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Behind the Scenes:
Sports Careers and Math

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KSPN
Knowledge Sports Production Network

Learning Symphony

Effective Integration of Technology Into K-12 Curriculum

Behind the Scenes:
Sports Careers and Math

Core Value:
Teamwork and Cooperation

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Grade Levels: 6-12
Curriculum Areas: Math, English Language Arts, Social Studies, and Technology
Approximate Time Frame: Approximately 2 - 4 weeks[1]

Introduction:

When most students think of a career in sports, they imagine being the next Babe Ruth, Michael Jordan, or Jerry Rice. They often do not realize that there are dozens of other exciting careers in sports and that math is an integral part of many of them. In this special "Behind the Scenes" episode, students will explore the role of mathematics in professional sport careers. As part of their research, students will be asked to consider the importance of the following core values: *Teamwork* and *Cooperation*.

For the "Behind the Scenes: Math in Sports" episode, students will profile a sports career which utilizes math. They will develop a segment for the program that demonstrates how math is used in that particular career. They will also give examples of how teamwork and cooperation play a role in that profession.

[1] You may need to adjust this time frame to meet the needs of your students.

Standards and Learning for this Activity:

Math: http://standards.nctm.org/document/appendix/numb.htm

- **Communication:** Students will organize and consolidate their mathematical thinking through communication. They will communicate their mathematical thinking coherently and clearly to peers, teachers, and others. They will analyze and evaluate the mathematical thinking and strategies of others and use the language of mathematics to express mathematical ideas precisely.
- **Connections:** Students will recognize and apply mathematics in contexts outside of mathematics.

Note: Additional standards will be covered, determined by the specific careers/topics selected by students.

English Language Arts: http://www.ncte.org/about/over/standards

- **Standard 4:** Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- **Standard 7:** Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
- **Standard 8:** Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

Social Studies: http://www.socialstudies.org/standards

- **Strand V:** Social studies programs should include experiences that provide for the study of individual development and identity.

Technology: http://www.cnets.iste.org

- **Standard 1 – Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
- **Standard 2 – Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
- **Standard 4 – Critical Thinking, Problem Solving, and Decision Making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students apply digital tools to gather, evaluate, and use information.

Required Materials and Resources:

Students will need access to video-production equipment, such as:

- ✓ Video and still digital cameras
- ✓ Video editing software, such as *Apple iMovie*, *Windows Movie Maker*, or *Adobe Premiere*.
- ✓ Tripod (optional)

Activity Procedure:

Introduction and Motivation

Provide students with a copy of the *Math in the World of…* handout. Students should complete the handout individually. (This can be assigned as homework.) Review answers with students and then ask students to notice what the two problems have in common. Students should notice that each math problem is related to scoring in sports and both use averaging (finding the mean). *Example A* is a gymnastic floor exercise score and *Example B* reports the individual scores of a basketball team.

As a class, discuss who might use or view these scores and how they would be used. For example, judges or referees, coaches, athletes, sports analysts, and sports reporters may refer to any of these scores in the course of their work.

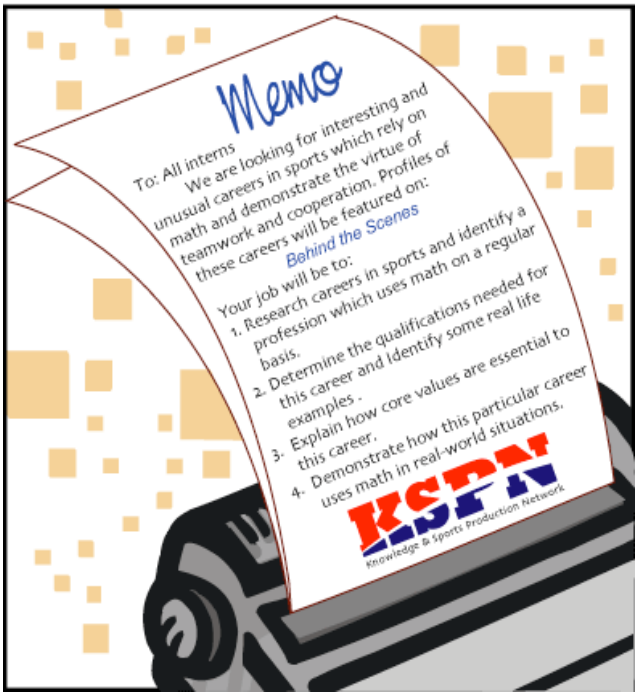
Ask students if they can think of other examples of how math is used in sports. (It may be helpful to have students brainstorm in small groups before sharing out with the class.) Place student responses on a T-chart titled "Math in Sports." Responses may vary, but may include individual statistics such as a player's batting average or free-throw percentage, or team statistics, such as the probability of a touchdown or rank in the league. With some prompting, students should move beyond scoring and statistical examples to include other examples such as salaries of players or determining the length of a game with time-outs.

Tell your students that they have just been hired as interns by KSPN, the *Knowledge & Sports Production Network*. Explain to students that in their next intern assignment they will be researching careers in sports and focusing on how these careers use math to provide content for the KSPN show, *Behind the Scenes!*

Provide students with a copy of the full handout for this activity, which can be found at the end of this document.

This handout is a memo from the KSPN production team explaining the intern's next task. As a class, review the content of the memo. You do not have to go into much detail, but make sure students understand what they are being asked to do.

Provide students with the rubric that will be used to assess their finished work. A sample rubric is included with this activity; however, you may need to customize this rubric to meet the needs of your students.



Teamwork and Cooperation in Action

For the following activity, students will be completing a *Progressive Problem with Huddle*. This is a set of math problems that relies on the previous solution in order to arrive at the correct solution. There are five steps per problem and each step is progressively more challenging than the last.[2]

Example of Progressive Problem:

*Student 1: 1 + 1 = **2***
*Student 2: **2** x 8 = 16*
Student 3: 16 / 4 = 4 etc.

In order to do this, students need to be divided into equal, heterogeneous teams. If teams have fewer than five members, some students may have to solve more than one step to the problem.

The rules are:

- ✓ Each student is required to complete the assigned step or steps independently. If help is given, the team will be disqualified (or lose points).
- ✓ Each student will write the solution to his/her step and then pass the problem to the next team member.
- ✓ The last person to complete a step will bring the completed problem to the "Fact Referee," who will check the answers
- ✓ The first team to complete the entire sheet correctly is declared the winner. If the entire sheet is not correct, the team will have an opportunity to "huddle" together to find their mistake.
- ✓ The first team to submit a correctly completed sheet wins the game (or round).

It may be helpful to play 2 or 3 rounds with students so they begin to understand the importance of taking the time to complete each step correctly and to check their answers. Once you have played several rounds, discuss the process with students. Which aspects of the game were easy? Which were difficult? How did the teams work together? What were some strategies they used? During the huddle, how did they communicate?

Answer Key for Sample Progressive Problems:

Problem 1:	*Problem 2:*
a = 7	*a = 12*
b = 19	*b = 7*
c = 18	*c = 9*
d = 6	*d = 11*
e = 48	*e = 8*

Note: After students have played a few rounds, have each group come up with their own progressive problems to challenge the other teams.

Guide students into a discussion of the importance of teamwork and cooperation. Explain that as part of their current intern assignment, they are going to need to identify whether these values are important to the career they are studying. You will also expect groups to demonstrate teamwork and cooperation as they complete the tasks in this activity.

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[2] Two sample problems can be found at the end of this document, or you can create your own progressive problems that align with your specific curriculum.

The Pitch

Students should begin to identify a sports career for the *Behind the Scenes* program. First, divide students into pairs. Depending on your students, you may want to have students select partners, or decide on partnerships based on similar interests. Have students brainstorm with their partner possible sports careers they may want to research. Provide time for students to conduct some preliminary research for this task.

Web Sites To Visit:

- Sports Careers – You Got Game: http://thefunworks.edc.org/index.php
- Teamwork Online: http://www.teamworkonline.com/career.cfm
- Jobs in Sports: http://www.jobsinsports.com/
  Note: This is a pay site, but will show 20 random job descriptions through a search.
- Women in Sports Careers: http://www.wiscfoundation.org/
  Note: This site is still being developed.
- About: Careers in the Sports Industry: http://careerplanning.about.com/od/occupations/a/sports_industry.htm

Note: Make sure there is a variety of careers among the groups.

Once each pair of students has determined which sports career they would like to research, they will need to "pitch" their selection. In the movie industry, a pitch is when the people who want to make a movie (writers, directors, etc.) verbally present their ideas to the people who pay for making the movie (the producers).[3] Make sure students understand that the purpose of their pitch is to persuade KSPN (here represented by you, the teacher) to accept the topic they selected.

The pitch should explain why the topic is a good choice for the segment. Remind students that their pitch should relate to both the math aspect and the core values mentioned in the memo. Students should be persuasive and demonstrate their reasoning for choosing this career.

The pitch can be submitted in writing, presented orally, or published on a blog. As "Executive Producer," make sure you determine the topic is appropriate before you "green light" (that is, approve) any group's pitch.

Researching the Segment

Once their idea has been accepted, each pair of students will need to prepare their presentation. They will need to determine the qualifications for their particular sports career, identify examples of how math is in an essential element of the career, and connect it to the core values of teamwork and cooperation.

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[3] To learn more about "pitching" a movie idea, visit: http://pbltech.org/wiki/index.php?title=Pitch.

In addition to traditional research, you may want to suggest (or require) that students interview someone who works in the selected career for their segment. Students should not be limited to people the can interview during the school day. Encourage groups to conduct interviews on their own time. Interviews can occur long distance via telephone, webcam, Skype, or even email.

One of the more difficult aspects of this video segment is the math demonstration. According to the *Memo* handout, the video should "Demonstrate how this particular career uses math in real-world situations." In order to meet this requirement, the segment should do more than point out math connections in the career. It should demonstrate one or more real-world situations and explain the math used and how it is integral to the career. Refer students to the rubric.

Additional Web Sites To Visit:

- Careers in Math Theme Page: http://www.cln.org/themes/careers_math.html
- Careers in Math: http://www.toroidalsnark.net/mathcareers.html
- Math on the Job: http://www.khake.com/page56.html
- Math Library: Sports: http://mathforum.org/library/topics/sports/

From Conception to Production

Once students have completed their research, they will need to develop a script and/or storyboard to layout their video segment. It will be important to place a deadline for the completion of the video and to stick to this deadline.

This is a wonderful opportunity to provide students with creative freedom in developing their video. This will give them ownership and invest them in the project's outcome. Encourage students to find creative ways to hook the viewer and make their topic interesting and exciting. Discuss various ways the real-world math situations can be covered in a video.

Up until this time, students have been working in teams of two. However, to produce a video segment, it often takes more than two individuals to cover all the tasks involved, especially if students develop elaborate scripts that require more than two actors. As students begin the production phase of this activity, two or more teams of students may want to partner, in order to complete all the production tasks. Encourage students to cooperate with other groups to get the job done.

Ready to air

Students will need to edit their video and prepare it to be aired on KSPN. Each group will present their video segment to a focus group (one or more of the other groups) and the Executive Producer (the teacher). The focus groups will be evaluating the work using the rubric and providing their feedback to the completed interview. They will also need to check all of the math examples demonstrated to ensure accuracy. Each pair will also submit a self-review of their process and their final product. Students should include how they worked with their partner as well as how they cooperated with other groups. This feedback will assist the Executive Producer in determining which segments will be included in the episode of *Behind the Scenes: Sport Careers and Math.*

Math in the World of …

A. Complete the chart using the steps listed to determine the "Final Evaluation Score":

1. Add up Criteria 1 and Criteria 2 for each Evaluator and record the subtotal.
2. Subtract the final deduction for each column.
3. Eliminate the highest and lowest score.
4. The Final Evaluation score is the mean of the remaining 4 scores.

	Evaluator 1	Evaluator 2	Evaluator 3	Evaluator 4	Evaluator 5	Evaluator 6
Criteria 1	0.90	1.00	0.90	0.70	0.80	0.60
Criteria 2	0.30	0.20	0.20	0.30	0.30	0.30
Subtotal						
Final Deduction	0.05	0.05	0.10	0.05	0.10	0.10
Scores						

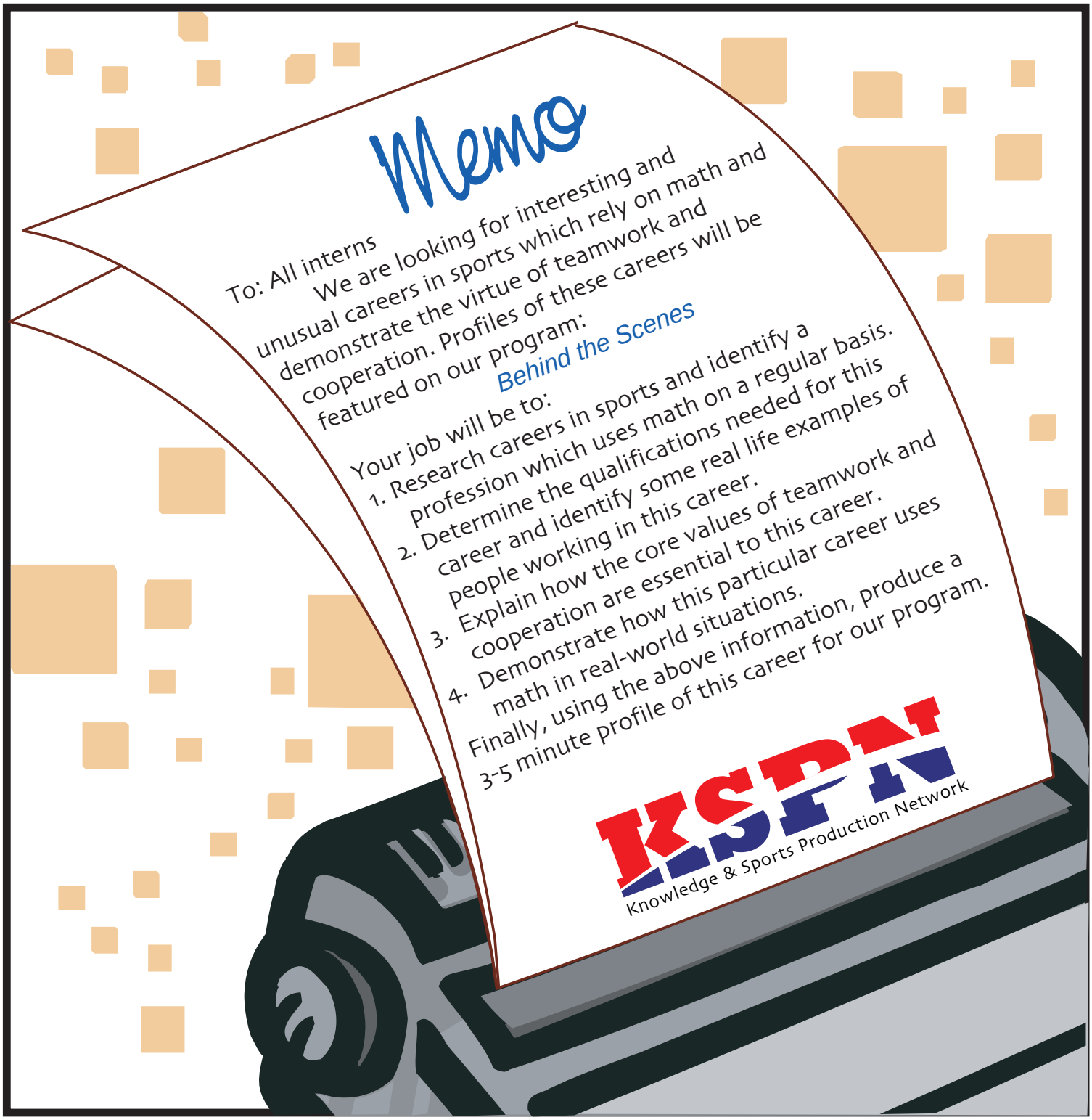
Final Evaluation score: _____.

B. Complete the last column and last row for the following chart and answer the questions below:

Last Name, First Name	Points from 2 pt Field Goals	Points from 3 pt Field Goals	Points from Free Throws	Total Ind. Points
Hart, Nathan	0	0	0	
Harvey, Nicholas	4	2	0	
Taylor, Seth	16	6	6	
Freedom, John	0	0	3	
Clark, Tyler	2	0	1	
Stewart, Mark	12	15	4	
Robinson, George	0	1	0	
White, Brian	8	3	1	
Jones, Kevin	10	6	4	
Total Points				

1. What is the range of scores for the game? _____
2. What is the mode of total individual scores for this game? _____
3. What is the mean of total individual scores for this game? _____
4. What is the median score for this game? _____

Behind the Scenes: Sports Careers and Math



Progressive Problem with Huddle

Team: _____

Problem #1:

1)	$25 - a = 18$	**a** =
2)	$2a + 5 = b$	**b** =
3)	$45 = 3(b + 2) - c$	**c** =
4)	$c / (d - 4) = 9$	**d** =
5)	$4(2 + 2d) - 2(d - 2) = e$	**e** =

Problem #1:

1)	$3a - 5 = 31$	**a** =
2)	$2(a - b) = 10$	**b** =
3)	$2c = 3(b + 2) - c$	**c** =
4)	$3(d - 2) + 2(5 + d) = 6c + 5$	**d** =
5)	$5(e - 2) - 3(2b - 2) = e(a - d) - 14$	**e** =

Rubric for Sports Careers and Math

Criteria	Above Standard (4 pts)	Meeting Standard (3 pts)	Getting There (2 pts)	Not Yet (1 pt)
Content	The segment provides in-depth information about the chosen career. Facts and statistics are introduced with a sense of style that engages the viewer.	The segment provides substantial information about the chosen career. Facts and statistics are accurate and informative.	The segment provides some information about the chosen career There are few facts or some information is inaccurate.	The segment provides little information about the chosen career. There are no facts or most information is inaccurate.
Organization	The segment demonstrates a clear and logical story. The organization enhances the viewer's understanding of the selected career.	The segment is organized logically. The viewer has a clear understanding of the selected career.	The segment is somewhat unorganized. This may lead to misunderstanding or misinterpretation at times.	There is no clear or logical order to the information, which interferes with understanding.
Demonstration of Math	The math concept is an integral part of the chosen career. It is demonstrated accurately and in an interesting manner. A variety of real world examples enhance the overall production.	The math concept in the segment is demonstrated accurately and is an integral part of the chosen career. More than one real world example is included.	The math concept is demonstrated accurately but may not be an integral aspect of the career. There is only one real world example.	No math concept is demonstrated or it is demonstrated inaccurately. There are no real world examples.
Production	The segment is perfectly produced with good sound and picture quality. Transitions, titles, and special effects are used tastefully. The length keeps the audience interested.	The segment is fairly well produced with good sound and picture quality. There is appropriate use of transitions, titles, and special effects. The length is appropriate to the subject matter.	The segment has some production problems and/or sound quality issues. Some transitions, titles, or special effects are missing or inappropriate. It is either too long or too short for the topic.	The segment has significant production problems. Transitions, titles, or special effects are missing or interfere with the segment. It is either too long or too short for the topic.
Collaboration and Communication	You work well with others. You assume a clear role and related responsibilities. You motivate others to do their best.	You work well with others. You take part in most decisions, share information, and contribute a fair share to the group.	You work well with others but have difficulty sharing decisions, information, and/or responsibilities. You contributed less than a fair share to the group.	You did not work with others in most situations. You did not share information and/or did not contribute to the group.
Score	**18 - 20**	**13 - 17**	**8 - 12**	**5 - 7**