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Football Math

Touchdown Activities and Projects for Grades 4–8

Second Edition

Jack Coffland and David A. Coffland

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Introduction for Parents and Teachers

When giving students in grades 4 through 8 problems to solve, we must be certain that they have practiced a wide variety of problems. By the time students are finished with the eighth grade, they should be proficient with problem-solving involving:

- Whole Number Computation
- Fraction Computation
- Decimal Computation
- Percent Computation

One problem classification system used by many mathematicians includes both routine and non-routine problem situations, as described below. In other words, it is no longer appropriate to give students problems that simply review computational operations that have just been taught.

Routine problems
"Routine problems" are defined as those problems that ask students to apply a mathematical process they have learned in class in a real-life, problem-solving situation. This book defines two types of routine problems:

1. Algorithmic problems—These are word problems (story problems) that ask students to read the problem, figure out the computational procedure required, and then apply that computational algorithm to solve the problem. For example:

Bobby scored 6 touchdowns in last night's game. Each touchdown is worth 6 points. How many points did he score in all?

2. Multi-step problems—These are algorithmic problems that demand two or more computational steps in order to obtain the answer. For example:

Last year the Bruisers won three-quarters of their 12 games. This year they won 5 games. How many wins did they have over the two seasons?

Non-routine problems
In recent years math educators have focused additional energy on "non-routine" problems—those that challenge the learner in some way. The different kinds of "non-routine" problems in this book are challenge problems and mini-project problems.

1. Challenge problems—Problems of this type are non-routine in that the student does not know how to solve them from memory. They require the use of heuristics, the act of inventing steps. It is the true test of problem-solving ability. Examples are:

A one-kilometer train enters a one-kilometer tunnel moving at 30 kilometers per hour. How much time will pass from the time the engine enters the tunnel until the caboose comes out of the tunnel?

Problems of this type are the final challenge in math. We cannot quit until we have challenged students to invent or create solutions to problems. The professional scientist, engineer, or mathematician all work to create

ideas, not to simply rehash old ideas. But the myth of mathematics learning has always been that only people in these professions must solve problems. The truth of the situation is that every day the carpenter, the clerical worker, or the grocery store clerk also invent solutions to problems.

2. Mini-project problems—These problems are "process" problems, not simple story problems. They are often open-ended in that different students may obtain different answers. The process is more important than the product; the process stresses such things as multiple steps, differences in answers, and discussion of considerations to see if everyone agrees. For example:

How much money do we need to take with us on the field trip to the stadium?

Notice that this situation depends upon several different variables; not everyone will take the same amount of money on the trip. Solving mini-project problems teaches children that not all problems have simple answers, nor do they all have one answer.

Long-term projects
Finally, because this book is meant to capture the interest of students by combining mathematics and football, we have suggested project problems. These are not really math problems; they are projects that the student can undertake that require the use of math and a knowledge of football. They are meant to be fun and to make math and football the student's hobbies.

Resources
If students are interested in learning more about football and its mathematical possibilities, take a look at these resources:

- Your local paper will print statistics of local high school or college teams.
- The National Federation of State High School Associations prints (or publishes on the Internet) high school football rule books, statistic books, and other materials.
- The NCAA publishes both books and Internet sites on college records.
- The NFL also publishes books and/or Internet sites on NFL football records.
- *Sports Illustrated* magazines often discuss records; they also publish Web sites and books on sports records.
- Go to ESPN web sites for extensive football information, from histories to record charts.

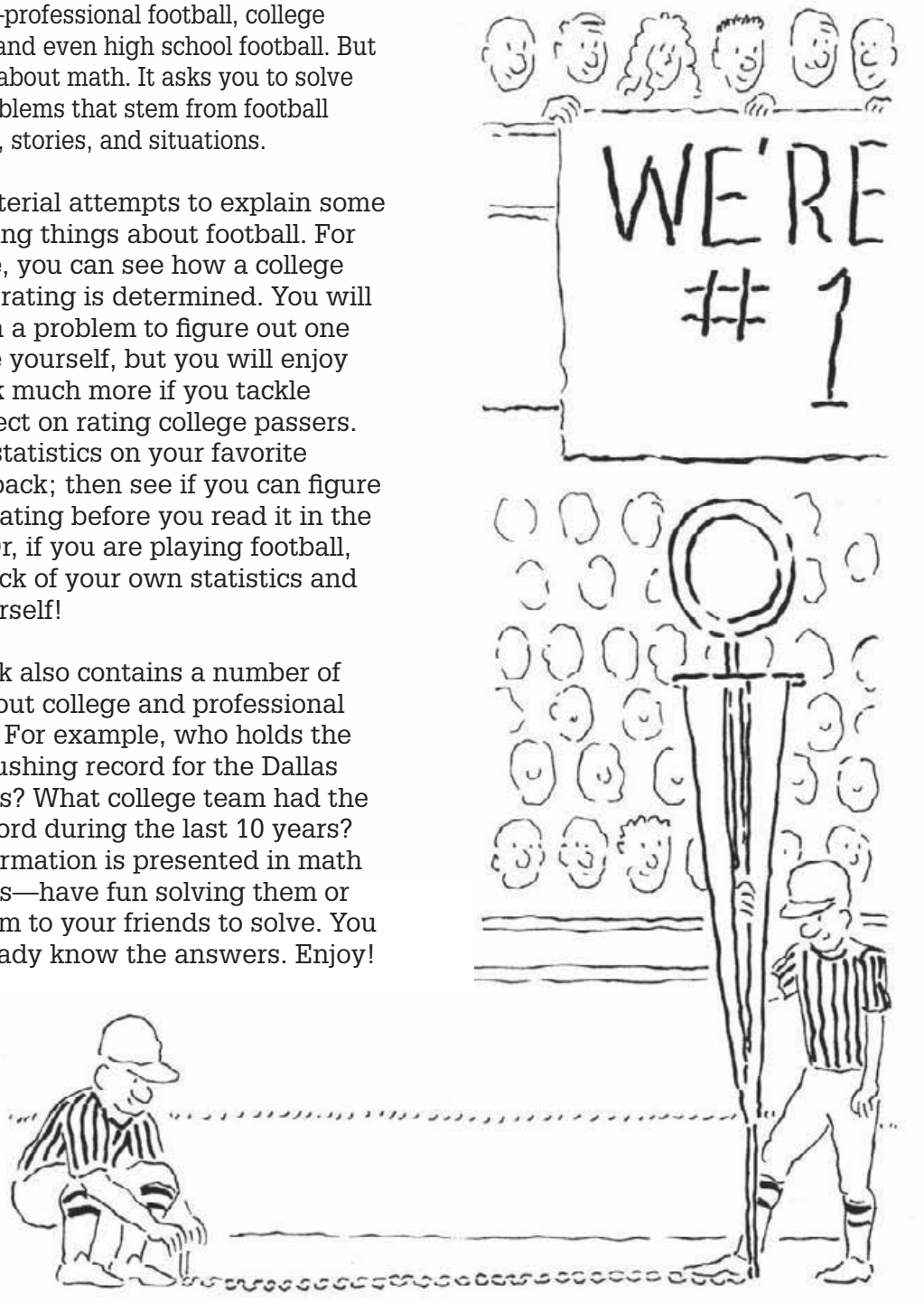
The advantages of looking on the Internet first is that such records are either up-to-date or the site will include a note explaining that the records are through the 2004 season.

Introduction for Students

This book is about football; it contains a great deal of interesting material about football—professional football, college football, and even high school football. But it is also about math. It asks you to solve math problems that stem from football statistics, stories, and situations.

This material attempts to explain some interesting things about football. For example, you can see how a college passing rating is determined. You will be given a problem to figure out one example yourself, but you will enjoy the book much more if you tackle the project on rating college passers. Collect statistics on your favorite quarterback; then see if you can figure out his rating before you read it in the paper. Or, if you are playing football, keep track of your own statistics and rate yourself!

The book also contains a number of facts about college and professional football. For example, who holds the career rushing record for the Dallas Cowboys? What college team had the best record during the last 10 years? The information is presented in math problems—have fun solving them or give them to your friends to solve. You will already know the answers. Enjoy!



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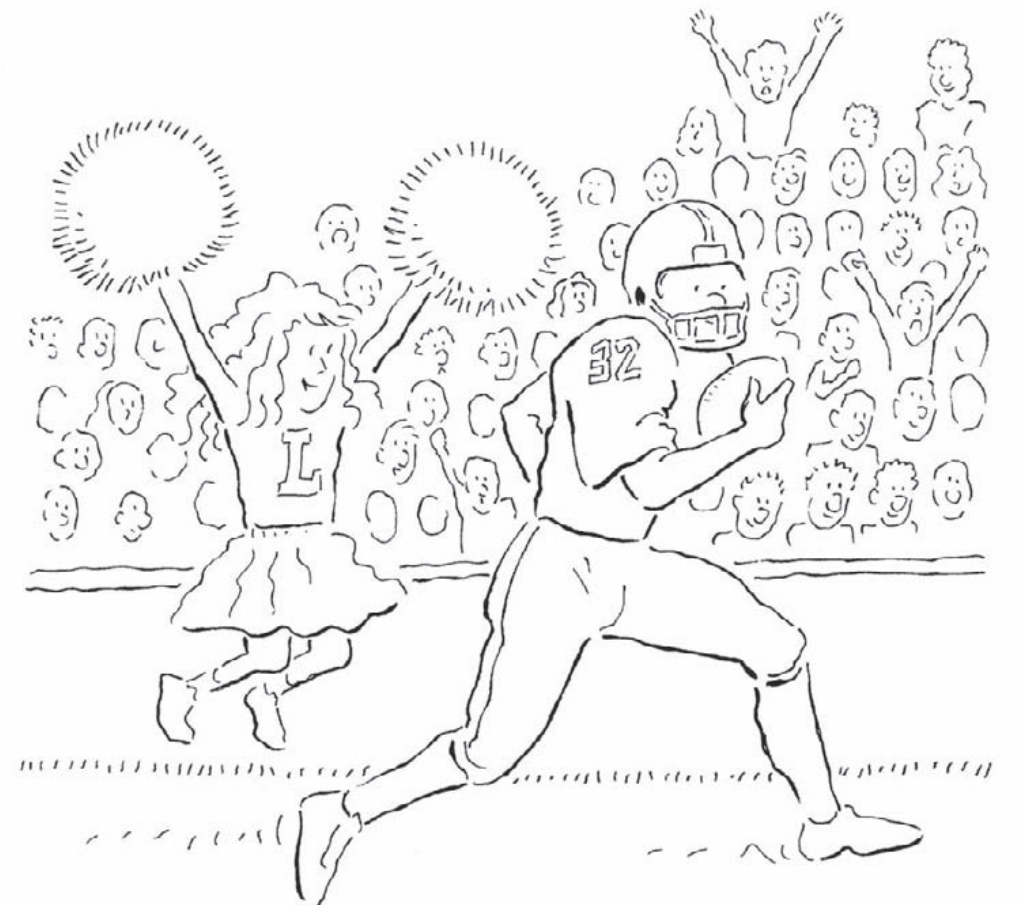

Activities

Miami Dolphin Records

Solve the following problems.

1. In 1984 Dan Marino set many of the NFL's single season passing records. He completed passes for 5,084 yards in 16 games that year—a record. How many yards did he average for each game?

_____

2. In 1984 Dan Marino set the Dolphin record for throwing 48 touchdown passes in one season. Because each touchdown is worth 6 points, how many points did the Dolphins score on Marino passes that year?

_____

3. Dan Marino's favorite targets for many years were Mark Clayton and Mark Duper, known as the "Marks Brothers." Clayton caught 550 of Marino's passes, while Duper caught 480. How many passes did they catch all together?

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4. Several years later the Dolphins gained 1,525 yards rushing and only 3,975 yards passing. A team's total offense is calculated by combining the rushing and passing yards. What was the Dolphins' "Total Offense" figure for 1992?

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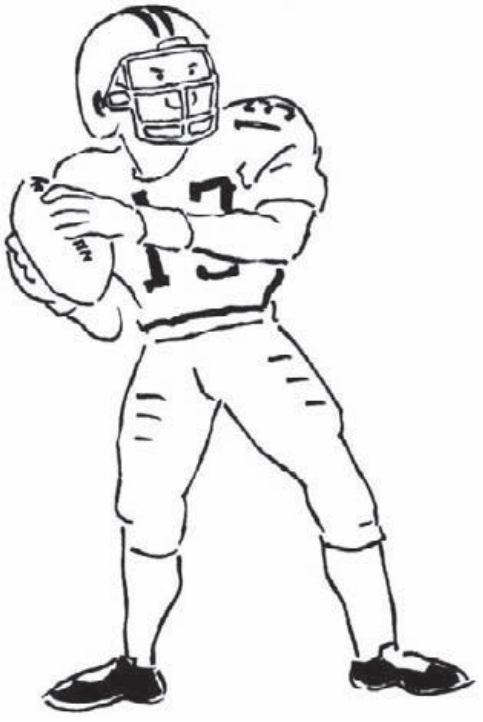

5. During the same 1992 season, the San Francisco 49ers led the league in total offense with 6,369 yards gained. How many more yards did the 49ers gain than the Dolphins?

_____

6. Larry Csonka was the fullback on Miami's undefeated team in 1972, and he still holds the career rushing record for the Dolphins. He was also involved in one of the NFL's strangest plays. During a game, Csonka received a penalty for unnecessary roughness as he carried the ball and the opponents were trying to tackle him! His stiff-arm was "too forceful!" Csonka's career rushing statistics for the Dolphins include 1,506 carries for a total of 6,737 yards. What was his "average yards per carry" for the Dolphins?

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