The Role of Numbers 3 and 4 in Baseball

Geometry and Baseball

The Pythagorean Theorem and Baseball

Magic Numbers in Baseball

Chapter 4

*Since in **Chapter 4** we compared two quantitative data sets, it seems appropriate to talk about the role of numbers in baseball.*

The Role of the Special Numbers 3 and 4 in Baseball

The numbers 3 and 4 play an important role in the rules for baseball. A partial list includes:

3 strikes is a strike-out.

4 balls is a walk.

3 outs concludes a team's 1/2 inning.

A regular game has $3^2 = 9$ innings.

A regular season consists of $162 = 2*3^4$.

A visiting team gets $27 = 3^3$ outs for a game.

A team plays $3^4 = 81$ home and away games.

The distance between the bases is $3^2*10 = 90$ feet.

Except for a few exceptions, the dimensions of the fences in a ballpark begin with either a 3 or a 4.

The best hitters in a lineup reside in positions 3 and 4 in the batting order.

Can you find any other examples of these two special numbers that relate to baseball?

Role of Geometry in Baseball

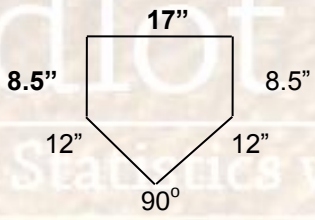
The **baseball diamond** is really a square. There are four right angles and each side has length equal to 90 feet.

Can you use the Pythagorean Theorem to compute the distance between second base and home plate?

What is the distance between first base and third base?

Home plate is an irregular pentagon. Why do you think home plate takes this shape?

Home plate is pictured in many baseball league rulebooks as follows:



The angle between the two 12 inch sides is a right angle. Can you calculate the perimeter and area of home plate?

There is a mathematical flaw in this picture. Can you find it?

The baseball field has circles and rectangles. Can you find them? There are sets of parallel lines. Can you find them?

Pythagorean Theorem of Baseball

Bill James set forth a special relationship between the number of wins (W) and losses (L) for a baseball team and the number of run scored (RS) and the number of run allowed (RA). The formula is:

$$W/L = (RS/RA)^2$$

This formula says that the ratio of a team’s wins to a team’s loses is equal to the square of the ratio of a team’s runs scored to a team’s runs allowed.

Later, James revised his formula by replacing 2 by 1.82.

We will look at this formula in Chapter 5 and examine if it really does work.

Other Special Numbers

The Magic Number – In a pennant race, the magic number for a first place team to win a pennant is calculated as follows:

(1) Find the number of games yet to be played by the team in first place.

(2) Add one to the number in (1).

(3) Subtract the number of games lost by the first place team from the number games lost by the closest competitor.

(4) Subtract the result in (3) from the result in (2).

Calculation of the Magic Number:

AL	W	L	GB
Team 1	100	58	-
Team 2	96	56	1

Magic Number = (4+1) – (56-58)
= 7

NL	W	L	GB
Team 1	100	58	-
Team 2	96	60	3

Magic Number = (4+1) – (60-58)
= 3

The interpretation of the *Magic Number* is:

If the sum of the remaining wins by the first place test and the remaining loses by the trailing team is equal to the magic number then the first place team is the guaranteed winner of the pennant.

Let's look at the example above where the magic number was 7. Let us suppose the first place team lost all its remaining 4 games while the trailing team lost 7 of its remaining games. The final records would be:

AL	W	L	GB
Team 1	100	62	-
Team 2	99	63	1

Use other examples to test the Magic Number theory.

Calculation of the *Games behind Number* (GB)

GB =1/2 * [(Team 1 W – Team 2 W) – (Team 1 L – Team 2 L)]

From the above example we have:

For the AL: 1/2 * [(100 – 96) – (58 – 56)] = 1/2(4 – 2) = 1 (Team 2 is one game behind Team 1).

For the NL: 1/2 * [(100 – 96) – (58 – 60)] = 1/2(4 – -2) = 3 (Team 2 is three games behind Team 1)

Calculation of a Team's Winning Percentage

For the AL: Team 1 has a team win percentage of [100/(100+58)]* 100 = .633*100 = 63.3%

Team 2 has a team win percentage of [96/(96+56)]*100 = .632*100 = 63.2%

For the NL: Team 1 has a team win percentage of [100/(100+58)]*100 = .633*100 = 63.3%

Team 2 has a team win percentage of [96/(96+60)]*100 = .615*100 = 61.5%

At the end of the 162 games, the team with the highest percentage is the team that is declared the league winner. Except for the team with the highest percentage, all the other teams will have a positive number assigned to their GB.

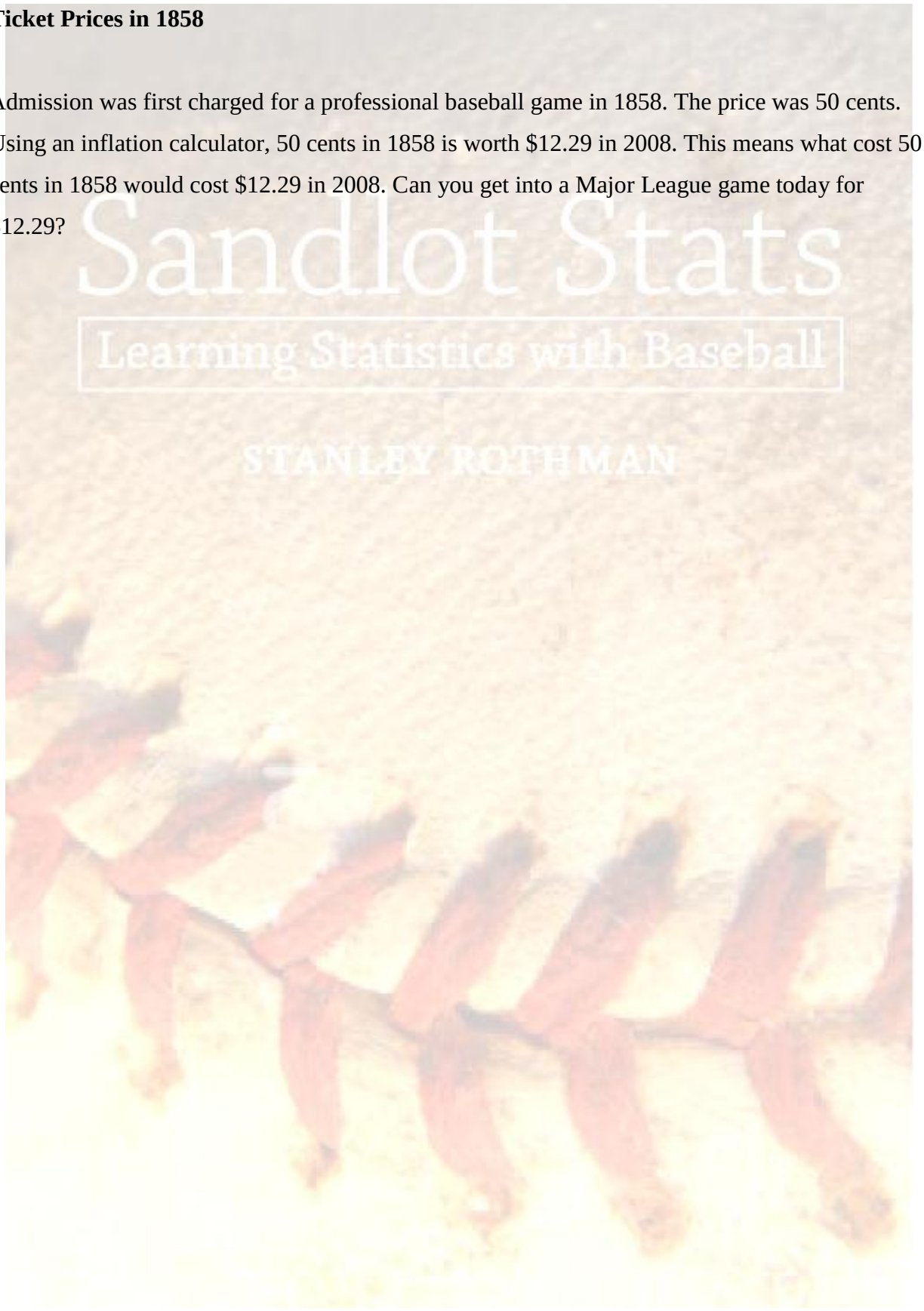
During the season the won-lost percentage may not necessarily agree with the GB results.

See if you can fill in the question marks below.

	W	L	GB	Won-Lost Percentage
Team 1	20	12	?	?
Team 2	23	14	?	?

Ticket Prices in 1858

Admission was first charged for a professional baseball game in 1858. The price was 50 cents. Using an inflation calculator, 50 cents in 1858 is worth $12.29 in 2008. This means what cost 50 cents in 1858 would cost $12.29 in 2008. Can you get into a Major League game today for $12.29?



Sandlot Stats
Learning Statistics with Baseball
STANLEY ROTHMAN