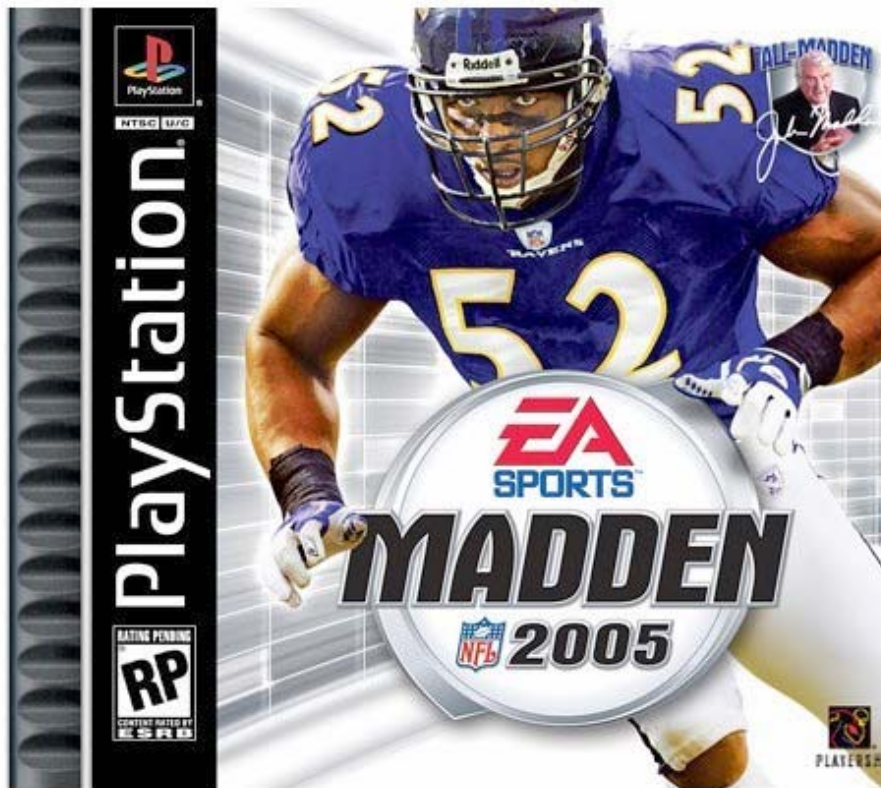


USING GAMES TO ENHANCE LEARNING
LEARNING AVERAGES AND PROPORTIONS WITH
MADDEN 2005



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INTRODUCTION

What is Madden 2005?

John Madden 2005 is a football game that can be used on Play station 2 or Xbox. It has been one of the most popular sports games over the past decade. Every year the creators of John Madden football have put countless hours in making the game as realistic as possible. Gone are the ideas of getting a first down when it is 4th and 10. In addition, the creators have made it more difficult to run and pass, making the game align closely to real NFL play.

My Goals

Football players and coaches have often been labeled as “dumb jocks” by those who have no idea of the mental process involved when playing or coaching. My primary goal is to allow students to have fun while gaining a deeper understanding of the intense thought that goes on before, during and after every game. In addition, we will focus on the mathematics used by every coach and player who has ever been on the sideline.

As an education tool we will utilize mathematics to look at averages and proportions to help predict what might happen next. We will look at trends from our opponents to help us win the game. We will calculate the following:

- Average yards per rush
- Average yards per pass
- Average yards per catch
- Proportions of runs and passes on first down
- Proportions of runs and passes on second down
- Proportions of runs and passes on third down

- Proportions of runs and passes on fourth down
- Look at trends to predict if the opponent will run or pass on the next play

Using John Madden in the Classroom

John Madden 2005 is a popular game for all ages. Although many people play it for fun, I want to incorporate the mathematics that is inherent in all sports, and more specifically, football. Elementary school students can use it to add whole numbers (positive numbers). Middle school students can utilize it to perform general proportions (wins to losses) as well as add integers (positive and negative numbers). In my high school Algebra class I will utilize it to find important averages (mean, median and mode) as well as use proportions to predict outcomes. Within the topics I will cover, there are some basic skills that are assumed. Students must be able to add, subtract, multiply and divide integers as well as rational numbers (numbers that can be written as a fraction or decimals that do not repeat).

How Video Games enhance Learning

Many students do not know how to connect learning at school to real life activities. Through the use of video games, we can simulate real-life, and allow our students to further their understanding by providing the necessary connection. In the past, averages and proportions have been taught in a rather boring way. “Add up all the numbers and divide by how many numbers there are.” It is surprising to me how many students know how to compute averages, and ratios, however they often ask how they find their grade point average. In addition, when I pass out papers, they often ask, “how do I find my percent or grade on this test?” I feel that utilizing video games and the lesson provided would allow for that connection to take place, creating a meaningful lesson that will help our students in the future.

Getting Started

Before we begin, we must understand some basic terminology as well as some general statistics that apply to each position. Although there are 22 people on the field (11 on each team), we will only be looking at the statistics of the quarterbacks, running backs, and receivers. First we must know what these positions are:

- **QUARTERBACK:** He stands behind the center (in the middle of the formation) and is the person that receives the ball first. He is known as the leader because he calls the plays, and then tells everyone to go with a certain cadence – Usually “Ready! Set! Go!” In addition he can pass the ball to a receiver, or he can turn around and hand the ball to the running back.
 - We will look at his average yards per pass.
- **RUNNING BACK:** He is usually lined up directly behind the quarterback, but is free to line up other places as well. His specialty is to run hard and fast once he is given the ball (by the quarterback). In addition, he can catch a pass from the quarterback, but his specialty is to run with the ball.
 - We will look at his average yards per carry.
- **RECEIVER:** They are usually on the outside of the formation (think of them as book ends). They are usually standing up. On most plays there are 2 receivers, but again they can vary. If a team is forced to pass, they usually take a running back out of the game and put an extra receiver in the game.
 - We will look at his average yards per catch.

In addition to these statistics, we will also look at our opponent. We will utilize proportions to predict if they will most likely run or pass when it is first down, second down, third down, and even fourth down. In football the offense has four downs to get ten yards. Once you have passed the ten yards, the downs start over at 1st and 10. If the team gains only two yards, then it will be 2nd down and 8. If they then gain 6 more yards, then it will now be 3rd down and 2. If they get more than two yards on the next play the downs will start over at 1st and 10. If they fail to get two yards, it will be 4th down. It is important to understand that in football, most teams will punt the ball to the other team on 4th down unless they are close to scoring. If they don't punt, and still do not get the required 10 yards, then the opponent will have the ball close to the end zone, which can give the opponent a shorter distance to go in order to score a touchdown. We will chart what our opponent does on each of the downs to help us predict if it will be a run or a pass.

Teacher and Student Preparation

Students must be able to add, subtract, multiply and divide integers and rational numbers. In addition, it will be helpful if the teacher illustrates where and what each position is, in order to eliminate any confusion. The teacher should also provide statistics sheets for each position (see Appendix a, b, c, and d in the resources section). Be sure to begin slow, and check for understanding as you start the game.

UNIT 1: LAW OF AVERAGES (Mean, Median and Mode)

In this unit, your students will explore how averages are used in a real-life setting. Sports are all around us, and many students enjoy following their favorite teams. However, there are many students who do not like sports, but can still benefit from this unit.

Everyone will get a better understanding of computing averages, as well as understand how averages are used in a real life setting.

LESSON 1: Finding Averages per Position

Objectives:

- Students will add, subtract, and divide integers and rational numbers.
- Students will compute the three basic averages: mean, median and mode.
- Students will learn how averages are used in a real-life setting.

Activity

In this activity the team will look at important averages that will help the “Head Coach” call the plays that will give their team the best chance of winning. Students will discover that if their average yards per carry are low, then it may not be good to run the ball when you have a lot of yards left for a 1st down or a touchdown. On the other hand, if the quarterback is not throwing well, and has a low average, then it may not be wise to keep throwing. Furthermore, they will learn that it is best to have a good balance so that they do not become reliant on one strategy.

Have students perform the following tasks:

1. Assign responsibilities to each coach. There should be a running backs coach, who is responsible for the statistics of the running backs. A receiver’s coach who is responsible for the receiver’s statistics. A quarterback’s coach who is responsible for the statistics of the quarterback. Finally the head coach, who is responsible for calling the correct plays according to the statistics.
2. Start John Madden 2005 and begin a “New Game.”

3. Pick your favorite team. Follow the directions on the screen.
4. Make sure that your controller is on the team you wish to play. Follow the directions on the screen.
5. Start the game.
6. As the game continues, the assistant coaches should tally the results using the stat sheets provided in the appendix. It is important that the coaches work quickly. They are only making tally marks, and calculating the positive and/or negative yards on each play. They do not keep a running total.
7. When the team is on defense, the assistant coaches will then total the yards gained and/or lost and calculate the three averages (mean, median, and mode) for each position.
8. Students will add the latest series of plays to the previous subtotal, creating an up-to-the-minute grand total.
9. Students will report their statistics to the head coach and add input on what their strategy might be.
10. Repeat steps 1 – 9 after each series of offensive plays, until the game is over.

Follow-Up

Have the students use the information to answer the following questions:

- How did the averages help the head coach when he was calling the plays?
- How was this information critical to the success of the team?
- Where else can averages be utilized to help in this game?

- How else can averages be utilized in areas other than sports?

Extension

- Have student's record data into a spreadsheet using EXCEL. Then use the graphing tools to create any graph they wish. Make sure that the graphs represent the data clearly. Then have students present and analyze their graphs.

UNIT 2: PROPORTIONS AND PREDICTIONS

In this unit, students will gain an appreciation for proportions and how they can be used to predict future outcomes. They will learn how to write numbers as a ratio, and also the importance of reducing to help better understand the data.

LESSON 2: Scouting the Opponent***Objective***

- Students will create proportions in order to predict future outcomes.
- Students will also use the proportions to analyze the probability of an outcome, and find the percentage linked to the proportion.

Activity

The students will be defensive coaches, and analyze the opposing team. They will chart the run plays versus the pass plays for each down and distance. For example:

1st down: 4 run plays and 12 pass plays for a ratio of 4:12, or 1:3 (reduced). They will gain an understanding of how proportions are used in real life, and how they can be helpful in predicting future outcomes.

1. Assign responsibilities to each coach. There should be the head coach who is playing the game. In addition, the assistant coaches should be assigned to each down (example: 1st down, 2nd down, and 3rd and 4th down to the same coach).

2. Start John Madden 2005 and begin a “New Game.”
3. Pick your favorite team. Follow the directions on the screen.
4. Make sure that your controller is on the team you wish to play. Follow the directions on the screen.
5. Start the game.
6. As the game continues, the assistant coaches need to create a ratio of run to pass following each play. Since each coach is assigned to only one down, they should keep a running tally and total. In addition, 1st down occurs the most often, so the other assistant coaches may need to help the coach responsible for 1st down.
7. When the team is on defense, the assistant coaches need to calculate and reduce their ratios. In addition, they should calculate the percentages for the run and pass (example: 84% of the time they run on first down. 16% of the time they pass on first down).
8. Once the statistics are calculated the assistant coaches will report to the head coach, allowing him to call the best defense based on the opponents offensive tendencies.
9. Repeat steps 1 – 8 as the game continues.

Follow-Up

- Why is it important to reduce the ratios (or fractions)?
- How does calculating the percent help to predict future outcomes?
- Where else are proportions and percentages used in real life?

Extension

- Have students record statistics for the upcoming game at your school. Report the statistics to the (real) head coach.
- Create a pie chart to illustrate their findings, and support their analysis.

Appendix A: Yards per carry.

Tally each attempt in the middle (according to the player who rushed), and list the yardage of each run on the right (positive or negative yards). Total the yards after each series of downs. You may need to expand the chart.

PLAYER #	ATTEMPTS	YARDS

Appendix B: Yards per reception.

Tally each pass play (according to the player who was thrown to). Be sure to include the incomplete pass (passes not caught). Total the yards after each series of downs. You may need to expand the chart.

PLAYER #	ATTEMPTS	YARDS

Appendix C: Yards per pass.

Tally each pass attempt (according to the player who threw the ball). List the yardage gained on each pass. If the ball was dropped, enter a 0 for yards, but be sure to list it as an attempt. You may need to expand the chart.

PLAYER #	COMPLETE	ATTEMPT	YARDS

Appendix D: Run to pass ratios.

Copy this for each down. Tally the runs and passes on each play according to the down (1st, 2nd, 3rd and 4th). Then calculate the ratio after each play. Then calculate the percentage.

RUN	PASS	RATIO	PERCENTAGE