



Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Math in Basketball: Take the Challenge**  
*Student Handout*

When NBA player Elton Brand steps to the free throw line, a number of key variables can influence his shot. Your challenge is to use the 3 key variables and Elton's stats to figure out the maximum height the ball reaches on its way into the basket to make the shot.

*(This activity can also be completed online. Go to [www.getthemath.org](http://www.getthemath.org), click on "The Challenges," then scroll down and click on "Math in Basketball: Take the Challenge.")*

**FAST BREAK FACTS: KNOW THE STATS**

1. **Identify what you already know.** Look at the Fast Break Facts (following the last question in this handout) for information about the 3 key variables and Elton's stats.

- The Acceleration of Gravity: \_\_\_\_\_
- Elton's Initial Vertical Velocity : \_\_\_\_\_
- Elton's Release Height: \_\_\_\_\_

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.

$$h(t) = \underline{\hspace{10em}}$$

**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 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 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 or show your work in the space below.

**Your solution:** (Round your answer to the nearest whole number.)

- The maximum height of the basketball will be at: \_\_\_\_\_

8. **What would you do if you had to determine the maximum height for any player's release height and initial vertical velocity stats? If you were going to email Elton Brand to explain your strategy, what would you tell him?**

## ***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  $-32\text{ft}/\text{sec}^2$ . Use only downward pull or half of  $-32\text{ft}/\text{sec}^2$ , which is  $-16t^2$ .
- **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.

### **ELTON BRAND STATS**

<b>Elton's Average Initial Upward Velocity:</b>	24 ft/sec
<b>Elton's Average Release Height:</b>	7.0 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***

