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**De La Salle University • College of Computer Studies**

Statistical Guide to

**Yahtzee**

A Dice Game

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**Introduction**

Yahtzee is a dice game that can be played with 1 or more players. The game is played with five dice and a score board. The objective of the game is to gain the highest score possible.

**Mechanics of the Game**

*The Roll*

Each player’s turn consists of rolling the five dice at most three times. After the first roll, they can choose to keep any of the five dice and re-roll the remaining (it is possible that they do not like the roll at all and they re-roll all five dice). On the third roll, they may choose to switch up the kept dice and the dice to be re-rolled. Whatever comes out of the third roll is the final roll for the turn. They must now fill in a field in their score board, even if the value of which is a zero. The player may stop before the third roll.

*The Score Board*

The score board has two sections for each player: an upper section and a lower section. There a total of thirteen fields to be filled. No field can be filled in twice.

In the upper section, the fields to be filled in are Aces, Twos, Threes, Fours, Fives, and Sixes. These are based on the corresponding numbers on the five dice. For example, if one were to roll a 2, 2, 3, 3, 5; they could score a 4 in the Twos field since they have two 2’s, a 6 in the Threes field since they have two 3’s, a 5 in the Fives field since they only have one 5, or a 0 in the Aces, Fours, or Sixes since there no 1’s, 4’s, or 6’s. If a player can accumulate sixty-three total points in the upper section (three dice in each field), they get a thirty-five point bonus.

In the lower section, the fields to be filled in are Three of a Kind, Four of a Kind, Full House, Small Straight, Large Straight, Yahtzee, and Chance. If the roll shows three of any value, it is eligible for Three of a Kind, which is scored by adding all the values of the dice. If the roll shows four of any value, it is eligible for Four of a Kind, which is scored by adding all the values of the dice as well; note that a roll of this kind is also eligible for Three of a Kind. A Full House consists of a three of a kind of one value and a pair of a different value, for example, 1,1,1,5,5. This is given a flat score of twenty-five. A Small Straight happens when four of the five dice are consecutive numbers, for example, 3, 3, 4, 5, 6. The last four dice are consecutive. This is granted a flat score of thirty. A Large Straight happens when all five dice are consecutive numbers, for example, 2, 3, 4, 5, 6. This is granted a flat score of forty. The greatest challenge of the game is the Yahtzee, which is simply all five dice having the same value. This is granted a score of fifty, but if a player is (Syfu) fortunate enough to get multiple Yahtzees in one game, they are granted a one hundred point bonus for each. They have to fill in the appropriate field in the upper section, for example, a 5,5,5,5,5, will grant the player a twenty-five in the Fives box. If the box has already been filled, the player can choose any field in the lower section, all of them scored in the same way. In the previous example, if the Fives box is already filled, they can put a twenty-five (sum of all dice) in the Three or Four of a Kind fields, a twenty-five in the Full House field, a thirty in the Small Straight field, or a forty in the Large Straight field. If all lower section fields are already full and the appropriate upper section fields is already filled, a zero must be put in an empty field in the upper section. Extra Yahtzees cannot be credited if the Yahtzee box was marked with a zero. Chance is a failsafe; if your roll is undesirable, you may just add up all the values and put whatever total there is in the Chance field.

*End of the Game*

At the end of the game, the Upper Section, with the bonus, if any, is added with the Lower Section, with any Extra Yahtzee bonuses, to get the Grand Total. High score wins.

**Scope**

The application will simulate a game of Yahtzee for a single player as a guide, informing the player of the possible decisions s/he can make, with their respective scores and probabilities. Also, if the player has any re-rolls remaining in a round, the application will suggest him/her what the best dice to re-roll will be, and what fields of the score board those suggestions are targeted towards. The application will have four phases – the initial roll, the first re-roll, the second re-roll, both of which are optional, and the final decision. One cycle of these four phases constitutes a round in actual Yahtzee. These four phases will be repeated a total of thirteen times, representing thirteen rounds, to simulate a full game.

Each round will run as follows:

**Initial Roll Phase**

In this phase, the player will input the five dice values that he/she initially rolled. After receiving this input, the application will then display the best fields that the player can fill up with the dice values he/she currently has. If there is more than one field that can be filled up, then the application will inform the player all potential fields, with the highest-scoring fields displayed first. If there are fields whose scores can be increased by re-rolling some of the dice, the application will inform the player which fields those are, what dice need to be re-rolled for each field, each field’s respective probability, and the possible score per field. After all this information is displayed, the application will then ask the player what he/she wants to do. At this point, the player can either make a decision to fill in a field, or re-roll. If the player chooses to make a decision, then the application proceeds to the final decision phase, otherwise it proceeds to the first re-roll phase.

**First Re-roll Phase**

This phase is identical to the initial roll phase. The player will input the result of his/her roll, the application will display the statistics stated in the Initial Roll Phase, and asks the player what he/she wants to do. At this point, the player can either make a decision to fill in a field, or re-roll. If the player chooses to make a decision, then the application proceeds to the final decision phase, otherwise it proceeds to the second re-roll phase.

**Second Re-roll Phase**

This phase is almost identical to the Initial Roll and First Re-roll phases, with the key difference that after displaying the statistics, the application will no longer ask the player if he/she wants to re-roll, and will immediately proceed to the Final Decision phase.

**Final Decision Phase**

In this phase, the application will display two things – the current score board for that player, and the most recent field suggestions, depending on which of the three phases the player came from. Afterwards, the application will then ask the player which field he wants to fill up. After the player makes a decision, the application will update the score board accordingly.

**Succeeding Turns**

At this point, the application will do one of two things – return to the Initial Roll phase, if the game is not yet over, or display the final score, if the game is over. For succeeding rolls, the fields that have already been filled up will not be considered.