

Quality Hit Game

The HitTrax Quality Hit Game (Q-Hit) is an exciting, competitive game that assess a player's ability to make "quality" hits. What is a quality hit? There are multiple factors that go into answering this question. Four metrics are used to calculate a score for each hit; exit velocity, launch angle, distance, and the calculated result. Simply put, the higher the score, the better the hit.

In the Quality Hit Game, the batter is required to take 15 AB's to accumulate the highest point total possible. Each AB should be treated as a regular AB in which he/she is allowed to take strikes and work the count until he/she gets their pitch to hit. The only exception to this is a ball that is pitched in the middle/middle area of the strike zone. The game will consider this a "super strike", and will penalize the player one AB on the basis that a pitch down the middle of the plate should be put into play.

Quality Hit Game takes 4 metrics into account for score calculation:

- Exit Velocity
- Launch Angle
- Distance
- Hit Result

How Is the Q-Hit Score Determined?

To determine the Q-Hit score of a hit, a formula¹ was created to reward hard hit line drives, while adjusting the overall point system for different skill levels.

$$Q - \text{Hit Score} = (Velo - A) * Velo * \frac{(\frac{Velo}{A})}{A} + \frac{Distance - D}{7} - \left(\frac{ABS(15 - LA)}{6}\right)^2 + 'Value of Hit Result'$$

There are two variables used in the above formula to adjust exit velocity and distance for skill level: A (velocity) and D (distance).

Skill Level	A (mph)	D (ft)
Pro	68.5	70
College	64.5	65
HS	62	60
15U	57	60
13U	53	55
12U	43.5	45
10U	37.5	40
8U	33.5	35

The 'A' variable is intended to be a velocity baseline for each age group. Any hit below 'A' in mph would result in a zero point hit. These hits would include mostly weak ground balls and pop ups. The weakest of line drives would likely be caught and result in an out in almost all cases.

The 'D' variable is intended to balance points awarded for distance, as in a long fly ball. For example, a hard hit ground ball with minimal distance is more effective than a fly out with the same exit velocity.

These variables were determined so that a "quality hit" in each skill level would score the same overall points. For example, a 70 mph hit in a 15U skill level would score the same as a 90mph hit in the college setting. The intention is to objectively measure the ability of a hitter against the same point scale across all skill levels.

Regarding launch angle, an ideal value was needed for comparison purposes and therefore 15° was chosen as this typically results in a solid line drive when coupled with significant exit velocity. In the formula, as the measured launch angle deviates from 15° (in either direction), the score is impacted. The launch angle function in the formula is exponential, therefore the further you move away from 15° less points are awarded, but can be offset by the other hit metrics. For instance, compare a 90 mph hit at 15 degrees vs. 22 degrees. The 22 degree hit will lose 1.36 points for LA, but more than make up for that in distance - resulting in a higher score than the 15 degree hit.

Lastly, the following are the awarded points for each possible hit outcome:

Single = 5 pts Double = 7.5 pts Triple = 9 pts Home run = 12 pts

Overall, the harder and further the hit, the more points that are awarded.

¹ Elements of the Quality Hit Game were developed in conjunction with Dan Kopitzke of The K-Zone in Apex, NC.

Strike Outs and Walks

An 'at bat' that fails to put the ball in play is worth zero points and is either recorded as a strikeout or a walk. A walk does not register points, but also does not count as an 'at bat.' To add another challenge to the Q-Hit Game, a pitch taken directly down the middle of the strike zone is considered a "super strike" and results in an automatic strike out. This is devised to penalize a batter for not putting such a pitch into play.

Score Calculation Example

Below is an example of a hit in Quality Hit Game at the College skill level. The formula is used to illustrate the resulting point calculation.



Total
Points for
Current
Game

$$QHit\ Score = (Velo - A) * Velo * \frac{Velo}{A} + \frac{Distance - D}{7} - \left(\frac{ABS(15 - LA)}{6} \right)^2 + 'Value\ of\ Hit\ Result'$$

Formula using actual hit data from above screenshot and the following College level variables :
(A = 64.5, D = 65) and 7.5 pts for the hit result of DOUBLE.

$$QHit\ Score = (87.6 - 64.5) * 87.6 * \frac{87.6}{64.5} + \frac{343 - 65}{7} - \left(\frac{ABS(15 - 32)}{6} \right)^2 + 7.5 = \boxed{81\ points}$$