

## Dr. Chun's Numb3rs & Løgic

*MLB World Series*



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# Baseball World Series



Brimberg & Hurley (2003), "A baseball decision problem,"  
*INFORMS Transactions on Education*, 5(1), 100-103.

## \* MLB Baseball

For those unfamiliar with **baseball**, we offer the following explanations for some of the terms we will use. For professional baseball in North America, two teams play each year for the championship in a final tournament called the **World Series**. The first team to win **four** games wins the **World Series**.

**Pitchers** are those players who throw the ball to the batter. They are a very important part of any baseball team. Starting pitchers normally require at least **four-days rest** between starts. Anything less than four days usually leads to a deterioration in performance.

The coach of a baseball team, the man responsible for deciding which players play and how they play, is termed a **manager**.



## \* Decision Problem

Suppose a manager of one of the teams in the World Series is faced with the following problem.

He is down **three** games to **two** so he must win the final two games to win the Series. His top two pitchers (his **Ace** and **Number 2**) are ready to go. However, his **Ace** would be pitching on three days rest if he were to pitch **Game 6**. The opposing team has its number 2 and 3 pitchers ready to go; the manager assesses that both are of about the same ability and sufficiently rested.

The manager feels he must win **Game 6**, and that his **Ace** on three days rest is **better** than his **Number 2** fully rested. He therefore decides to go with his **Ace** in **Game 6**. Do you agree with him or not?

- (a) Pitch the **Ace** in **Game 6** and **Number 2** in **Game 7**.
- (b) Pitch the **Number 2** in **Game 6** and the **Ace** in **Game 7**.



## \* Notation and Assumptions

### ▪ Ace Pitcher

$a_6$  = probability that the **Ace** wins **Game 6**

$a_7$  = probability that the **Ace** wins **Game 7**

=  $a_6 + \alpha$  because he has an additional day of rest!

### ▪ Number 2 Pitcher

$b_6$  = probability that the **Number 2** wins **Game 6**

=  $a_6 - \beta$  <  $a_6$

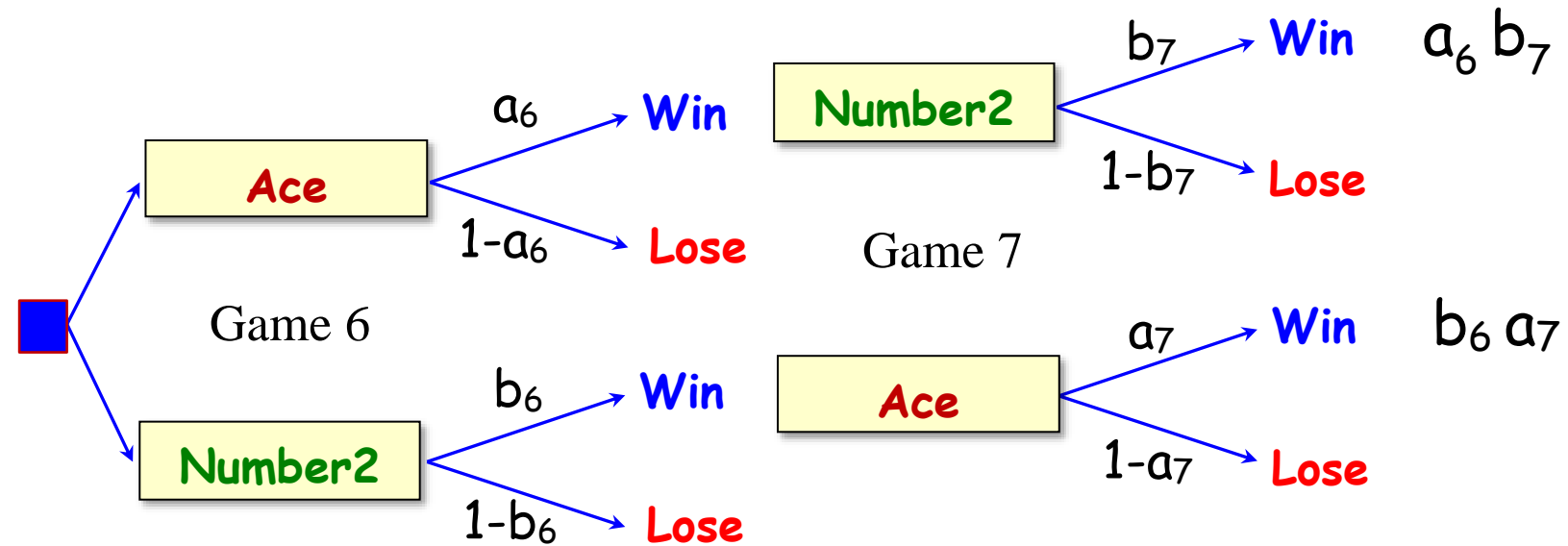
$b_7$  = probability that the **Number 2** wins **Game 7**

=  $b_6$  because he has already fully rested!





\* Tree Diagram:



(a)  $P[\text{Win the Series?} \mid \text{Ace and then Number 2 !}] = a_6 b_7$

(b)  $P[\text{Win the Series?} \mid \text{Number 2 and then Ace !}] = b_6 a_7$

$$= b_6 (a_6 + \alpha)$$

$$= b_7 (a_6 + \alpha)$$

$$= a_6 b_7 + b_7 \alpha > a_6 b_7$$



The correct answer is (b) since it gives the team the best chance to win the World Series. Most students choose (a).



## \* Counter-intuitive Best Strategy

- **Dr. Chun:** "So what would you do?"
- **You:** "I would pitch the Ace in Game 6."
- **Dr. Chun:** "Why?"
- **You:** "Because if you don't win Game 6, there's not going to be a Game 7."
- **Dr. Chun:** "But if you pitch your Number 2 in Game 6, you maximize your chances of winning the Series."
- **You (slightly hostile):** "I don't care what your probabilities say. There is not going to be a Game 7 if you don't win Game 6!"

Most of my **colleagues** still do not believe that it is best to save the **Ace** for **Game 7**, even though a simple application of the laws of probability suggests otherwise.



## \* Human Intuition

This example demonstrates that **human intuition** is notoriously bad at processing even the simplest **probability problems!**

I believe the source of the difficulty is choice of the **wrong objective**: The objective of **getting** to **Game 7** is different than the objective of **winning Game 6** and **Game 7**.

The prospect of elimination if the next game is lost appears to override the longer term **rational objective** of winning the Series.

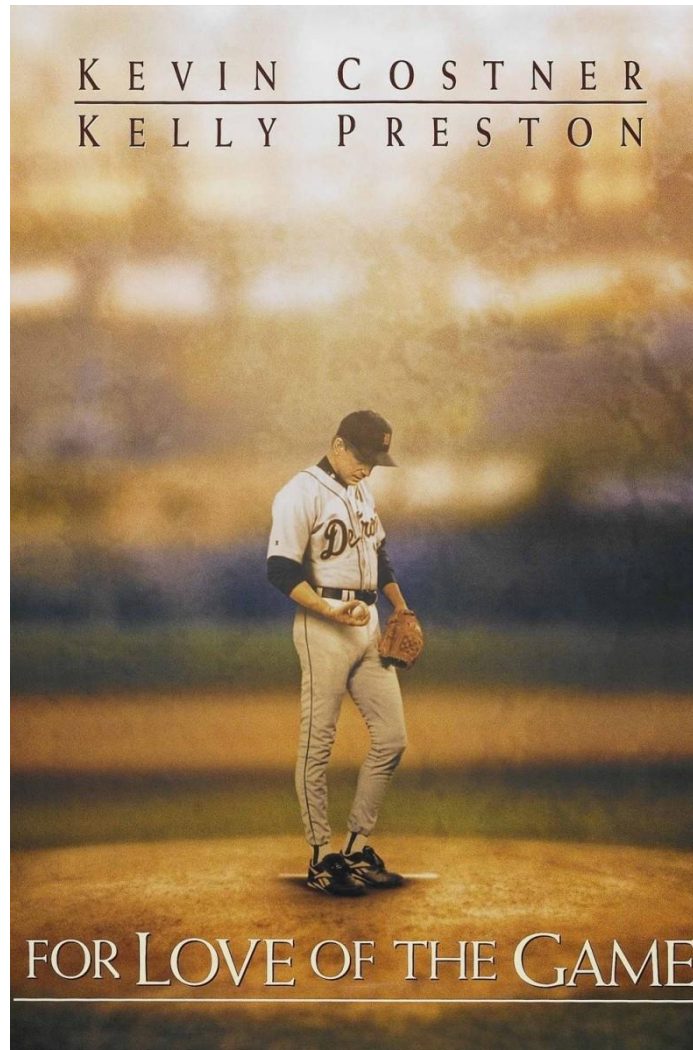
**Innumeracy!** An inability to deal comfortably with the fundamental notions of **number** and **chance**, plagues far too many otherwise knowledgeable citizens.

# Movie Trivia



The film follows the perfect game performance of an aging **baseball pitcher** as he reminisces about his career and his relationship with his on-and-off girlfriend, while pitching his final game.

# For Love of the Game (1999)



The film follows the perfect game performance of an aging **baseball pitcher** as he reminisces about his career and his relationship with his on-and-off girlfriend, while pitching his final game.