Baseball and Softball

High School: Baseball and Softball are considered the most popular spring sports with 25.3 million participants this year! Challenge yourself to answer the following questions as professionals in the field use math to make informed decisions.

1. In the movie "Money Ball" Billy Beene and Peter Brandt apply mathematics to put together a winning "cheap" team. They used the Pythagorean Expectations formula to predict the number of wins needed to go to the playoffs. Recently a linear formula has been generated to also predict the wins needed. Which formula is more accurate?

Table 1 provides the Runs Scored (RS) and Runs Allowed (RA) for each team as well as the final win percent for each team in 2024 season.

Table 1:Data

Team	RS	RA	Season Win %
Chicago Cubs	736	669	0.512
LA Dodgers	842	686	0.593
Pittsburgh Pirates	665	739	0.469

Formulas

Pythagorean Expectations: $W\% = \frac{RS^{1.8}}{RS^{1.8} + RA^{1.8}}$

Linear Formula: W% = 0.000683(RS - RA) + 0.5

Test each formula to determine which is more accurate using the data in Table 1.



You are creating a baseball video game and need to enter the expected distance and time of flight for each type of hit based on the launch angle and the initial velocity.

Use the following equations for the horizontal distance (D) and the time (t) in the air.

$$D = \frac{v_0^2 \sin \theta}{g}$$
$$t = \frac{2v_0 \sin \theta}{g}$$

Where g is the force of gravity (16 ft/sec), v_0 is the initial velocity and θ is the launch angle.

2. Jenna hits a softball at a launch angle of 27° and an initial velocity of 92 feet per second. An outfielder is attempting to make the catch. How many seconds does the outfield have to get beneath the ball before it hits the ground? Allow for a diving catch. Justify your answer.

3. Pedro hits a baseball at a launch angle of 32° and an initial velocity of 110 feet per second. The distance to the fence is 380 feet and stands 7 feet tall. In the video game programming is this a homerun? Justify your answer.

