INTEGRATING MATH IN THE REAL WORLD

THE MATH OF SPORTS

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Contents

Introduction

How often, as math teachers, have we heard students say, "When am I going to use that?" Perhaps this is because much of the mathematics taught in today's classrooms was developed for an industrial society, whose schools were organized and curricula designed to prepare students to work on farms, in factories, and in shops. Today, we live in an information age full of technology that was unimaginable at the beginning of the century. The shop-keeper arithmetic of fifty years ago will not help students succeed in today's world of calculators and high-speed computers.

The National Council of Teachers of Mathematics (NCTM) developed standards, the *Principles and Standards for School Mathematics* (2000), to meet the challenges of the twenty-first century. This document calls for a curriculum that will help all students solve problems and make connections between mathematics and the real world. For mathematics to be relevant to all students, they must see how it relates to their lives outside the classroom.

One way to motivate and interest students is to connect the skills and concepts of school mathematics with real-world applications. In *Integrating Math in the Real World: The Math of Sports,* students can see how topics normally found in the middle-school curriculum can be used to explain and interpret their favorite sports and recreational activities. The activities in this book are open-ended and encourage students to:

- work collaboratively to develop strategies to solve problems;
- make connections between their life experiences and the mathematics classroom; and
- make connections between mathematics and other curricular areas.

Organization of Activities

Each activity in *Integrating Math in the Real World: The Math of Sports* is organized in a similar fashion. Each activity consists of two parts, a teacher page and one or more student pages. Each teacher page includes the following elements:

Areas of Study

Most of the activities in the book relate to more than one strand of mathematics. Often three or four math strands will be addressed in one activity. These strands are listed at the top of each teacher page.

Concepts

The mathematics concepts are listed in the form "Students will . . .". This will help you tie assessment to the lesson objectives. Evaluating the concepts and objectives of the lesson encourages authentic assessment.

Materials

This section includes a brief list of materials, supplies, and special settings the lesson may require.

Procedures

This is a brief description of the lesson and suggestions for the teacher. This section is not meant to be a step-by-step recipe of procedures but an overall guide. Feel free to adapt the procedure to make it more relevant to your classroom and your teaching style.

Solutions

Many of the activities in this book are open-ended, and the answers will depend on your students. Where questions on the student pages have one correct answer, the answer is provided on the teacher page.

Assessment

Suggestions are made in this section concerning assessment strategies. It will suggest observation of students and student groups, and a journal question suggestion, when appropriate.

Extensions

This includes some suggestions you or your students can use to extend the lesson.

Internet Connection

When appropriate, suggested Internet sites are described in this section.

The student pages that follow the teacher page for each activity have been designed to serve as blackline masters and can be copied for student use.

Assessment

When we change the way we teach, we need to examine the way we assess. Paper-and-pencil tests have been used for many years to determine if a student can perform specific skills that have one and only one right answer. An example of a skill is the ability to find the solution to: $x + 5 = 21$. Only one number can be substituted for x to solve this simple equation. This type of evaluation is a natural consequence of a curriculum that is built upon behavioral objectives aligned to discrete skills.

In the *Integrating Math in the Real World* series, problem solving, mathematical communication, and critical thinking skills are emphasized. These are process skills which students work toward attaining on a continual basis. Many times there are no simple right-or-wrong answers and the strategies used are as important to the process as the answer obtained.

How do we evaluate process goals? Multiple strategies are used to assess students' performance. Some are informal, such as observation and questioning, and some are more formal, such as presentations and reports, grading matrices (assessment guides), portfolios, and journals. Suggestions for assessment are provided for each activity and at least one journal question related to the activity is included.

Observation of Students

When students are active and working together, it is essential that the teacher walk around the room to become aware of the progress of the student groups and any problems that might arise. During these times it is possible to assess student understanding in a more formal way. While not every student can be observed each time, it is possible to perform a formal-type assessment at least twice during each grading period for each student. These observations can be shared with both parents and students during parent-teacher conferences.

A form, such as the one on the next page, can be used to make the observations more consistent and simplify the process.

Name of Student _____

Criteria	4	3	2	1
How actively are students participating in group project?				
How well does student appear to understand concept of lesson?				
Is student actively listening to other members of group?				
Is student assuming positive leadership or problem-solving role?				
Comments:				

Using a Rubric for Performance Assessment

Authentic assessment is based upon the performance of the student and should be closely tied to the objectives of the lesson or activity. A rubric can be used to quantify the quality of the work. If the rubric is explained before the activity or project, students become aware of the requirements of the lesson. A grading matrix should be developed in which each of the objectives is examined using a five-point scale.

5 Student shows mastery and extends the concepts of the activity in new and unique ways

4 Student shows mastery of the concepts of the lesson

3 Student shows understanding, but there is a flaw in the presentation or reasoning

2 Student shows some understanding and has attempted completion, but there are some serious flaws in the presentation or reasoning

1 Student makes an attempt, but exhibits no understanding

0 Student makes no attempt

Integrating Math in the Real World: The Math of Sports has been designed to be teacher-friendly. By highlighting the interrelationships between math and sports, both teachers and students are enriched. Students can see the relevance of school skills and concepts to their lives and the interconnectedness of learning.

Name _____ Date _____

Women in the Summer Olympics

The Summer Olympic Games began in 1896 and have been held every four years since then, except for 1916, 1940, and 1944, when the games were canceled because of war. The first women participated in the 1900 games in Paris. Use the chart below to calculate the percentage of women competitors in each Summer Olympic Games. Round the answer to the nearest tenth of a percent.

When you have completed the table, use the information to create a scatterplot of women in the Summer Olympic Games, a bar graph showing the percentage of women competitors, and a bar graph showing the percentage increase from one Olympics to the next.

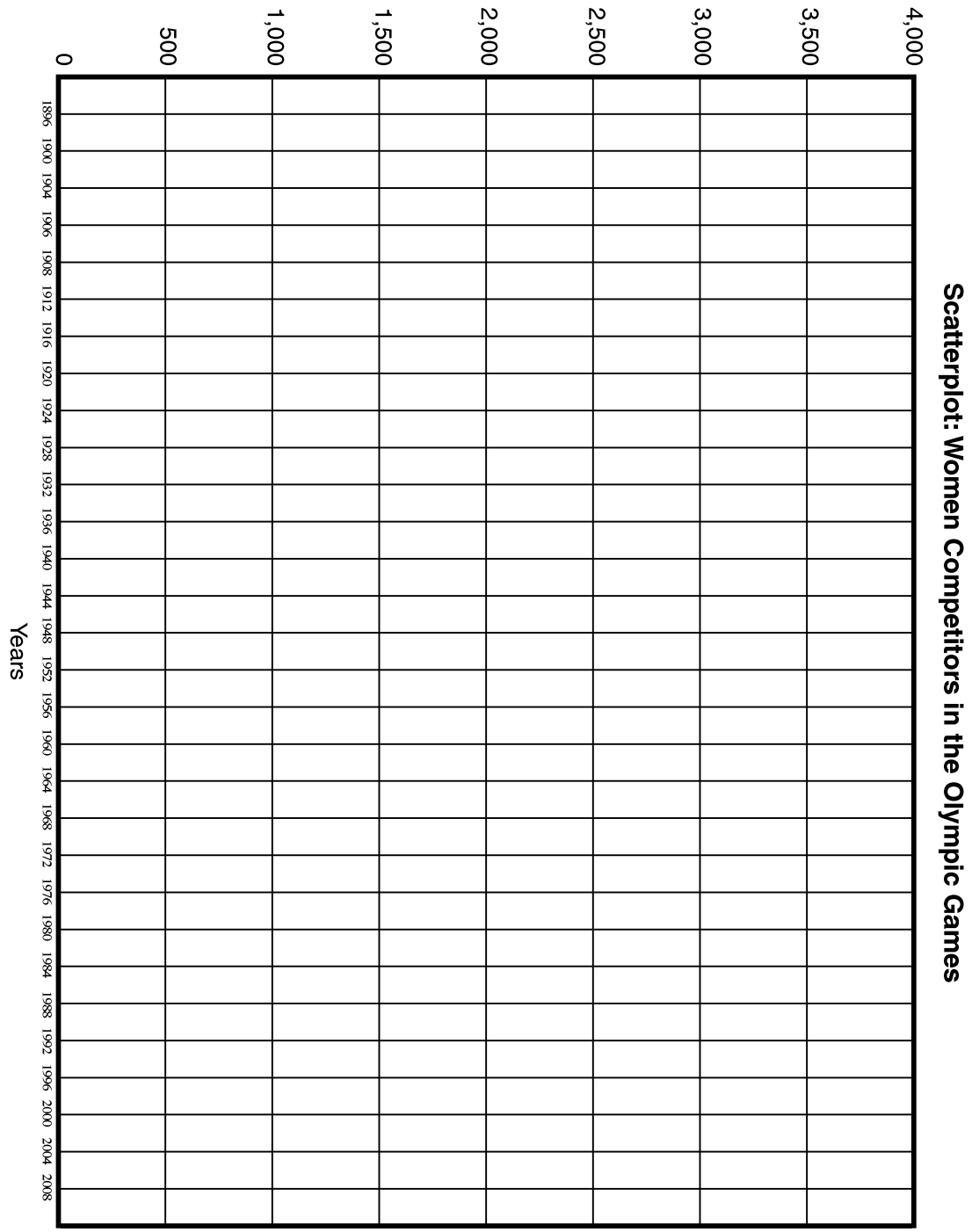
Year	Location	Male Competitors	Female Competitors	Total	Percent Female	Increase
1896	Athens	311	0			
1900	Paris	1,318	11			
1904	St. Louis	681	6			
1906*	Athens	877	7			
1908	London	1,999	36			
1912	Stockholm	2,490	57			
1916	Canceled					
1920	Antwerp	2,543	64			
1924	Paris	2,956	136			
1928	Amsterdam	2,724	290			
1932	Los Angeles	1,281	127			
1936	Berlin	3,738	328			
1940	Canceled					
1944	Canceled					
1948	London	3,714	385			
1952	Helsinki	4,407	518			
1956	Melbourne	2,958	384			
1960	Rome	4,738	610			
1964	Tokyo	4,457	683			
1968	Mexico City	4,750	781			
1972	Munich	5,848	1,299			
1976	Montreal	4,834	1,251			
1980	Moscow	4,265	1,088			
1984	Los Angeles	5,458	1,620			
1988	Seoul	6,983	2,438			
1992	Barcelona	7,555	3,008			
1996	Atlanta	7,060	3,684			
2000	Sydney					
2004	Athens					

*1906 games were held as a ten-year anniversary of the modern Olympics.

(continued)

Name _____ Date _____

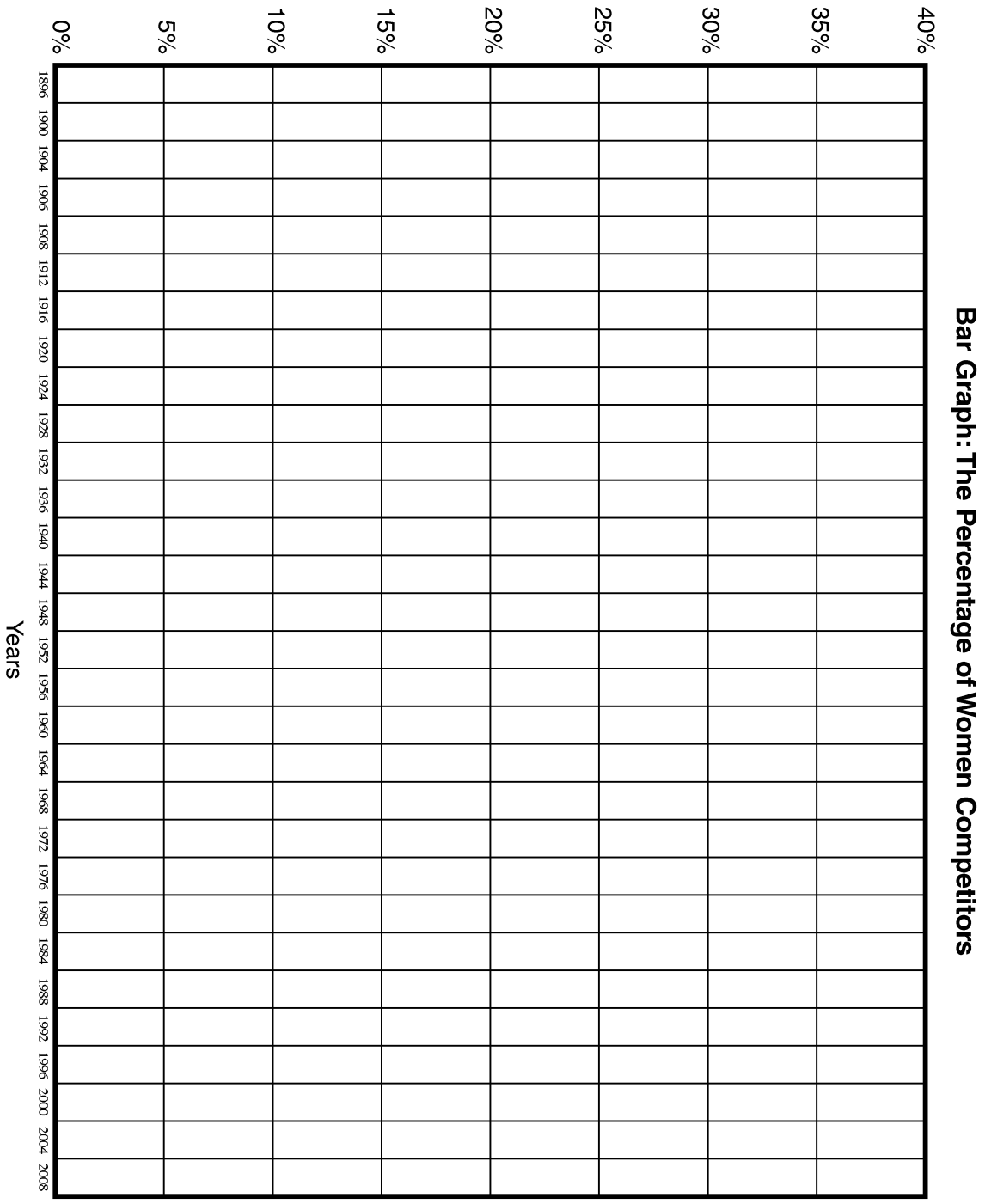
Women in the Summer Olympics *(continued)*



(continued)

Name _____ Date _____

Women in the Summer Olympics *(continued)*



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Name _____ Date _____

Women in the Summer Olympics *(continued)*