Math in Basketball: Try other basketball challenges  
Student Handout

In this challenge, you get to choose a new set of player stats, then use the 3 key variables to figure out the maximum height the ball reaches during a free throw shot.

(This activity can also be completed online. Go to www.getthemath.org, click on "The Challenges," then scroll down and click on "Math in Basketball: Try other challenges.")

**FAST BREAK FACTS: KNOW THE STATS**

1. **Identify what you already know.** Look at the Fast Break Facts on the last page of this handout for information about the 3 key variables and select a player's stats from the choices below:
   - The Acceleration of Gravity: ______
   - Initial Vertical Velocity (Select one): ___ 20 ft/sec ___22 ft/sec ___ 24 ft/sec
   - Release Height (Select one):____ 5 ft ____ 6 ft ____ 8 ft

   Combine these 3 key variables used to calculate the ball's height, \( h \), at a given time, \( t \), by setting up an equation to get started.

   \[ h(t) = \]  

   **AT WHAT TIME(S) DOES THE BALL REACH 10 FEET?**

2. **Plan it out.** What strategy will you use? Select one or more representations, such as your equation or a graph (found on the last page), to calculate the value(s) of \( t \) when the ball reaches a height of 10 feet.
3. **Solve your problem.** Show all your steps. You may use the graph on the last page of this handout or show your work in the space below.

Your solution: (Round your answer to the nearest hundredth.)

- The time(s) the ball will reach 10 feet are: ____________________

**AT WHAT TIME DOES THE BALL REACH THE MAXIMUM HEIGHT?**

4. **Plan it out.** What strategy will you use? Select one or more representations, such as your equation or a graph (found on the last page), to **calculate the value(s) of** \( t \) **when the ball reaches its maximum height.**

5. **Solve your problem.** Show all your steps. You may use the graph on the last page of this handout or show your work in the space below.

Your solution: (Round your answer to the nearest hundredth.)

The time the ball will reach the maximum height is: ____________________
**WHAT IS THE MAXIMUM HEIGHT OF THE BASKETBALL?**

6. **Plan it out.** What strategy will you use? Select one or more representations, such as your equation or a graph (found on the last page), to calculate the maximum height the ball will reach on its way to the basket.

7. **Solve your problem.** Show all your steps. You may use the graph on the last page of this handout or show your work in the space below.

   **Your solution:** (Round your answer to the nearest whole hundredth.)
   The maximum height of the basketball will be at: ___________________

8. **Try another player’s stats.** See how the maximum height and times change when you modify the initial vertical velocity and release height. Use another copy of the handout to select a different Initial Vertical Velocity and Release Height and assist another player!
**FAST BREAK FACTS**

**THE 3 KEY VARIABLES**
- **The Acceleration of Gravity** – which causes a ball to speed up, or accelerate, when falling at a rate of \(-32\text{ft/sec}^2\). Use only downward pull or half of \(-32\text{ft/sec}^2\), which is \(-16\text{t}^2\).
- **Initial Upward Velocity** \((v_0)\) - the angle and speed when it leaves the player’s hand. Multiply by time to get the vertical distance traveled.
- **Release Height** \((h_0)\) - the starting position of the ball.

**PLAYER’S STATS (Select one of each)**
- **Initial Upward Velocity**: __ 20 ft/sec __ 22 ft/sec __ 24 ft/sec
- **Release Height**: __ 5 ft __ 6 ft __ 8 ft

**STANDARD COURT MEASUREMENTS**
- Height of the basketball hoop off the floor: 10 ft
- Distance from the free throw line to backboard: 15 ft
- Diameter of hoop/rim: 18 in

**GRAPH YOUR DATA**

![Graph](image)