 2020

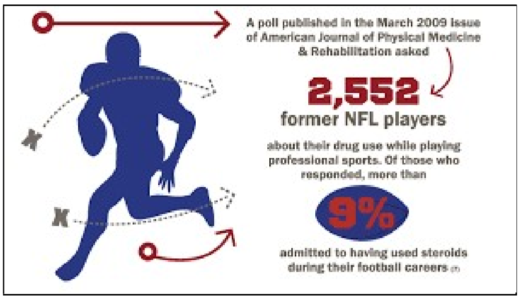
A GAME OF PROBABILITY

Based on the statistics that a player has, the statisticians or even viewers can slightly predict the outcome. The probability that is shaped around the statistics gives the player an idea of what to work on, and what shots to take or not to take during the game. Basically, the chances of the outcome. Sports and statistics are used to compare and rank athletes.

Application of Statistics in Sports :

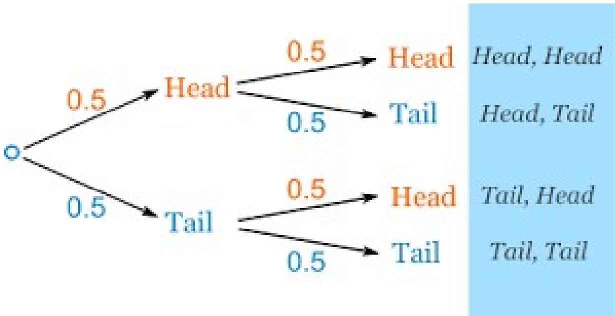
There is lots of uses of statistics in sports. Every sport requires statistics to make the sport more effective. Statistics help the sport person to get the idea about his/her performance in the particular sports.

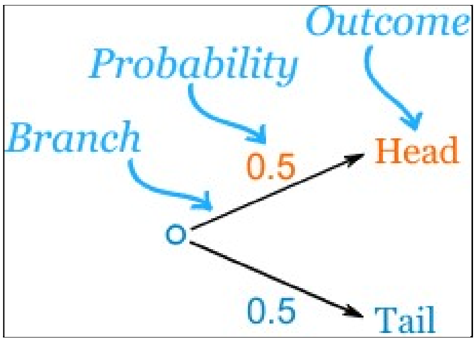
Nowadays sports are utilizing the statistics data into the next level. However, the reason is getting more popular and there are various kinds of equipment in the sports that are used to collect data of various factor. Statistics is used to get a conclusion from the given data. Statistics is used to rate players, decide on who gets cut from the team, decide who plays on which days and against which teams and with which teammates. It's used in salary arbitration, draft picks and so on and on. Sports statistics such as a batting average don't involve the scientific discipline of statistics at all, but are merely numbers determined by simple arithmetic.



Probability Tree Diagrams

Calculating probabilities can be hard, sometimes we add them, sometimes we multiply them, and often it is hard to figure out what to do ... tree diagrams help us to the rescue!





Here is a tree diagram for the toss of a coin:

There are two "branches" (Heads and Tails)

- The probability of each branch is written on the branch
- The outcome is written at the end of the branch

We can extend the tree diagram to two tosses of a coin:

How do we calculate the overall probabilities?

- We multiply probabilities along the branches
- We add probabilities down columns

Now we can see such things as:

- The probability of "Head, Head" is 0.5×0.5 = 0.25
- All probabilities add to 1.0 (which is always a good check)

- The probability of getting at least one Head from two tosses is 0.25+0.25+0.25 = 0.75
- ... and more

That was a simple example using independent events (each toss of a coin is independent of the previous toss), but tree diagrams are really wonderful for figuring out dependent events (where an event **depends on** what happens in the previous event) like this example:


Example: Soccer Game

We are off to soccer, and love being the Goalkeeper, but that depends who is the Coach today:

- with Coach John the probability of being the Goalkeeper is 0.5
- with Coach Andrew the probability of being the Goalkeeper is 0.3

John is Coach more often ... about 6 out of every 10 games (a probability of 0.6).

So, what is the probability I will be a Goalkeeper today?

Let's build the tree diagram. First, we show the two possible coaches: John or Andrew:

The probability of getting John is 0.6, so the probability of Andrew must be 0.4 (together the probability is 1)

Now, if I get John, there is 0.5 probability of being Goalkeeper (and 0.5 of not being Goalkeeper):

If I get Andrew, there is 0.3 probability of being Goalkeeper (and 0.7 not):

The tree diagram is complete, now let's calculate the overall probabilities. This is done by multiplying each probability along the "branches" of the tree.

Here is how to do it for the "John, Yes" branch:

(When we take the 0.6 chance of John being coach and include the 0.5 chance that John will let me be the goalkeeper we end up with an 0.3 chance.)

But we are not done yet! We haven't included Andrew as Coach:

An 0.4 chance of Andrew as Coach, followed by an 0.3 chance gives 0.12.

Now we add the column:

0.3 + 0.12 = 0.42 probability of being a Goalkeeper today

(That is a 42% chance)

I Check

One final step: complete the calculations and make sure they add to 1:

0.3 + 0.3 + 0.12 + 0.28 = 1

Yes, it all adds up.

Conditional Probability

*How to handle **Dependent Events***

Life is full of random events! I need to get a "feel" for them to be a smart and successful person.

Independent Events

Events can be "Independent", meaning each event is **not affected** by any other events.

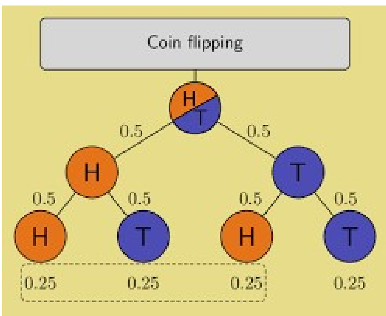

Example: Tossing a coin.

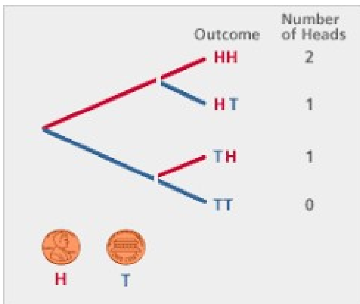
Each toss of a coin is a perfect isolated thing.

What it did in the past will not affect the current toss.

The chance is simply 1-in-2, or 50%, just like ANY toss of the coin.

So each toss is an **Independent Event**.





Example: Playing Cards - Drawing 2 Kings from a Deck


Drawing 2 Kings from a Deck

Event A is drawing a King first, and Event B is drawing a King second.

For the first card the chance of drawing a King is 4 out of 52 (there are 4 Kings in a deck of 52 cards):

P(A) = 4/52

But after removing a King from the deck the probability of the 2nd card drawn is less likely to be a King (only 3 of the 51 cards left are Kings):

P(B|A) = 3/51

And so:

P(A and B) = P(A) x P(B|A) = (4/52) x (3/51) = 12/2652 = 1/221

So the chance of getting 2 Kings is 1 in 221, or about 0.5%

Using Algebra we can also "change the subject" of the formula, like this:

Start with:	P(A and B) = P(A) x P(B|A)
Swap sides:	P(A) x P(B|A) = P(A and B)
Divide by P(A):	P(B|A) = P(A and B) / P(A)

And we have another useful formula:

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)}$$

"The probability of ***event B given event A*** *equals*
the probability of ***event A and event B*** *divided by the probability of* ***event A***

Conclusion

- Probability is: (Number of ways it can happen) / (Total number of outcomes)
- Dependent Events (such as soccer game goalkeeper) are affected by previous events
- Independent events (such as a coin toss) are not affected by previous events
- We can calculate the probability of two or more Independent events by multiplying

<u>Application of Statistics and Probability in Sports</u>



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