How Math is used in Baseball

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Honors Project
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ERA

What is ERA?

Earned run average (ERA) represents the number of earned runs a pitcher allows per nine innings -- with earned runs being any runs that scored without the aid of an error or a passed ball. ERA is the most commonly accepted statistical tool for evaluating pitchers.

How is it Calculated?

The formula for finding ERA is: 9 x earned runs / innings pitched. If a pitcher exits a game with runners on base, any earned runs scored by those runners will count against him. ERA should be an ideal evaluation of pitchers.

For Example:

If a pitcher throws 50 innings and gives up 20 runs this is how it would be calculated

9 x 20 / 50 = 3.60 ERA

Batting Average

What is Batting Average?

Batting average is a measure of a batter's performance, calculated as the number of hits divided by the number of times at bat.

How is it calculated?

Batting average is calculated by first counting the number of times that a batter reaches base by getting a hit. This number of hits is then divided by the number of times that he gets a chance to hit

For example:

If a hitter gets 38 in 120 at bats it would be 38/120 = .316 batting average

WHIP

What is WHIP?

WHIP stands for "Walks and Hits per Innings Pitched" and is a pitching statistic in baseball that tells you the average number of walks and hits per inning that a pitcher gives up.

How is it Calculated? Calculating WHIP is simple: add the number of walks (base on balls) plus hits, then divide by innings pitched. WHIP does not measure hit batters, errors, or fielder's choice base runners; it also will not tell you how many bases are given up – all types of hits count as one

For example: If a pitcher has 5 walks and 43 hits in 45 inning pitched it would be 43+5 / 48 = 1.06

OBP

What is OBP?

On Base Percentage (OBP) refers to how frequently a batter reaches base per plate appearance. Times on base include hits, walks and hit-by-pitches, but do not include errors, times reached on a fielder's choice or a dropped third strike.

How is it Calculated?

Generally defined as "how frequently a batter reaches base per plate appearance", OBP is specifically calculated as the ratio of a batter's times on base. The full formula is OBP = (Hits + Walks + Hit by Pitch) / (At Bats + Walks + Hit by Pitch + Sacrifice Flies).

For Example: If a hitter has 38 hits, 25 walks, 5 sacrifice flies, and 8 Hit by pitches in 120 at bats, it would be :

(38+25+8) / (120+25+8+5) = .449 OBP

SLG

What is SLG?

Slugging percentage represents the total number of bases a player records per at-bat. Unlike on-base percentage, slugging percentage deals only with hits and does not include walks and hit-by-pitches in its equation. Slugging percentage differs from batting average in that all hits are not valued equally.

How is it Calculated?

Slugging Percentage simply put is the the total number of bases a batter gets per at bat, divided by the total number of at bats they have.

For Example: If a hitter gets a total of 58 bases in 120 at bats it is simply 58/120 = .483 SLG

OPS

What is OPS?

OPS adds on-base percentage and slugging percentage to get one number that unites the two. It's meant to combine how well a hitter can reach base, with how well he can hit for average and for power. It can also be used in evaluating pitchers; when used in that context, it is referred to as OPS against.

How is it Calculated?

On-base plus slugging, or OPS, is a baseball statistic which is calculated as the sum of a player's on-base percentage and slugging percentage.

For Example: If a hitters On base percentage is .449 and Slugging is .483 it is .449+.483= .932