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Contents

1	Yahtzee A Brief History	1
2	Yahtzee The Rules.....	3
3	Contemplating Yahtzee Strategies.....	15
4	Yahtzee's Secrets Unlocked	
	The Optimal Strategy	23
5	The Basic Strategy.....	34
6	Basic Opening Strategy	
	Hands One to Four	39
7	Basic Middle-Game Strategy	
	Hands Five to Nine	52
8	Basic End-Game Strategy	
	Hands 10 to 13.....	60
9	Playing Against Others	71
	Appendix I.....	76
	The Yahtzee Score Distribution	80
	Appendix II	
	Sample Games with Annotations.....	81
	Appendix III	
	The Yahtzee Solution.....	134
	About the Author	141

1

Yahtzee A Brief History

Yahtzee is one of the world's best known and most avidly played games. Now approaching its silver anniversary, it's estimated that more than 90% of all Americans are familiar with the name Yahtzee and that it's played regularly by some 100 million people worldwide.

Although it's now a part of the American landscape, Yahtzee is a game of humble beginnings. It was invented in 1954 by a wealthy Canadian couple while sailing aboard their yacht. They called their invention Yacht Game. Wishing merely to have copies to distribute to friends, the couple sold exclusive production rights to Edwin S. Lowe in exchange for the first 1,000 copies.

For reasons unknown, Lowe changed the name from Yacht Game to Yahtzee, then began actively marketing his new product. One of his most successful marketing techniques was orga-

nizing Yahtzee parties, which increased the game's popularity dramatically via word of mouth. Lowe profited handsomely, and in 1973, sold his company—and the rights to Yahtzee—to Milton Bradley, now a subsidiary of Hasbro, Inc.

Over the years, the Yahtzee family has grown to include several versions of the original game. These include Triple Yahtzee (three games played at once), Painted Yahtzee (die faces have different colors), Battle Yahtzee (players duel), and Pyramid Yahtzee (tetrahedral dice replace cubes). However, proving that some things may be better left unchanged, the original Yahtzee game remains the public's overwhelming favorite.

Low Roller

Yahtzee impresario Edwin S. Lowe's touch was decidedly less golden in Las Vegas. In 1962, Lowe bucked conventional wisdom by opening the first resort on the Las Vegas Strip without a casino. The \$12 million 450-room Tallyho closed in 1963 and was replaced by the Aladdin.

2

Yahtzee The Rules

Before going further, let's get a handle on the rules of Yahtzee. If you're already familiar with how the game is played, feel free to skip ahead to Chapter 3.

Yahtzee's popularity is due, in large part, to its simplicity. The object of Yahtzee is to achieve the highest score by constructing up to 13 different poker hands from the rolling of five dice. As the hands are made, they're recorded on the Yahtzee scorecard. Each combination earns a specified number of points, which is indicated on the scorecard.

That's it. Yahtzee is made up of two parts: playing the hands and recording the results.

The Yahtzee Hand

The play of a Yahtzee hand consists of an initial roll of all five dice and up to two re-rolls. During the course of a hand, the player has a great deal of

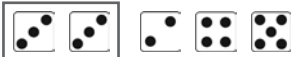
flexibility, as indicated by the following two rules.

1. Any or all dice may be held or discarded prior to each re-roll.

It's often desirable to change strategy in the middle of a hand. Consider the example below. Your first roll is 2-6-3-3-2 and you hold the 3-3. With the 3s put aside, the re-roll of three dice produces a 2-4-5, creating the hand 3-3-2-4-5. You may now change directions and hold the Small Straight of 3-2-4-5 (thus discarding one of the previously held 3s) prior to the final roll.

First roll: 

Hold: 

Second roll: Held from 1st roll


Hold: 

2. It is not mandatory to use all three rolls.

There will be times when, after either the first or second roll, it will be best to hold all five dice and end the hand early.

First roll: 

In this example, the first roll has produced a Large Straight; you may hold all five dice and finish the hand without taking a re-roll.

REVIEW OF THE SCORECARD

Let's take a closer look at each section of the Yahtzee scorecard.

Scorecard—Upper Section







The top of the scorecard consists of six categories: Aces, Twos, Threes, Fours, Fives, and Sixes. Scores in these categories are calculated by adding all of the dice *that display the chosen number* in a finished hand. For example, the hand below can be scored as 6 (equal to 2+2+2) in the Twos box on the scorecard.



Alternatively, this hand could be scored as a total of 4 in the Fours box or 5 in the Fives box. If necessary, the hand could also be used to record a total of 0 in the Aces, Threes, or Sixes boxes.

Notice the Upper Section “bonus.” This is a

The Yahtzee Scorecard

UPPER SECTION		HOW TO SCORE		
Aces	 = 1	Count and Add Only Aces		
Twos	 = 2	Count and Add Only Twos		
Threes	 = 3	Count and Add Only Threes		
Fours	 = 4	Count and Add Only Fours		
Fives	 = 5	Count and Add Only Fives		
Sixes	 = 6	Count and Add Only Sixes		
TOTAL SCORE		—————>		
BONUS		If total score is 63 or over SCORE 35		
TOTAL		Of Upper Section —————>		
LOWER SECTION				
3-of-a-kind		Add Total Of All Dice		
4-of-a-kind		Add Total of All Dice		
Full House		SCORE 25		
Sm. Straight		Sequence of 4	SCORE 30	
Lg. Straight		Sequence of 5	SCORE 40	
YAHTZEE		5-of-a-kind	SCORE 50	
Chance		Score Total Of All 5 Dice		
YAHTZEE BONUS		✓ FOR EACH BONUS		<input type="text"/>
		SCORE 100 PER ✓		<input type="text"/>
TOTAL		Of Lower Section —————>		
TOTAL		Of Upper Section —————>		
GRAND TOTAL		—————>		

The Yahtzee scorecard resembles the figure above. The results of each completed hand are entered on the scorecard. A score must be recorded after every hand.

very important part of the game, since a bonus of 35 points is awarded when the total in the upper portion is at least 63. The value 63 represents an average of a three-die tally for each entry. That is, 3 Aces + 3 Twos + 3 Threes + 3 Fours + 3 Fives + 3 Sixes ($3 + 6 + 9 + 12 + 15 + 18$) equals 63 points. Thus, the Upper Section entries are linked by this bonus consideration; if you're below average on one of the entries, you must achieve better-than-average results on another in order to obtain the 35-point bonus.

Scorecard—Lower Section

The bottom of the scorecard consists of seven categories: 3-of-a-kind, 4-of-a-kind, Full House, Small Straight, Large Straight, Yahtzee, and Chance. The scoring for each of these categories varies, so let's take a look at them individually.

3-of-a-kind: A 3-of-a-kind is a hand in which at least three dice show the same number. The score for this hand is the total of all five dice.



For example, this hand may be used as a 3-of-a-kind with a score of 23.

4-of-a-kind: A 4-of-a-kind is a hand in which at least four or more dice show the same number. Just as with 3-of-a-kind, the score for this hand is the total of all five dice.



This hand may be used as a 4-of-a-kind with a score of 19.

Full House: A Full House is a hand containing three dice showing one number and two dice showing another (3-of-a-kind and a pair). The score for this hand is fixed at 25 points.



This is a Full House with a score of 25.

Small Straight: A Small Straight is a hand containing four dice in sequence. The score for this hand is fixed at 30 points.



This is a Small Straight (because of the 3-4-5-6 sequence) with a score of 30.

Large Straight: A Large Straight is a hand containing five dice in sequence. The score for this hand is fixed at 40 points.



This is a Large Straight with a score of 40.

Yahtzee: A Yahtzee is a 5-of-a-kind. The score for this hand is fixed at 50 points.



This is a Yahtzee with a score of 50. Additional Yahtzees made in the same game must be used to fill another scorebox, but also earn a 100-point bonus (see “The Unique Nature of a Yahtzee Hand” next page).

Chance: This is a catch-all entry. The score for this hand is the total of all five dice. Any hand may be used as Chance.



This hand, if used as Chance, is scored as 20.

Scorecard-Filling Rules

At the end of each hand, one scorebox must be filled. And once a box is filled, it can no longer be used. In order to get the highest final score, it's preferable to fill in each box with as high a value as possible. But on occasion, one or more scoreboxes will have to be filled with a 0.

For example, consider a position near the end of the game in which only two score-boxes are open: Aces and Full House. With the final hand outcome displayed below, we have a dilemma.



A score must be entered into either the Aces or Full House category, since one scorebox must be filled after every hand. However, the combination does not equal a Full House, nor are there any Aces (1s) present. In this case, it's necessary to fill in a 0. It's your choice which of the two open scoreboxes gets the goose egg, but you will have to enter a 0 into one of them.

THE UNIQUE NATURE OF A YAHTZEE HAND

The best hand in the game of Yahtzee is, naturally, a Yahtzee. Provided that the scorebox for

Yahtzee is still empty, your first Yahtzee is scored in that box and earns 50 points. Subsequent Yahtzees made in the same game earn a 100-point bonus. They are tallied by placing a check mark in the appropriate spot in the Yahtzee scorebox. (Note that while the Yahtzee box has room for only three subsequent Yahtzee check marks, you are allowed to score as many Yahtzees as you make during the course of a game.)

Subsequent Yahtzees must also be tallied in an open scorebox, and a fair amount of confusion arises in deciphering the rules governing this requirement. Since Yahtzee always qualifies naturally as a 3-of-a-kind, 4-of-a-kind, Full House, or Chance in the Lower Section, and also as its Upper Section counterpart (that is, a Yahtzee made up of 5s can be used in the Upper Section Fives box), subsequent Yahtzees may be tallied in any of these open boxes, earning, in addition to the 100-point bonus, the points specified by that box's scoring rules. Yahtzee may also be scored in either of the remaining two Lower Section categories (Small and Large Straight) according to the game's "Joker Rules," provided that each of two conditions are met: 1) the Yahtzee box is filled (with 50 or 0), and 2) the corresponding Upper Section box is filled. If only non-corresponding Upper Section boxes remain, you have no choice

but to fill one of them with 0 (see pg. 15 for the practical application of these rules).

If you make a Yahtzee, but have already filled the Yahtzee box with 0, score the hand in an open box in the manner described above. In this case, you earn only the score associated with the category that you fill. You may not score the 50 points for a Yahtzee or 100-point bonuses for subsequent Yahtzees.

Different Rules

The rules of Yahtzee sometimes have slight differences, which vary by game version or release, even though they come from the same manufacturer. The explanations in this book come from the rules specified in recent Hasbro games. Of course, players sometimes employ their own “house rules,” such as allowing a Yahtzee to be used as a Joker only if it was scored as 50, or never allowing a Yahtzee to function as a Full House. Regardless of which variation you play, none of these subtle rules differences alters the strategy advice presented in *Advantage Yahtzee*.

Sample Hands

Notice in the sample hands that follow that several scoring choices are possible.



This hand is a Large Straight (40 points). It can also be scored as a Small Straight (30 points), Aces (1 point), Twos (2 points), Threes (3 points), Fours (4 points), Fives (5 points), or Chance (15 points). If all of these scoreboxes are filled, the hand may be entered as 0 in any open box.



This hand is a Full House (25 points). It can also be scored as a 3-of-a-kind (13 points), Twos (4 points), Threes (9 points), or Chance (13 points). If all of these scoreboxes are filled, the hand may be entered as 0 in any open box.



This hand is a 4-of-a-kind (26 points). It can also be scored as a 3-of-a-kind (26 points), Fives (20 points), Sixes (6 points), or Chance (26 points). If all of these scoreboxes are filled, the hand may be entered as 0 in any open box.

Recording Additional Yahtzees



Lucky You! You've just made your second (or third or fourth) Yahtzee of the game. How do you score and log the hand above?

If the Yahtzee scorebox is filled with 50, take your 100-point bonus. If the Yahtzee scorebox is filled with 0, you get no bonus.

You must now fill a scorebox and record the appropriate score.

Though the rules appear complicated, the best move tends to be straightforward. If the Upper Section Threes scorebox is open, it will almost always be best to enter a score of 15 there. If not open, the Joker Rules will usually be in effect, so choose the open Lower Section scorebox that earns the most points between 3-of-a-kind, 4-of-a-kind, or Chance (15 points each), Full House (25), Small Straight (30), or Large Straight (40).

If the corresponding Upper Section box and all Lower Section boxes are filled, you are forced to place a 0 in a remaining (choose the lowest) Upper Section scorebox.

3

Contemplating Yahtzee Strategies

Part of the beauty of Yahtzee is that every game is different. Much like chess, you'll never play the same game twice.

We have to wade into a bit of math to explain why this is so. Don't worry, the numbers are here simply to paint a clearer picture; you don't have to memorize them to use the strategies presented later (and there won't be a test). If this sort of presentation isn't your cup of tea and you want to skip the whole thing, I urge you to at least peruse the final subsection of this chapter—"The Variety of Yahtzee." It will give you a feel for the enormous underlying complexity of this game that seems so simple on its face.

THE ROLL OF FIVE DICE

When you roll five dice, you'll see many different outcomes. Mathematicians call each of these outcomes a "combination." A combination is a grouping of elements in which order does not matter. If we wanted to, we could list all the possible combinations of five dice beginning with:

1 - 1 - 1 - 1 - 1

1 - 1 - 1 - 1 - 2

1 - 1 - 1 - 1 - 3

1 - 1 - 1 - 1 - 4

1 - 1 - 1 - 1 - 5

1 - 1 - 1 - 1 - 6

1 - 1 - 1 - 2 - 2

1 - 1 - 1 - 2 - 3

... and so forth. Skipping ahead, the last few combinations would be:

4-5-6-6-6

4-6-6-6-6

5-5-5-5-5

5-5-5-5-6

5-5-5-6-6

5-5-6-6-6

5-6-6-6-6

6-6-6-6-6

In total, there are 252 distinct combinations that may be rolled with five dice.

Before proceeding, it's important to understand that not all of these combinations are equally likely. For example, look at the last two: 5-6-6-6-6 and 6-6-6-6-6. In a random roll of five dice, which of these two combinations is more likely? The intuitive answer, that the Yahtzee is less likely to come up (making the first combination the more likely), is correct. The easiest way to illustrate this is to imagine that each of the five dice has a distinct color. Let's choose red, yellow, blue, black, and white.

Consider first the hand of 6-6-6-6-6. There is only one possible way to make this combination: All five colors (of dice) must land on the number 6.

Red	6
Yellow	6
Blue	6
Black	6
White	6

On the other hand, 5-6-6-6-6 has five possible ways of occurring. One way is for the red die to be a 5 and the rest 6s. Another is for the yellow die to be the 5 and the rest 6s, and so forth.

Red	5	6	6	6	6
Yellow	6	5	6	6	6
Blue	6	6	5	6	6
Black	6	6	6	5	6
White	6	6	6	6	5

So, for a roll of five dice (remember, order does not matter), the hand of 5-6-6-6-6 is in fact five times more likely than the hand of 6-6-6-6-6. We can say that the hand of 5-6-6-6-6 has five times the weight (5x) of 6-6-6-6-6.

A weight can similarly be assigned to each of the other 252 combinations. For example, a hand of 1-2-3-4-5 is 120x as likely as a hand of 6-6-6-6-6, and so forth.

THE PLAY OF A HAND

Okay, we've learned that on every first roll, there are 252 possible outcomes. We've also seen that each of these outcomes has a weight associated with its relative probability. Now let's consider the variety of choices you may encounter as you play through the two re-rolls.

To illustrate, consider a first roll of 1-2-3-5-6 and count the number of different strategies that may be adopted for this hand. To do this, it's use-

ful to categorize the strategies based on how many dice are held.

We begin by holding all five dice. There are no decisions in this case—there is only one possible strategy.

Next we consider holding four dice and find five possible ways to proceed (an “x” denotes a re-rolled die): 1-2-3-5-x, 1-2-3-x-6, 1-2-x-5-6, 1-x-3-5-6, and x-2-3-5-6. Each possibility is created by the decision to re-roll a different die.

If we hold three dice, there are 10 ways to proceed: 1-2-3-x-x, 1-2-x-5-x, 1-x-3-5-x, x-2-3-5-x, 1-2-x-x-6, 1-x-3-x-6, x-2-3-x-6, 1-x-x-5-6, x-2-x-5-6, and x-x-3-5-6.

In the same way (without listing all the examples), we can determine that holding two dice also yields 10 possibilities, holding one die yields five possibilities, and holding none has only one possibility.

Phew! That’s everything. Thus, there are a total of $1+5+10+10+5+1$, which equals 32 possible strategies that may be adopted for the combination of 1-2-3-5-6, based on how many and which dice we decide to hold.

By repeating this exercise for each of the other possible 252 starting rolls, we can determine how many different ways the very first roll in a Yahtzee game can be played.

- The distance from the sun to the Earth in inches is about 6 trillion (6×10^{12}).
- An Earth-sized ball of sand might contain 10 million trillion trillion (10^{32}) grains.
- Even multiplying all of the numbers in these five examples together does not *begin* to approach the value 10^{135} .

Indeed, a universe-sized ball of sand might contain only about 10^{100} grains. Thus, we would need perhaps a trillion trillion trillion universes made entirely of sand in order to have a grain of sand for each possible game. In the context of these numbers, you might begin to get a handle on the complexity of Yahtzee. While it can't be strictly stated that Yahtzee is never the same game twice, the possibilities afford such unimaginable variety that it's appropriate to consider the game in a universal context.

Here's just one more way to characterize it. Assume that you've just completed a game of Yahtzee. A super-computer with the ability to play a trillion games per second, playing nonstop, would have perhaps a 1 in 10^{100} chance of duplicating your game in the next billion years. Even if you programmed the computer to mimic your strategy exactly, there would still be only a minuscule chance of duplication. Such is the variety in game play for Yahtzee.

Yahtzee's brilliant combination of simplicity

(rules) and variety (game play) is what makes it one of the world's most popular games. Though it takes only a few minutes to learn, for the rest of your life you'll never experience the same result twice. Given Yahtzee's mind-boggling complexity, how on Earth can we possibly derive the optimal way to play it? Read on.