

Sports
Math

The Math of Football



Ian F. Mahaney

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Ian F. Mahaney

PowerKiDS
press.
New York

For Brenda

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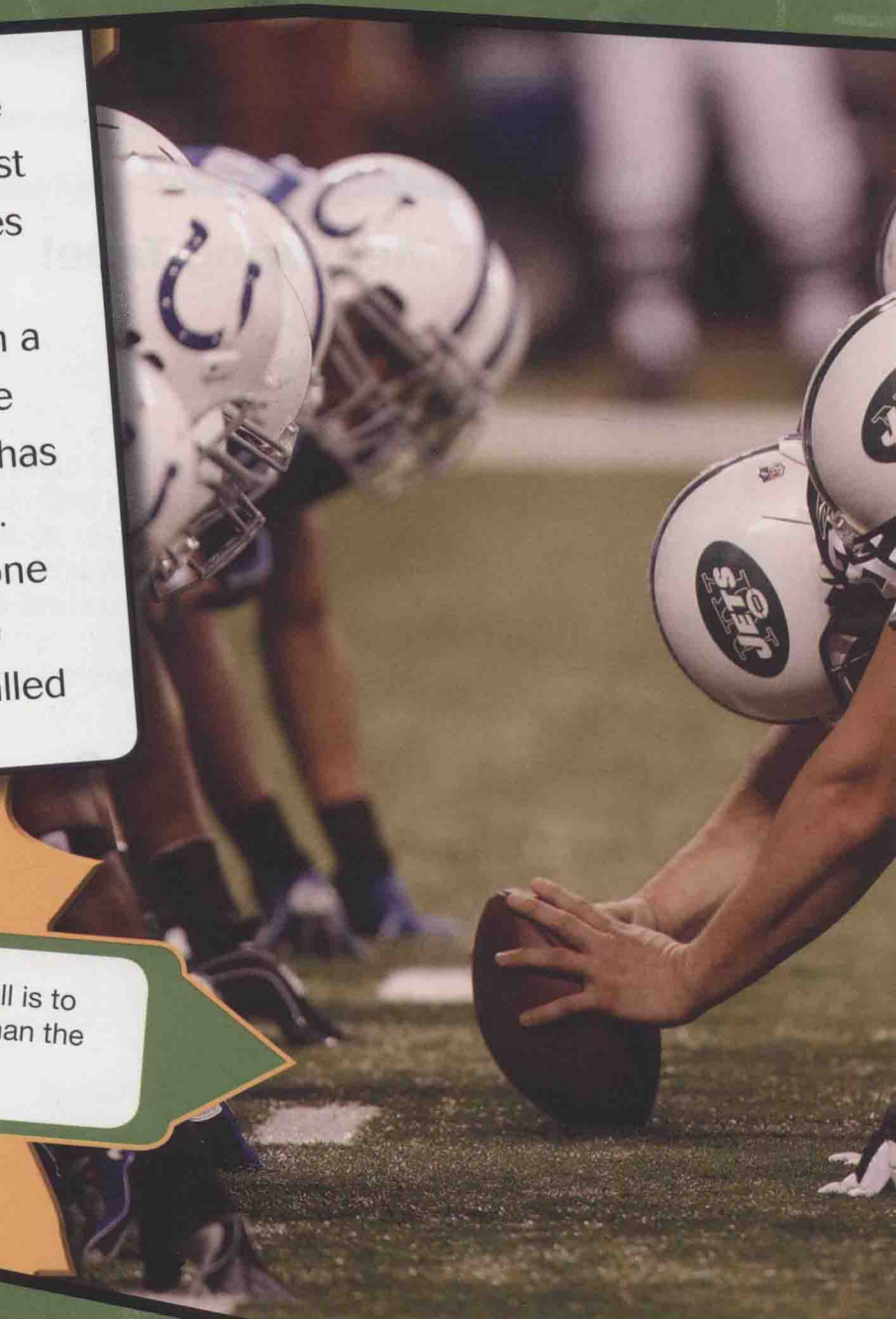
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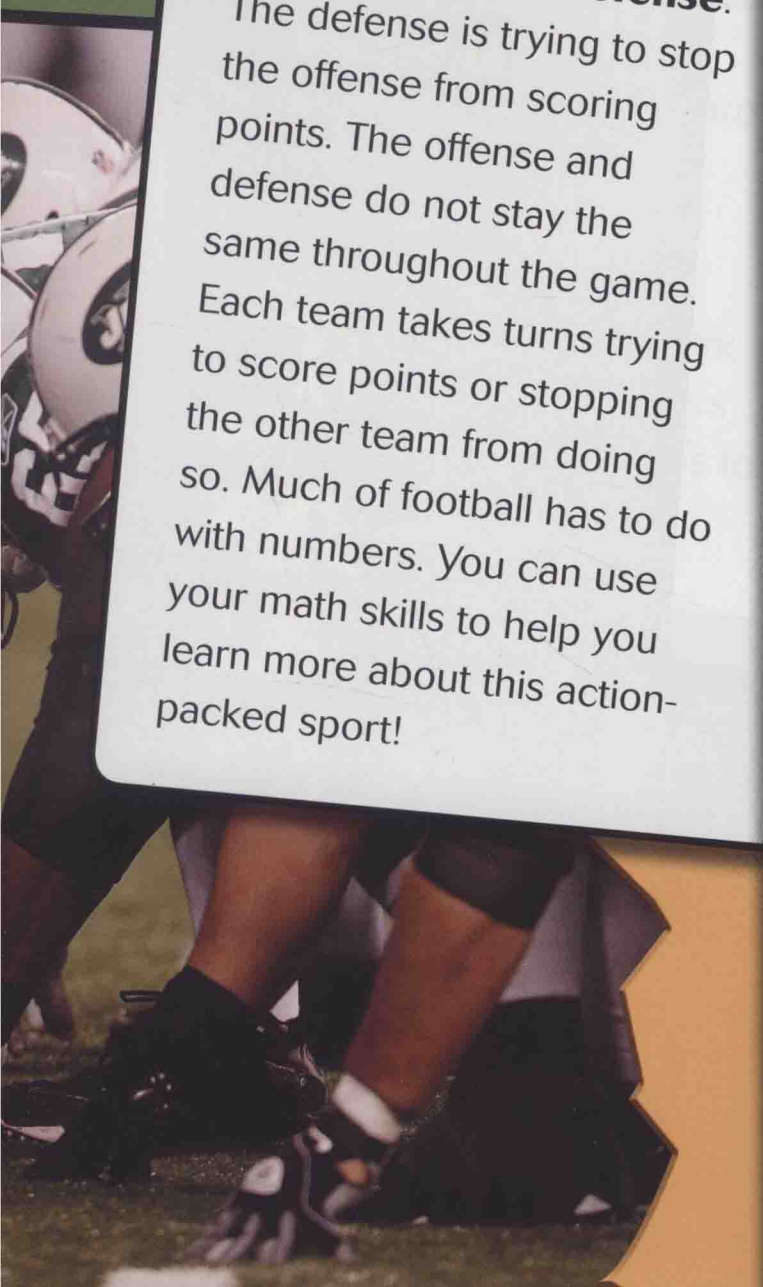
How Does Football Work?

Football may look like a confusing sport the first time you see it. The rules of football, though, are very well **organized**. In a football game, there are two teams. Each team has 11 players on the field.

At any given time, one team is trying to score points. This team is called

The object of football is to score more points than the opposing team.



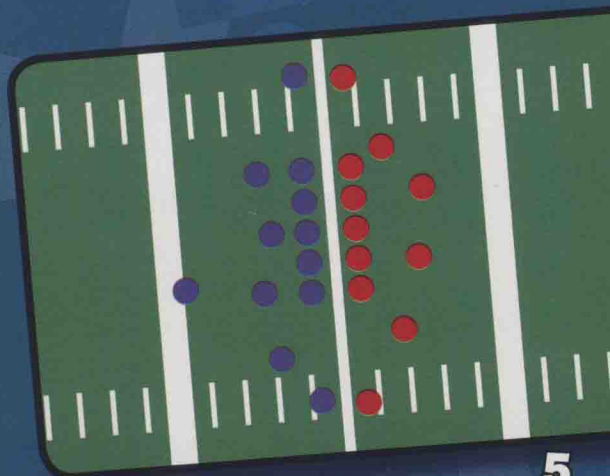


the **offense**. The second team is called the **defense**. The defense is trying to stop the offense from scoring points. The offense and defense do not stay the same throughout the game. Each team takes turns trying to score points or stopping the other team from doing so. Much of football has to do with numbers. You can use your math skills to help you learn more about this action-packed sport!

Figure It Out!

Counting the number of players on the field is important. If your team has too few players, your **opponent** could beat you. If your team has too many players, your team could get a **penalty**. Count how many players the red team has on the field below. How many blue players are there? Does each team have 11 players? How many players need to leave the field?

(See page 22 for the answers.)



Get Out Your Measuring Tape!

A football field is 100 yards long. There is a bold white line down the middle called the 50-yard line. This line divides the field in half. Each team defends their own half of the field. There is a goal line at the end of each half. Each team tries to cross the other team's goal line.

Here the New Orleans Saints and the Indianapolis Colts line up at the 25-yard line before a play.

It's a Fact!

Football fields are measured in yards. One yard is equal to 3 feet (1 m).

Figure It Out!

To help players understand where they are on the field, there are white lines every 5 yards. Every other line, or each 10-yard line, is labeled with a number.

The field is 160 feet (49 m) wide. There are white stripes, called sidelines, that clearly mark the sides of the field. The players must remain inside the sidelines to continue playing the game.

The end zone is the space between the goal line and the **goalposts**. There are two end zones, one at each end of the field. Each end zone is 10 yards long. How far is the distance between the 50-yard line and one of the goalposts? How long is the whole field, including the end zones?

(See page 22 for the answers.)



Do you see what shape a football field is? Can you find the 50-yard line?

Point Math

The object of football is to score points and beat the other team. There are several ways the offense can score points. If a player kicks the ball through the goalposts, he has scored a field goal. A field goal is worth three points. If a player runs with the football past the goal line or catches the ball in the end zone, the offensive team scores a touchdown.

It's a Fact!

The defensive team can score points, too! When the defensive team tackles the offensive team in their end zone, the defensive team wins two points. This is called a safety.

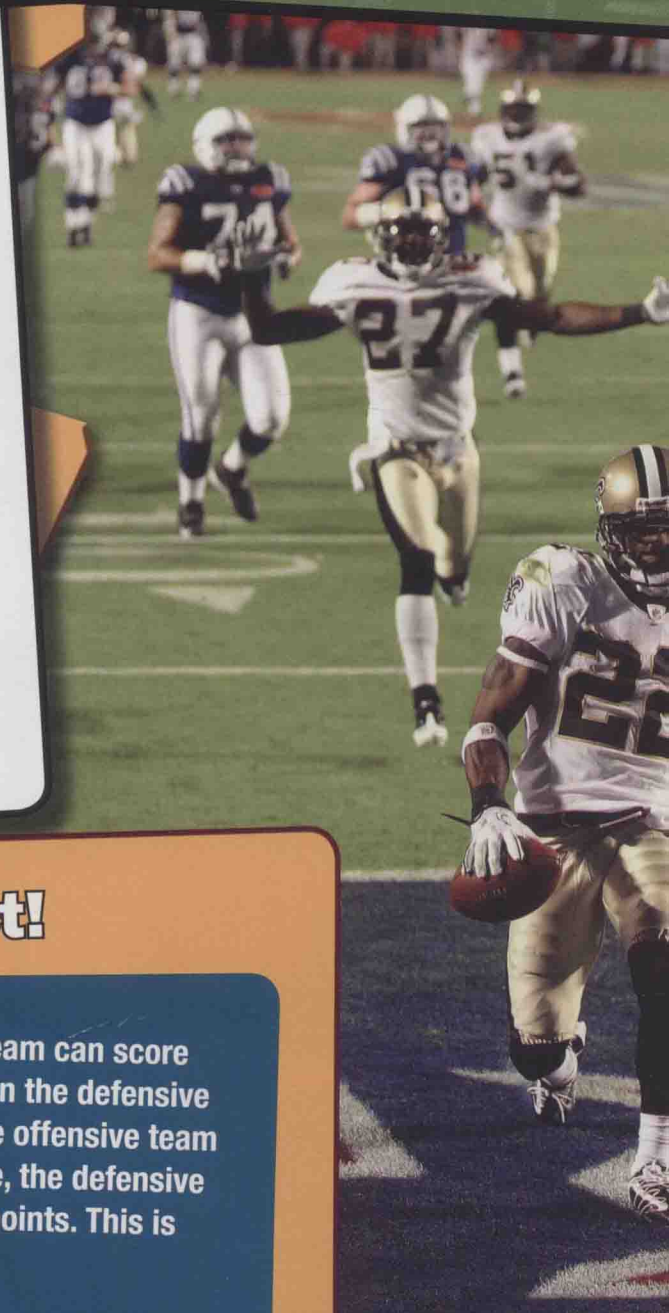


Figure It Out!

A touchdown is worth six points. After a team scores a touchdown, it has a second chance to score more points. The offensive team can kick the ball through the goalposts for one more point. It could also try for a two-point conversion instead. This means a player runs the ball past the goal line for two more points.

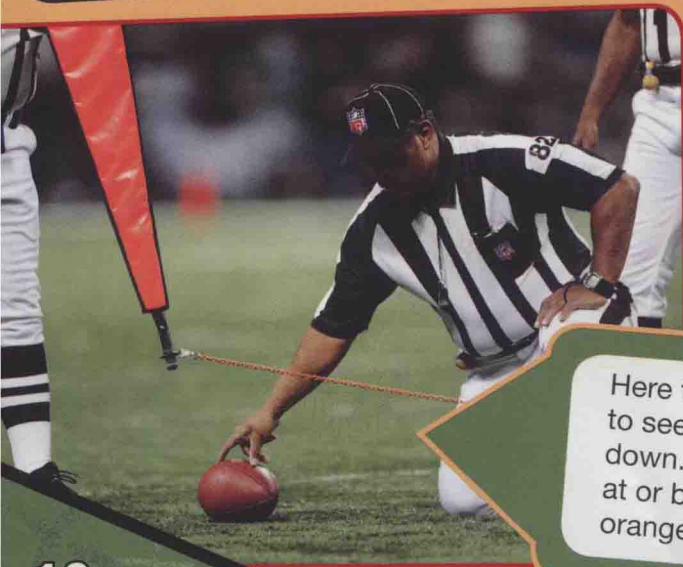
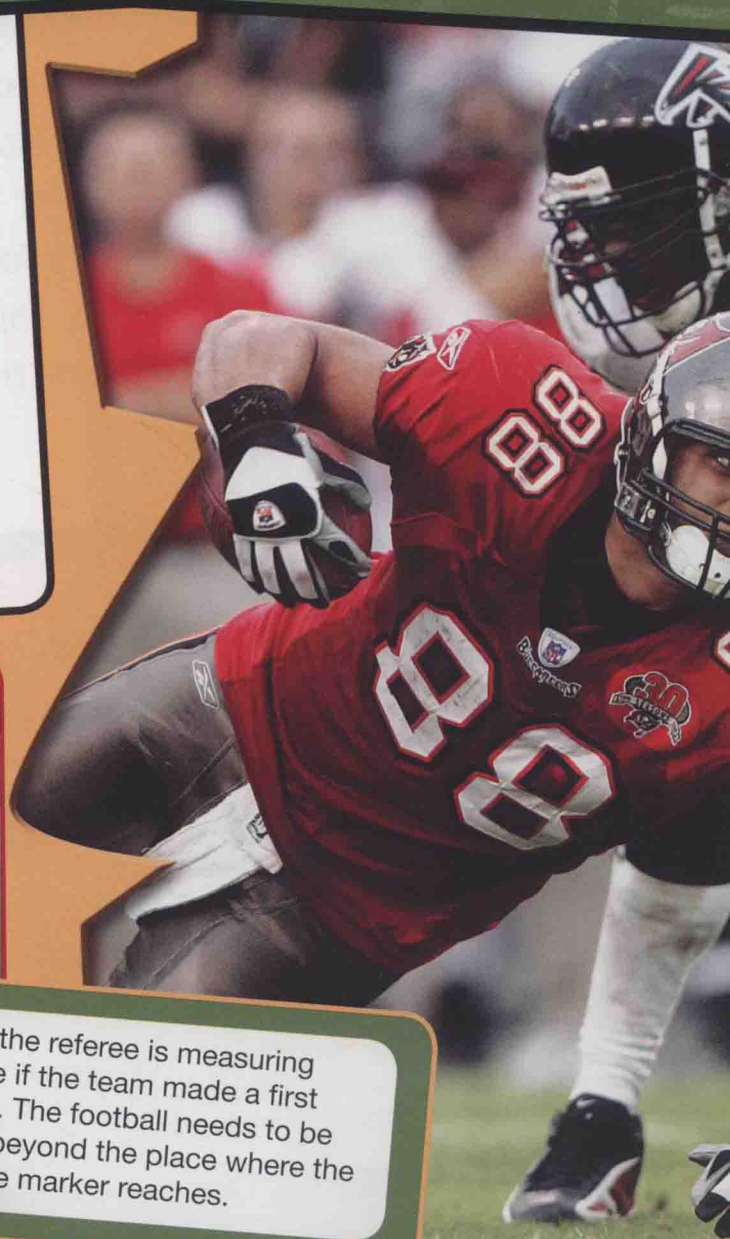
The Cincinnati Bengals are playing the Baltimore Ravens. The Ravens score a touchdown, plus they get the extra point. The Bengals kick a field goal then score a touchdown. The Bengals also kick the ball for an extra point. Next, the Ravens score a safety, and the Bengals score two field goals in a row. What is the score of the game? Make a chart to help you keep track of the points scored by each side.

(See page 22 for the answers.)

Here Tracy Porter of the Saints is scoring a touchdown. That is six points for the Saints!

Moving the Ball

When the offensive team has the football, it gets four chances to move the football farther down the field. These four chances are called downs. If the offense can move the football at least 10 yards down the field, then the team gets another first down and gets four



Here the referee is measuring to see if the team made a first down. The football needs to be at or beyond the place where the orange marker reaches.

Figure It Out!

more chances. It uses these downs to try to move 10 more yards toward the other team's end zone.

Sometimes the offense may have used up three downs and is not sure it can cover the yards that are left to make a new first down. In this case, the team may decide to punt. This means the offense kicks the ball to the defensive team. The hope is that the other team will catch or stop the ball at a place that is farther away from scoring points.

The Seattle Seahawks have the ball. They are the offense and it is first down. They move 6 yards during the first play. On their second play, they move another 6 yards. Then the Seahawks move 4 yards on their third play. What down is it now?

Hint: Remember that the team needs to move the ball 10 yards to get back to a first down.

(See page 22 for the answers.)

Dave Moore of the Tampa Bay Buccaneers makes a first down here.

Time!

Every football game has four time segments called quarters. A quarter means that it is a quarter, or fourth, of the total length of the game. Four quarters equal one game, just as four quarters equal \$1.

It's a Fact!

Between the second and third quarters, the players rest during a break called halftime. It generally lasts for 12 minutes.

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CHARGERS	7	21	7		35	3
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THE CHARGERS
WELCOME

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AT&T
FAST STAT
KC 14 1ST DOWN
4 TURNOVER
PENALTY
KC 39
SD 2

Figure It Out!

In the National Football **League** (NFL), a **professional** football league, each quarter is 15 minutes long. A whole game is 60 minutes long, or 1 hour. How can you figure this out on your own? Write down the facts you know as a math **equation**:

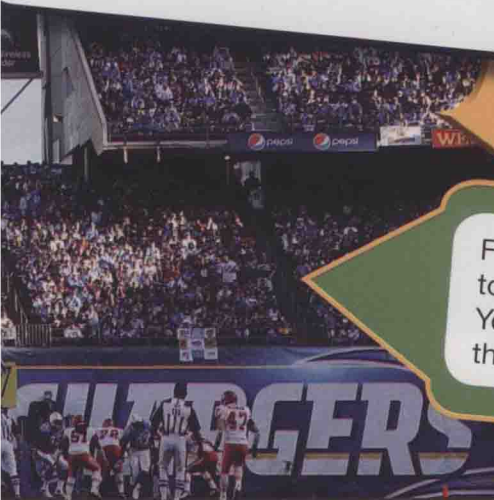
$4 \text{ quarters} \times 15 \text{ minutes} = 60 \text{ minutes.}$

Another way to write this is:

$15 \text{ minutes} + 15 \text{ minutes} + 15 \text{ minutes} + 15 \text{ minutes} = 60 \text{ minutes.}$

- 1) In a high-school game, each quarter is 12 minutes long. How long is the game?
- 2) If a quarter in your town's football league lasts for 8 minutes, how long is the game?

(See page 22 for the answers.)



Football stadiums have scoreboards to help fans keep track of the game. You can see how much time is left in the quarter at the center of this board.