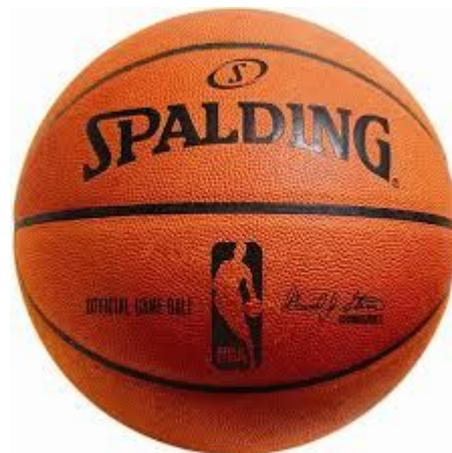
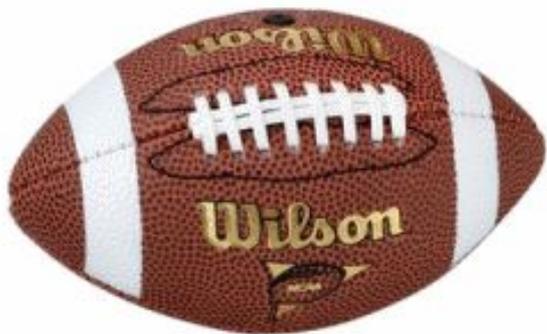


# Football for Physicists

Your glorious leaders,  
SASS czars and gods incarnate,  
masters of all non-foot related balls,  
Dylan and Noah

Which one is the football?



# Objectives of the Game

Four quarters, 15 minutes each; each half (two quarters) starts with a kickoff

If the score is tied at the end of regulation:  
OVERTIME (discussed later)

Points are awarded for:

- Touchdown - 6 points
- Field Goal - 3 points
- Safety (Tackled in your own endzone) - 2 points
- Two Point Conversion (after touchdown) - 2 points
- Extra Point (after touchdown) - 1 point
- One point safety - 1 point

“Usually the team that scores the most points wins the game.”- John Madden



# Football Field Position

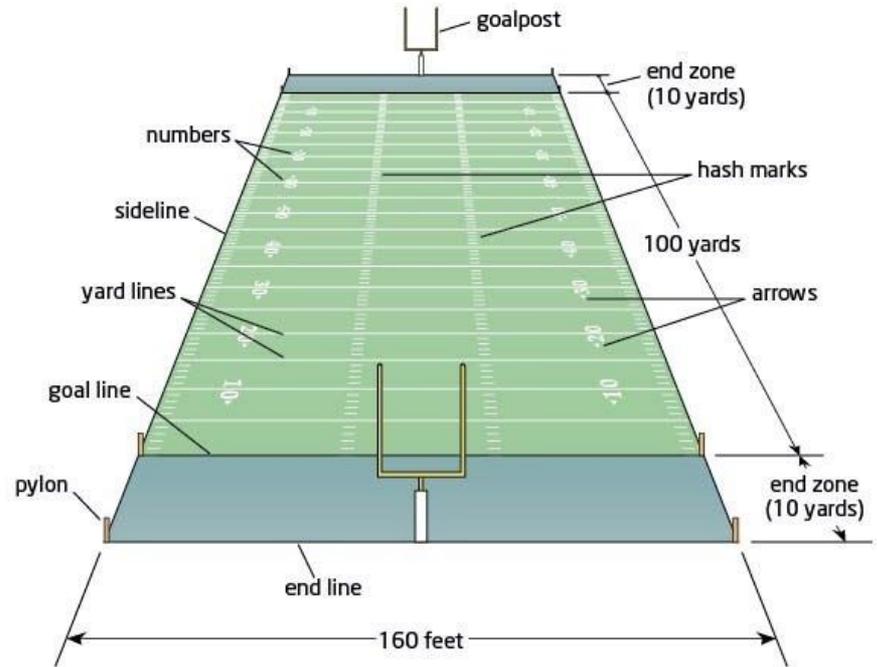
The field is 100 yards long and each endzone is an additional 10 yards; this means a kick from the 40 is actually a 50 yard field goal

The line of scrimmage is the yardline on which the ball starts

All plays start on the hash nearest the end of the previous play

Kickoffs start from the kicking team's 40 yard line, and extra points are started from the opponent's 15 yard line

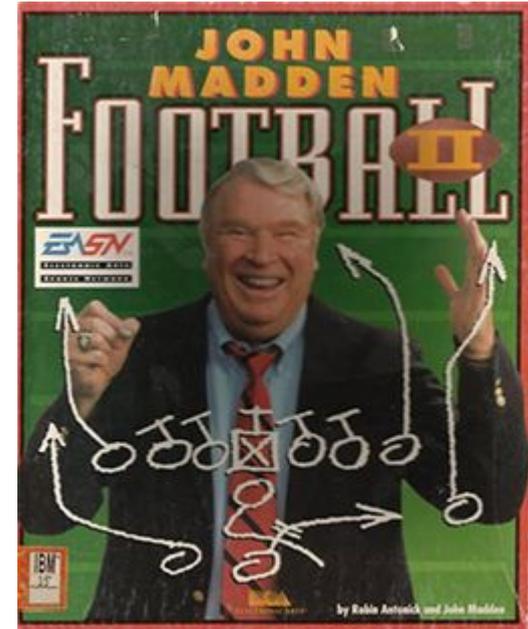
A touchdown is scored when a player carries the football over the plane defined by the forward pylons and the goal line; the player can even dive out of bounds if he's inside the pylons



# Offense

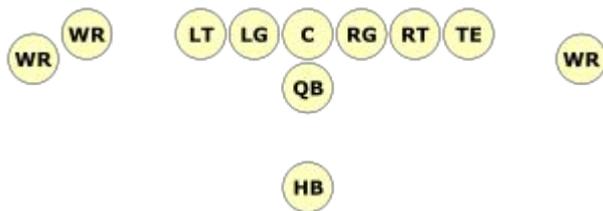
- The objective of the offense is to advance the ball into the opponent's endzone for a touchdown.
- However, they must also advance at least ten yards cumulatively every four plays
- Once these ten yards have been gained, the play counter resets (“a new set of downs”)
- Should they fail to advance the ball 10 yards in the allotted downs, the opponents gain possession of the ball from where the last play ended.
- When the offense is unable to advance the ball the requisite 10 yards in the first three downs, they often elect to punt (kicking the ball downfield, where the opponent takes over possession)

“The best way to gain more yards is advance the ball down the field from the line of scrimmage.” - John Madden



# Offensive Positions

- Quarterback (QB) - the player who receives the ball from the center to begin a play. The QB is the player who throws the ball the most.
- Halfback/running back (HB) - a player who specializes in running in possession of the ball.
- Wide receiver (WR) - players who specialize in catching the ball downfield
- Offensive line - players who specialize in blocking defensive players



“Hey, the offensive linemen are the biggest guys on the field. They’re bigger than everybody else, and that’s what makes them the biggest.”

- John Madden



# Defense

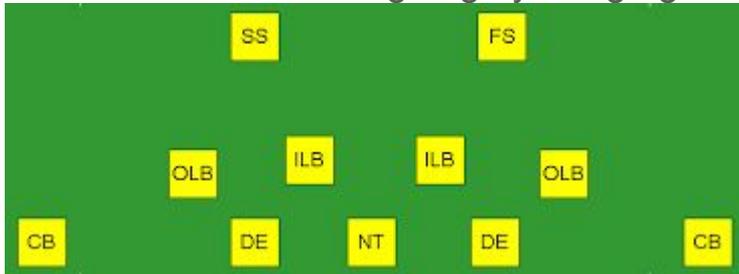
- The objective of the defense is to stop the offense from gaining enough yards for a new set of downs
- To end a play the defense must tackle (or force out of bounds) the offensive player with the ball
- The defense can force a “turnover” by obtaining the ball from an offensive player who fumbles, or by intercepting a throw from the quarterback before it hits the ground
- If the defense returns the football to the endzone, they are awarded a touchdown.

“He would have scored a touchdown if he hadn’t been tackled right there.” - John Madden

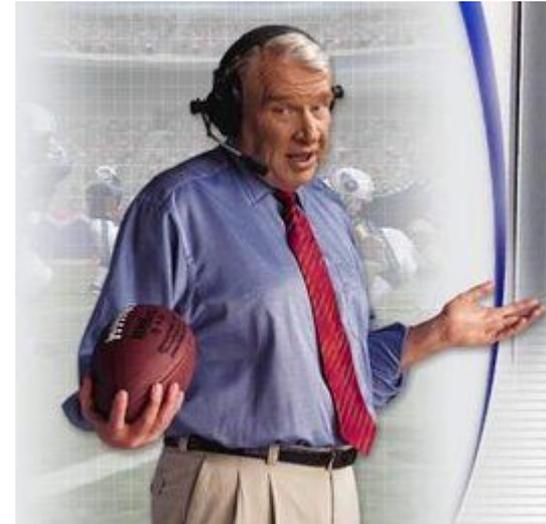


# Defensive Positions

- Defensive Line - these players specialize in getting past the offensive line to tackle the offensive player with the ball
- Cornerback (CB) - these players specialize in stopping wide receivers from catching the ball
- Linebackers (LB) - these players try to stop runners and stop passing plays up the middle as well
- Safeties (S) - these players read the play from far away and attempt to stop the offense from making large yardage gains



“The defense should be expecting a run or a pass here.” - John Madden



# Types of Plays

## Running plays:

- A ball carrier (typically the RB, though occasionally a QB or WR will fill this role) tries to progress with the ball past the line of scrimmage

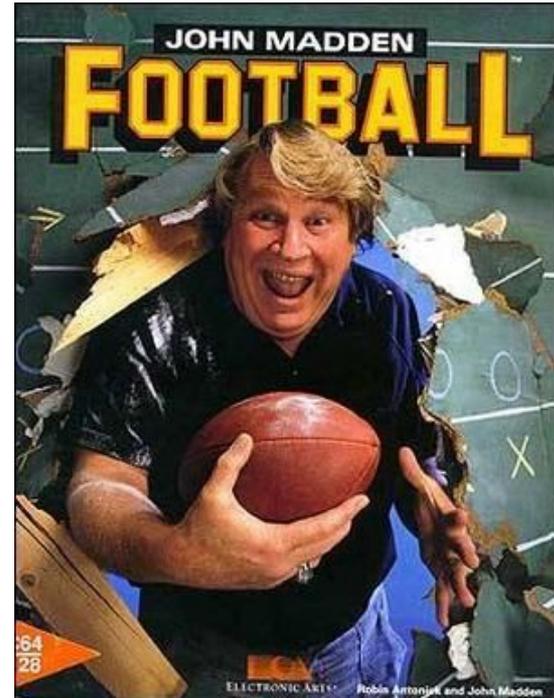
## Passing plays:

- The QB attempts to throw the ball to a WR who will catch it and gain yards

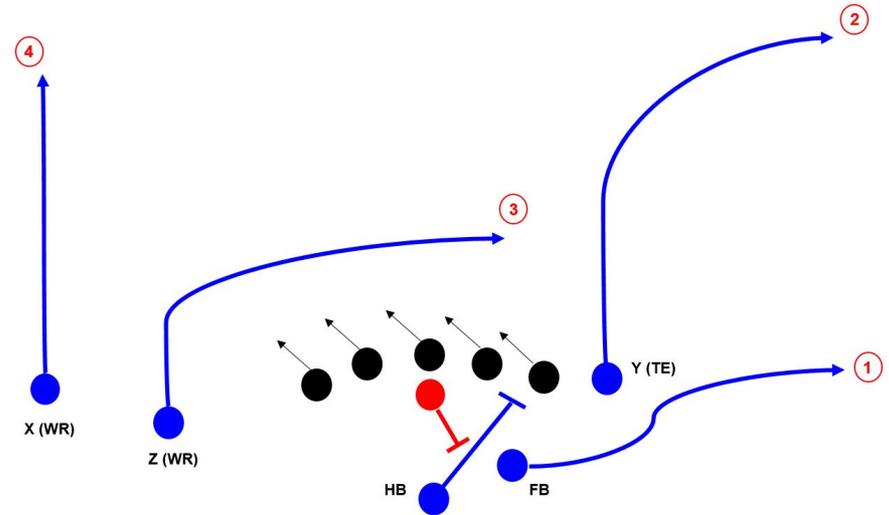
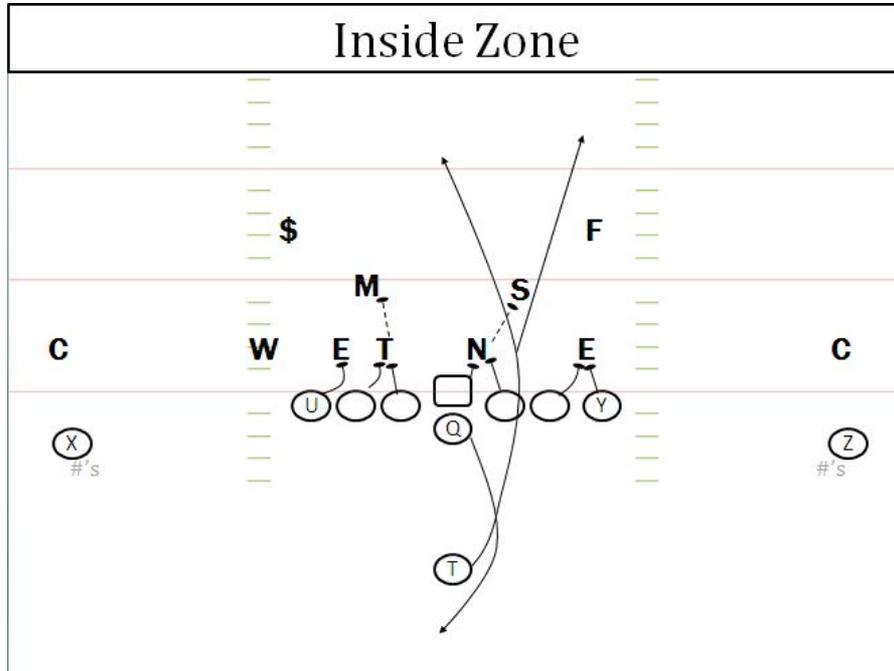
## Playaction pass:

- The QB will pretend to hand the ball to the RB in an attempt to fool the defense, before passing the ball to a WR

“The Dallas Cowboys have 2 types of plays in their playbook. Passing plays, and running plays.” - John Madden



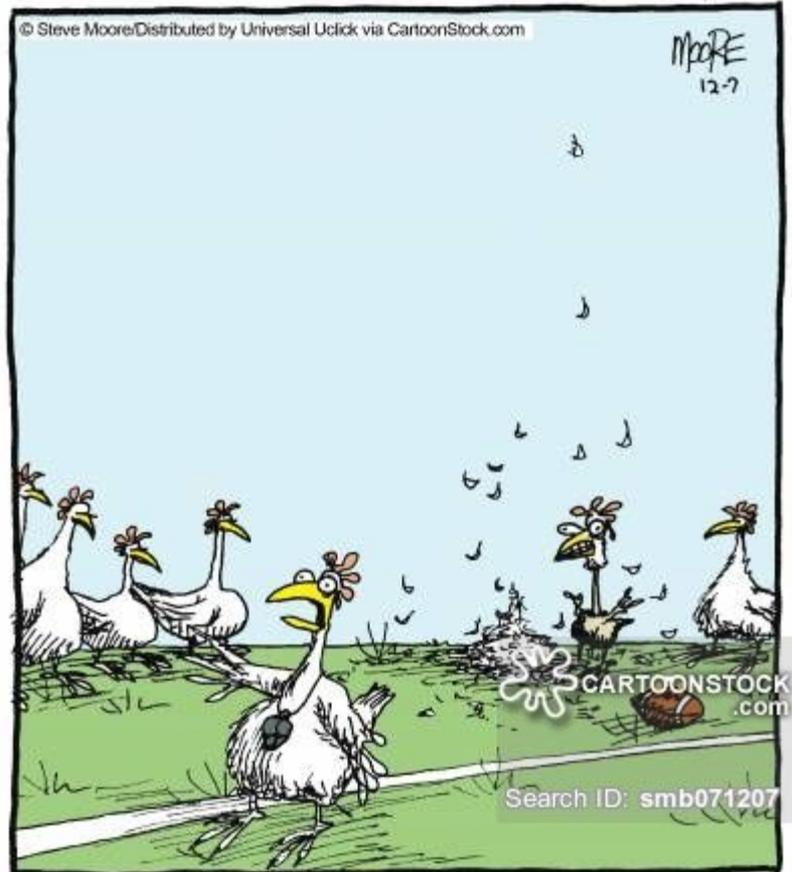
# Look at some plays!



“If the quarterback throws the ball in the endzone and the wide receiver catches it, it’s a touchdown.” - John Madden

# What's Not Allowed?

- Being offsides before the ball is snapped
- Interfering with someone trying to catch a pass (either on offense or defense)
- The offense cannot hold the defense, the defense can hold the offense if they're not trying to prevent the offensive player from passing them
- Blocking in the back (or generally from behind)
- Going for a hit head-first (this is new)
- Grabbing someone's face mask
- Hitting the quarterback after a pass, a kicker after a kick, or a receiver after he has called a fair catch
- Being a dick



**"Personal foul. On the defense.  
Plucking the passer."**

# What is the Ref Saying?



Holding



Penalty declined, incomplete pass, missed field goal, missed extra point, no play



Pass interference



First down (one arm pointing)



Facemasking



Time out



Offside



Clipping



Touchdown, successful field goal, successful extra point



Personal foul



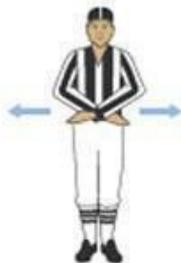
Illegal motion

# But Actually...

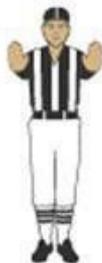
## A GUIDE TO THE HAND SIGNALS OF THE NFL REPLACEMENT REFS



"My hands are sweating uncontrollably."



"This is all too fast. Please slow down."



"No no no, don't look at me. Ask one of the other guys."



"I think I saw a ball-shaped object go in that general direction."



"I got distracted by a bird."



"If I stand still long enough, maybe they'll stop asking me things."



"These are what goal posts look like. I know that much."



"Touchback, maybe? Is that a thing?"



"I was a gym teacher three weeks ago."



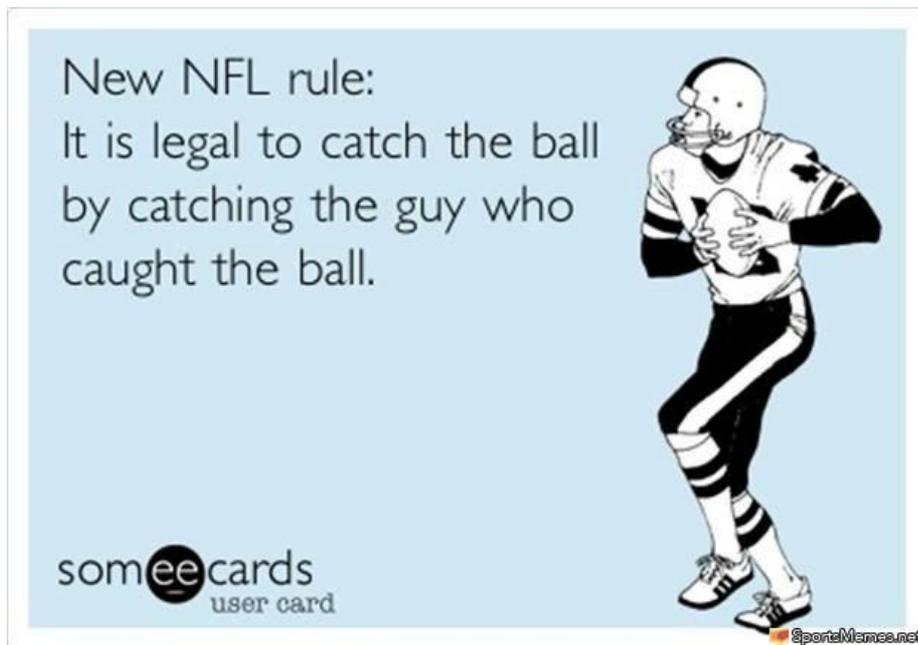
"We are shitting on the game of football."



"I'm hanging myself at halftime."

# Some Finer Points

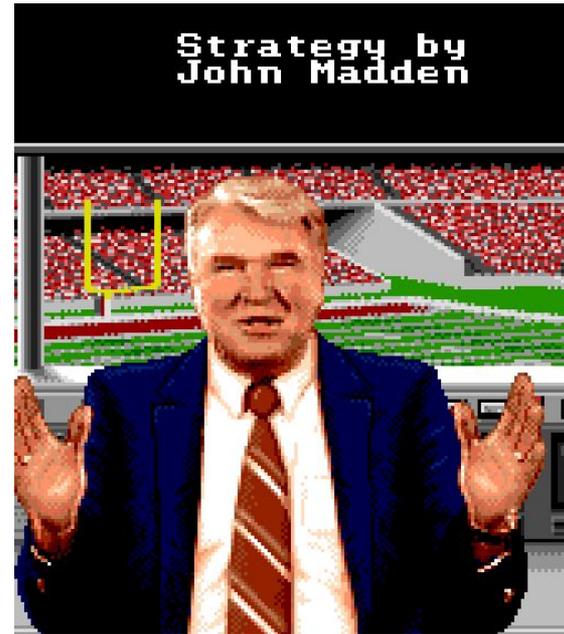
- A player is “down” once his knee has made contact with the ground simultaneous with a touch from an opposing player
- A pass is only complete if a) the receiver is in “control” of the ball and b) if the receiver is able to take two steps inbounds
- A quarterback can only throw the ball forward behind the line of scrimmage
- A quarterback cannot throw the ball away to avoid being tackled if in the “pocket” the area between the end linemen behind the line of scrimmage
- Any player can toss the ball backwards to another player; this is a lateral
- If a player loses control of the ball once in possession (including a missed backwards pass), the team which recovers the ball gets possession (this is a fumble)



# Things to Watch For

- Trick plays: running back passes the ball, quarterback runs the ball, fake kicks
- A great run; if the camera angle is right you'll see the hole in the line open wide up
- Receiver mismatches: watch a fast receiver make a 50 yard touchdown catch
- Onside kicks
- Redonkulous hits
- Interceptions
- Fumbles
- Sacks (when the quarterback is tackled); also the related "Blitz", when receivers are left open so that linebackers can rush the quarterback
- Stupid penalties
- Peyton manning's feet
- Commercials

"When you have great players, playing great, well that's great football!" - John Madden



Enjoy the Superbowl! (Or just the Commercials)

