Hot Shot Statistics

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Introduction

As students ponder their future careers, they may be surprised to learn that mathematical skills are a part of almost every career opportunity that exists today. How often, as math teachers, have we heard students say, "When am I going to use that?" Solving linear equations of algebra come into play quite often. Banks use them to compute the interest on a savings account. Corporations use them to figure when to replace a machine that is worth less and less each year it gets older. Race car drivers use them to determine whether they can cover a certain distance at a certain rate of speed given how many miles per gallon a car gets. Cooks use them to convert a recipe meant for four people into a recipe for five. In sports, statisticians use them to decide which players the team should attempt to add to their team. Based on what a statistician can infer, it helps them determine how to make predictions of players for upcoming seasons.[1]

Rationale

This lesson 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. This is definitely one way to motivate and interest students in making the connections. This lesson will demonstrate confidence in students as mathematical thinkers, believing that they can learn and achieve high standards in mathematics in addition to, allowing students to realize that their effort and persistence play a vital role in their success. By integrating math into the real world, students can see how math strategies can be used to explain and interpret their favorite sport and recreational activity. This lesson is designed for my Algebra-I class where, students will understand that systems of equations can be used to model, analyze and solve real world situations. It also demonstrates how the usage of systems of equations can determine important statistics in sports. Students will grasp how two equations with the same variables will be able to work together and solve for the two unknown variables. It is my goal that the learning outcome will enable students to work collaboratively to develop strategies to solve systems of equations using three different methods with real-world applications. The usage of graphs, calculators, and other manipulatives will assist the student in interpreting exactly what a problem is inquiring and how to better solve it.[2]

Population

My name is Monica Echols and I'm an eighth grade mathematics teacher at Francis Bradley Middle School. Based upon prior End-of-Grade tests in mathematics, these students have demonstrated grade-level proficiency by scoring at or above Achievement Level III. This accomplishment qualified them to take Algebra I in middle school for a high school credit. There are thirty-three eighth grade students, ages thirteen to fourteen years old in this Algebra I (Honors) class. Thirteen of which are male and twenty that are female. I've seen many examples of their talents, for example: football, soccer, band, dance, basketball, track, volleyball just to name a few and have long been impressed by their diligence and work ethic. They are a group of highly motivated, positive self-starters as well as team players who are eager to learn. Each student brings a common ground to the class as well as essential differences this allows the classroom to be a good fit for each individual. By incorporating their prior experiences, culture, personality, and gender, it allows learning to be more effective. Through the knowledge of their personal preferences, it assists me in understanding and predicting their performance. This also helps me restructure the situation to facilitate more student participation.

Francis Bradley Middle School has a diverse student and staff population. Presently, we have 1153 students enrolled— 31% African-American students, 56% White students, 9% Hispanic, 2% Asian and about 2% of our students come from other races and ethnicities. In the last five years our school has continued to become more and more diverse. Although we consider all of our students to be talented in some way, we have approximately 16.5% of our students in the program for the gifted. We have five classes of self-contained exceptional children (three Autistic classrooms, and two SAC classrooms). There are approximately 120 total exceptional children serviced by nine exceptional children's teachers. Bradley Middle School also serves about 35 LEP students and these students are accommodated through a well-established ESL program in which students are either enrolled in an ESL class or monitored and supported if they are mainstreamed in regular education classes.

The 2011-12 school year at Francis Bradley Middle was successful in the North Carolina Department of Public Instruction's ABC Assessment program. Our school was recognized as a North Carolina School of Distinction as we achieved high growth status and had positive growth in every tested area. High growth status was met in four out of seven tested subjects and eleven out of thirteen subgroups. We met all of our AMO targets and had 85.3% of our students perform at a proficient level, which is an increase of 1.7%.

Overall, 87.6% of our students tested scored on/above grade level in Math and 80.8% in Reading. Our Algebra students are also performing high with 100% on grade level respectively. We are proud of the increased percent of students at or above grade level in 6^{th} grade Reading, 6^{th} grade Math, 7^{th} grade Reading, 8^{th} grade Reading and Math.

Francis Bradley Middle offers a variety of experiences and opportunities to meet the unique needs of our students. The climate and culture at our school is inviting and nurturing.

The History

History suggests that the ancient Egyptians and Babylonians, as well as the Chinese, Persians, and Hindus, used in algebra thousands of year ago. However, the earliest of its use is contained in the Rhind papyrus, one of the oldest known mathematical manuscripts. This document was found in 1858. It is an Egyptian papyrus written by a scribe named Ahmes. A papyrus is an early form of paper that became an important source of information about Egyptian mathematics and suggests that as early as 1700 B.C. people were dealing with the same kind of problems that are now solved with algebra. In other words, they were trying to solve mathematical problems that involved unknown quantities.[1]

Much later, Greek mathematician Diophantus (c.200 - c.284) solved problems using what would now be called algebra, and even worked out a symbolism of his own. Some call him the "father of algebra," since his work inspired Arab scholar al-Khwarizmi (c.780 – c.850).As early as 200 B.C. the Chinese had devised a clever method for solving systems of two linear equations with two unknowns. The method is illustrated in Chapter 7 of the Jiuzhang suanshu (Nine Chapters in the Mathematical Art), one of the earliest surviving mathematical texts from China.[1]

As a problem-solving tool, algebra uses what is called an equation. An equation describes a statement of what equal what, or as a mathematical sentence that says two things are equal. Thinking of an equation as a balanced see-saw sometimes helps understand the idea. Since algebra is all about trying to find out what the unknown quantity of something is, the problem is written down as an equation in which x is the unknown number. Second, all the terms involving x should be arranged systemically on one side of the equation. Next, these terms are combined and reduced using regular arithmetic until a single variable is left on one side of the equation and a known number remains on the other side which is the answer.[3]

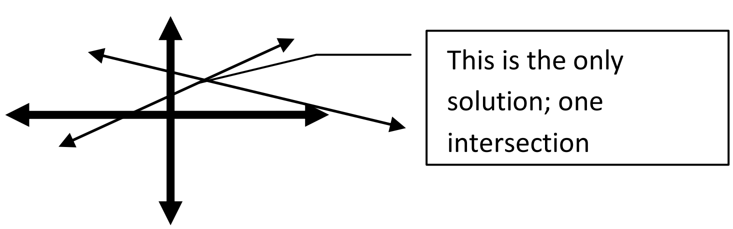
The Instructional Content

This lesson corresponds to the North Carolina Common Core Standards in that students use strategies to strengthen their knowledge by working with and understanding functions in more complex methods. Standard A.CED.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. Standard A.REI.5: Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. Standard

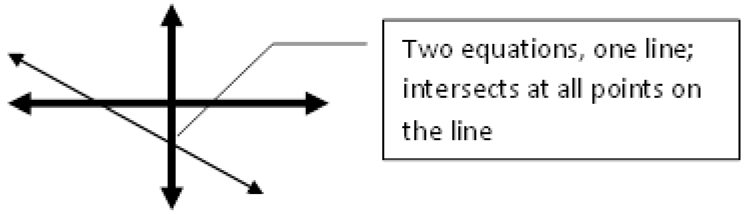
A.REI.6: Solve systems of linear equations exactly and approximately (e.g. with graphs), focusing on pairs of linear equations in two variables. Standard A.REI.11: Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y= g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables or values, or find successive approximations.

As a class we worked with two types of linear equations—linear equations with one variable and equations with two variables. A linear equation is an equation that models a linear function. Many real-world mathematical problems can be represented algebraically. These representations can lead to algebraic solutions. A function that models a real-world situation can then be used to make estimates or predictions about future occurrences. In a linear equation, the variables cannot raise to a power other than one. For example, y = 2x is a linear equation but $y = x^2$ or $y = 2^x$ are not one. In general, we could find a limited number of solutions to a single equation with one variable, while we could find an infinite number of solutions to a single equation with two variables. This is because a single equation with two variables is underdetermined--there are more variables than equations. But what if we added another equation? A "system" of equations is a set or collection of equations that you deal with all together at once. Linear equations (ones that graph as straight lines) are simpler than non-linear equations, and the simplest linear system is one with two equations and two variables. A solution for a *single* equation is any point that lies on the line for that equation. A solution to a system of equations is a set of values for the variable that satisfy all the equations simultaneously. In order to solve a system of equations, one must find all the sets of values of the variables that constitute solutions of the system. A system of equations that has at least one solution is *consistent*. A consistent system can be either independent or dependent. A *consistent system* that is *independent has exactly one solution*. The lines intersect at one point. The lines have different slopes. A *consistent system* that is *dependent has infinitely many solutions*. The lines are the same. The lines have the same slope and y-intercept. *A system of equations that has no solution is inconsistent*. The lines are parallel. The lines have the same slope and different y-intercepts.[4]

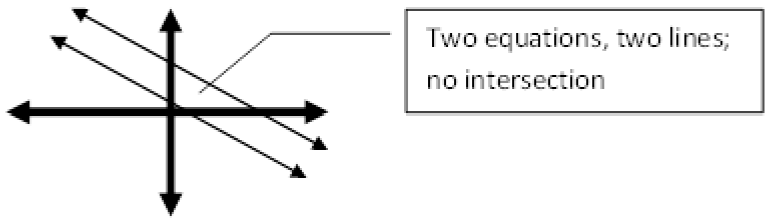
Consistent- a system with at least one solution
Independent- a consistent system with only one solution, (x, y)[5]



Dependent- a consistent system with infinitely many solutions (same line)[5]



Inconsistent- a system with no solution (parallel lines)[5]



There are three methods that will demonstrate how to solve systems of linear equations: Solving Systems of Linear Equations by Graphing, Solving Systems of Linear Equations by Substitution, Solving Systems of Linear Equations by Elimination, and Solving Systems of Linear Equations using Matrices.

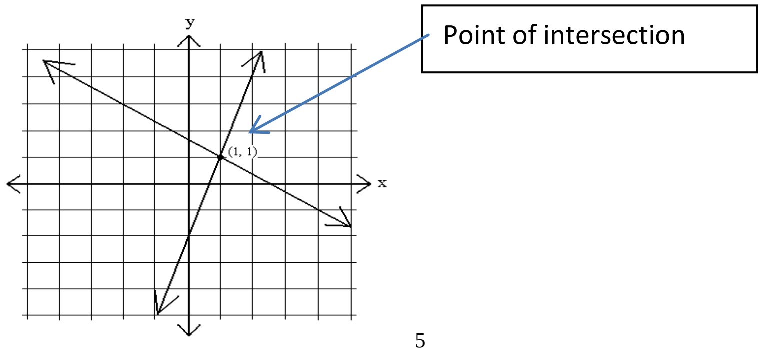
Solving Systems of Linear Equations by Graphing

On day oneof this unit the warm up will review students on how to solve for "y" when two variables are given in one equation. I would choose equations of different levels for students.

For example: Warm-up. Solve the following equations for y.

1. $x - y = 9$
2. $y – 2 = \frac{2}{3}(x + 4)$
3. $10x + 5y = 20$
4. $3x + 6y = -12$
5. $y + 5 = -2(x + 5)$

When we graph a linear equation in two variables as a line in the plane, all the points on this line correspond to ordered pairs that satisfy the equation. Thus, when we graph two equations, all the points of



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intersection--the points which lie on both lines--are the points which satisfy both equations. To solve a system of equations by graphing, graph all the equations in the system. The point(s) at which all the linesintersect are the solutions to the system. For example: $y - 3 = -\frac{2}{3}(x + 2)$ and $y = 3x - 2$. The first thing that needs to be done is making sure both equations are in slope-intercept form ($y = mx + b$). You will then use the slope and y-intercept of a line to graph the equations. The slope tells you the ratio of vertical change to horizontal change. Plot the y-intercept (the y-coordinate of a point where the graph crosses the y-axis). Then use the slope to plot other points on the line. Since the two lines intersect at the point (1, 1), this point is a solution to the system. Therefore, the solution set to the system of equations is {(1, 1)}. To check the solution, plug (1, 1) in to both equations, does 1 - 3 = - (1 + 2) and1 = 3(1) - 2? Yes, it checks to be correct. As a result, (1, 1) is the solution.[7]

The use of graphing to solve a system of equations has become a powerful investigative tool. With graphing calculators and graphing software, technology has opened the door to quickly and easily making change to equations and sees how these changes impact the location and steepness of a line. Students will be given the following steps to use on their graphing calculators to find the point of intersection: Step 1: Press the “y =” key. Step 2: Type the first equation where y1 is located and second equation where y2 is located. Step 3: Press the “Graph” key. Step 4: Press “2^{nd}” then “Trace”. Step 5: Select Intersect. Step 6: Press “Enter” three times and you will be given the x- and y- values which represent the point of intersection.

Solving Systems of Linear Equations by Substitution

On day three/four of this unit to ensure comprehension of the vocabulary discussed in the previous lesson the following warm-up is used:

1. Suppose you graph a system of linear equations. If a point is on only one of the lines, is it a solution of the system? Explain.
2. Can a system of two linear equations have exactly two solutions? Explain.

3. Suppose you find that two linear equations are true when x = -2 and y = 3. What can you conclude about the graphs of the equations? Explain.

Graphing is a useful tool for solving systems of equations, but it can sometimes be time-consuming. A quicker way to solve systems is to isolate one variable in one equation, and substitute the resultingexpression for that variable in the other equation. The method of solving "by substitution" works by solving one of the equations (you choose which one) for one of the variables (you choose which one), and then plugging this back into the other equation, "substituting" for the chosen variable and solving for the other. Then you back-solve for the first variable. [7]

For example: $2x - 3y = -2$
$4x + y = 24$

The idea here is to solve one of the equations for one of the variables, and plug this into the other equation. It does not matter which equation or which variable you pick. There is no right or wrong choice; the answer will be the same, regardless. But, some choices may be better than others.For instance, in this case, can you see that it would probably be simplest to solve the second equation for "y =", since there is already a y floating around loose in the middle there? You could solve the first equation for either variable, but I'd get fractions, and solving the second equation for x would also give me fractions. It wouldn't be "wrong" to make a different choice, but it would probably be more difficult.

Solve the second equation for y:
$4x + y = 24$
$y = -4x + 24$
Now plug this in ("substitute it") for "y" in the first equation, and solve for x:
$2x - 3(-4x + 24) = -2$
$2x + 12x - 72 = -2$
$14x = 70$
$x = 5$

Then you can plug this x-value back into either equation, and solve for y. But since you already have an expression for "y =", it will be simplest to just plug into this:

$y = -4(5) + 24 = -20 + 24 = 4$
Then the solution is $(x, y) = (5, 4)$.

If you had substituted "$-4x + 24$" expression into the same equation as the one used to solve for "y =", you would have gotten a true, but useless, statement:

$4x + (-4x + 24) = 24$
$4x - 4x + 24 = 24$
$24 = 24$

Twenty-four does equal twenty-four. So when using substitution, make sure you substitute into the *other* equation. It is useful to check this solution in both equations. Although we chose y in the first equation in the previous example, isolating any variable in any equation will yield the same solution.

Solving Systems of Linear Equations using Elimination

On day five/six of this unit to review concepts from previous lessons the following warm-up is used:

1. What is the y-intercept of $2x + 5y = 15$?

   For each system below, tell which equation you would first use to solve for a variable in the first step of the substitution method. Explain your choice.

2. $-2x + y = -1$
   $4x + 2y = 12$

3. $2.5x - 7y = 7.5$
   $6x - y = 1$

One disadvantage to solving systems using substitution is that isolating a variable often involves dealing with messy fractions. There is another method for solving systems of equations: the elimination method. In the elimination method, the two equations in the system are added or subtracted to create a new equation with only one variable. In order for the new equation to have only one variable, the other variable must cancel out. In other words, we must first perform operations on each equation until one term has an equal and opposite coefficient as the corresponding term in the other equation. We can produce equal and opposite coefficients simply by multiplying each equation by an integer.[7] Here are the steps to solving systems of equations using the addition/subtraction method:

1.) Rearrange each equation so the variables are on one side (in the same order) and the constant is on the other side.
2.) Multiply one or both equations by an integer so that one term has equal and opposite coefficients in the two equations.
3.) Add the equations to produce a single equation with one variable.
4.) Solve for the variable.
5.) Substitute the variable back into one of the equations and solve for the other variable.
6.) Check the solution--it should satisfy both equations.[7]

For example: Solve the following system of equations:

$$2y - 3x = 7$$
$$5x = 4y - 12$$

Rearrange each equation:

$-3x + 2y = 7$
$5x - 4y = - 12$

Multiply the first equation by 2:

$-6x + 4y = 14$
$5x - 4y = - 12$

Add the equations:

$- x = 2$

Solve for the variable:

$x = - 2$

Plug x = - 2 into one of the equations and solve for y:

$-3(- 2) + 2y = 7$
$6 + 2y = 7$
$2y = 1$
$y = \frac{1}{2}$

Thus, the solution to the system of equations is (- 2,).

Check:$2(\frac{1}{2}) - 3(- 2) = 7$? Yes, it checks to be correct.$5(- 2) = 4(\frac{1}{2}) - 12$? Yes, it's correct. [5]

Solving Systems of Equations using Matrices

On day seven/eight of this unit to review concepts from previous lessons the following warm-up is used:

Without solving (1-3), decide what method you would use to solve each system: *graphing*, *substitution*, or *elimination*. Explain.

1. $y = 3x – 1$ 2. $3m – 4n = 1$ 3. $4s – 3t =8$
   $y = 4x$ $3m – 2n = -1$ $t = -2s – 1$
4. You have a jar of pennies and quarters. You want to choose 15 coins that are worth exactly $4.35. Write and solve a system of equations that models the situation. Is your solution reasonable in terms of the original problem? Explain.

A matrix is a rectangular arrangement of numbers in rows and columns. The plural of matrix is matrices. You can use a special type of matrix, called an augmented matrix, to solve a system of linear equations. An augmented matrix is formed using the coefficients and constants in the equations in a system. The equations must be written in standard form. (Ax + By = C, which was taught in a previous lesson).[6]

Example:Using matrices, calculate the values of x and y for the following simultaneous equations:

$2x – 2y – 3 = 0$
$8 y = 7x + 2$

Solution:

Step 1: Write the equations in the form Ax + By = C.

$2x - 2y - 3 = 0 \Rightarrow 2x - 2y = 3$

$8y = 7x + 2 \Rightarrow 7x - 8y = -2$

Step 2: Write the equations in matrix form.

$$\begin{matrix}\text{coefficients of first equation} \rightarrow \\ \text{coefficients of second equation} \rightarrow\end{matrix} \begin{pmatrix} 2 & -2 \\ 7 & -8 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 \\ -2 \end{pmatrix} \begin{matrix}\leftarrow \text{constant of first equation} \\ \leftarrow \text{constant of second equation}\end{matrix}$$

Step 3: Find the inverse of the 2 × 2 matrix.

Determinant = $(2 \times -8) - (-2 \times 7) = -2$

$$\text{Inverse} = -\frac{1}{2}\begin{pmatrix} -8 & 2 \\ -7 & 2 \end{pmatrix} = \begin{pmatrix} 4 & -1 \\ 3.5 & -1 \end{pmatrix}$$

Step 4: Multiply both sides of the matrix equations with the inverse.[6]

$$\begin{pmatrix} 4 & -1 \\ 3.5 & -1 \end{pmatrix}\begin{pmatrix} 2 & -2 \\ 7 & -8 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 & -1 \\ 3.5 & -1 \end{pmatrix}\begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 14 \\ 12.5 \end{pmatrix}$$

Therefore, x = 14 and y = 12.5

Class Activities:

Station Activity: This activity is a station-based activity that consists of 4 stations. You might divide the class into groups of four-five students. You may want to assign roles to students. For example, the reader (reads the steps of the activity aloud), facilitator (makes sure that each student in the group has a chance to speak and pose questions as well as making sure everyone agrees to all answers), materials manager (handles the materials at the station and makes sure the materials are put back in place at the end of the activity), timekeeper (tracks the group's progress to ensure that the activity is completed in the allotted time), and spokesperson (speaks for the group during the debriefing session after the activities).

In station one, students will be given a real-world application of systems of linear equations. Problem: The Booster Club voted to go to the Bobcats game for their annual trip. They bought 100 tickets for $2,025. Lower deck tickets were $25.00 each and upper deck tickets were $10.00 each at the special group rate. How many of each type of ticket did they buy? Let x represent the number of tickets for the lower deck and let y represent the number of tickets for the upper deck.[7]They will set up the system of linear equations. Then they will find the solution using one of the four methods previously taught. They will explain the strategy behind the method they used to find the solution.

In station two, students will be given six index cards with the following equations written on them: 14x + y = 233; x + y = 233; 14x + 20y = 3748; x + 20y = 2128; x + y = 2128; 14x + 20y = 233.

Shuffle the cards and place them face-down. As a group, they will read the following real-world problem scenario: Francis Bradley Middle School Athletic Booster Club sold t-shirts for $14.00 and sweatshirts for $20.00. They sold 233 pieces and raised $3,748. How many of each type of shirt did they sell? [7]Students will work together to solve a real-world application of system of linear equations. Students will choose which of the two index cards represents the equations in the system and explain why they choose the equation. They will solve the system of linear equations using either substitution or elimination method. Then they will explain why graphing the system to find the solution is not the best way to solve the problem.

In station three, students will find a graphing calculator. Students will graph systems of linear equations on their calculator to find the point of intersection.

Problem: $\begin{cases} y = 4x - 3 \\ y = x - 8 \end{cases}$

Students will be reminded to use the steps given in the notes from the graphing systems of linear equations lesson to find the answer. Students will be asked to find the solution to each system of linear equations: [6]

1.) $\begin{cases} y = 3x = 12 \\ y = x - 4 \end{cases}$ 2.) $\begin{cases} y = -4x + 9 \\ y = 3x \end{cases}$ 3.) $\begin{cases} 2x + 2y = 8 \\ y = 10x - 4 \end{cases}$

In station four, students will be given four index cards with the following systems of linear equations written on them:

1.) $\begin{cases} 10x - 2y = 10 \\ 5x - y = 5 \end{cases}$ 2.) $\begin{cases} x - y = 3 \\ 2x - y = 5 \end{cases}$ 3.) $\begin{cases} y = 4 \\ -x + y = 10 \end{cases}$ 4.) $\begin{cases} y = 2x + 5 \\ -2x + y = 8 \end{cases}$

Students will work together to match each system of linear equations with the appropriate graph. They will explain the strategy they used to match the graphs and how they know if a system of linear equations has infinite or no solutions. [6]

Sports Statisticians Activity: This activity will help students master their skills with the various methods discussed. Students will also have to interpret what their solution represent and justify their reasoning by proving their work.Students will work in pairs to solve the system of equations on the statistics of basketball players Chris Paul and Deron Williams. Students will be given the stats for Chris and Deron (this information was gathered from ESPN.com profile pages) and should be prepared to share their equations and the process (graphical, substitution, and/or elimination method) they used to solve for the total number of 2-point and 3-point field goals for the 2007-2008 season. [2]

Deron Williams and Chris Paul have been compared to each other their entire careers inthe NBA. Deron Williams was drafted by the Utah Jazz with the third pick of the 2005 NBADraft. Chris Paul was drafted one spot later by the New Orleans Hornets. Both players havecomparable statistics from their three seasons in the league, both have played in the NBA All-Star team, and both were part of the gold medal winning 2008 United States Olympic BasketballTeam.[2]

(Students will answer several questions to ensure comprehension)
Question1: In basketball, a free throw is worth 1 point and a field goal is ether 2 points or 3 points. In the2007-2008 season, Chris Paul scored a total of 1684 points. The total number of 2-point and 3-point field goals he made was 630 and the total number of free throws he made was 332. Using a system of equations, determine how many 2-point field goals and 3-point field goals Chris Paulmade in the 2006-2007 season. Students will be asked to explain the system of equations they used to solve these real-world problems and the meaning of the solution to these problems. They will also explain different approaches (graphical method, substitution method, and/or elimination method) to solving these problems.[2]

Answer:Free throws + 2-point field goals + 3-point field goals = 1684
$332 + 2x + 3y = 1684$
$x + y = 630$ ($y = 630 – x$)
$332 + 2x + 3(630-x) = 1684$
$332 + 2x + 1890 – 3x = 1684$
$2222 – x = 1684$
$x = 538$ (the number of 2-point field goals)
$x + y = 630$
$538 + y = 630$
$y = 92$ (the number of 3-point field goals)

In the 2007-2008 season, Deron Williams scored a total of 1545 points. The total number of 2-point field goals and free throws he made was 813 and the total number of 3-point field goals hemade was 83. Using a system of equations, determine how many 2-point field goals and freethrows Deron Williams made in the 2006-2007 season.[7]
Free throws + 2-point field goals + 3-point field goals = 1545
$x + 2y + 83(3) = 15$
$x + 2y + 249 = 1545$

x + y = 813 (y = 813 – x)
x + 2(813 – x) + 249 = 1545
x + 1626 – 2x + 249 = 1545
-x + 1875 = 1545
-x = -330
x = 330 (the number of free throws)
x + y = 813
330 + y = 813
y = 483 (the number of 2-point field goals)

Question 2: During the 2007-2008 season, Chris Paul played in 80 games. How many field goals did Chris Paul make per game during the 2007-2008 season?

Answer: $\frac{630\ (the\ total\ 2-point\ and\ 3-point\ field\ goals)}{80 (number\ of\ games)}$ = 7.9 field goals made per game[8]

Question 3: During the 2007-2008 season, Deron Williams played in 82 games. How many field goals did Deron Williams make per game during the 2007-2008 season?

Answer: $\frac{566\ (the\ total\ 2-point\ and\ 3-point\ field\ goals)}{82\ (number\ of\ games)}$ = 6.9 field goals made per game[8]

Question 4: In basketball a field goal is defined as a shot that is worth 2 points or 3 points. What was Chris Paul's field goal percentage if he attempted 1291 field goals?

Answer: $\frac{630 (\ the\ total\ 2-point\ and\ 3-point\ field\ goals)}{1291\ (attempted\ field\ goals)}$ = Approximately 49%

Question 5: What was Deron Williams' field goal percentage if he attempted 1117 field goals?

Answer: $\frac{566\ (the\ total\ 2-point\ and\ 3-point\ field\ goals)}{1117\ (attempted\ field\ goals)}$ = Approximately 51%

Question 6: What was Chris Paul's 3-point percentage if he attempted 249 3-point field goals?

Answer: $\frac{92\ (number\ of\ 3-point\ field\ goals)}{249\ (number\ of\ attempted\ 3-point\ field\ goals)}$ = Approximately 37%

Question 7: What was Deron Williams' 3-point percentage if he attempted 210 3-point field goals?

Answer: $\frac{83\ (number\ of\ 3-point\ field\ goals)}{210\ (number\ of\ attempted\ 3-point\ field\ goals)}$ = Approximately 40%

Unit Project:

This project will be due at the end of the unit. It will give students an opportunity to show their creative side while displaying comprehension of mathematical concepts. Students will be broken into groups of four-five people. In order to involve all members of the group in this activity, you should assign roles to each person in the group. For example, researcher (investigate the information about the players and help prepare the paper), two presenters/sportscasters(prepares and deliver the information), recorder (tapes the video and ensure it is properly done), and manager/producer (ensures that the project proceeds according to the plan and there is equal participation by team members to guarantee all tasks are met). The presenters (sportscasters) will provide the audience with stats of the players and an explanation of the groups' results, and the videographer will operate the camera. They will imitate the roles of a sports broadcasting show and make a fifteen-minute video to upload on YouTube. Each group will choose three NBA players to review. They will incorporate system of equations of their results demonstrating why they think a particular player best fits a particular team.

The role of a sportscaster isn't just commentating on the game. Much of what he/she does involves tracking players' performances from game to game during the year and throughout careers. A sportscasterspends a lot of time preparing and findingout information and use statistics that are basic mathematical foundations. Statisticians that work for a particular team may track data on the performance of each individual on the team as well as the team as a whole. They also look at a variety of statistical measures related to the team's competition. A sports statistician may collect and analyze data on an upcoming opponent's players, and use data to analyze a player's success against certain types of players and in specific game situations, and to analyze performance against particular individuals, as well as a wide range of other possible statistical analyses.[8] This information is usually communicated to team management so that the team can plan appropriate strategies to take advantage of their strengths and their opponent's weaknesses.

News organizations also employ sports statisticians for the purpose of providing the reader, listener, or viewer with information that helps describe the performance of an individual or team. Sports statisticians also track records and accomplishments of past and present athletes. Sports statisticians are part of the general category of statisticians. Statisticians are also employed in such areas as manufacturing, health, government and business. Statisticians apply their abilities to a wide variety of tasks. For example, statisticians may conduct surveys designed to gather information about a particular group of people. Others may analyze data obtained from experiments on manufactured items for the purpose of determining quality, performance, and failure rates.[9]

Group members will research the players' stats per game from 2010-2011 and 2011-2012 seasons. Each group will be assigned a specific approach (graphical, substitution, or elimination method) to use in answering certain questions about the players. Each group will have to submit a one-page paper of the group's plan for the project and the script for the show. The plan will also include the names of each group member and their roles. A rubric will be provided to demonstrate how the groups will be graded. They will be graded on the following areas: Teamwork, Overall Quality of the Show (transitions, video effects, title slides, use of music), Credits, and Relation to Math. This project will include all methods of solving systems of equations and help students appreciate the significance of these functions in daily life.

Project-based Learning Rubric

	Content	Conventions	Organization	Presentation
4	▪ Is well thought out and supports the solution to the challenge or question ▪ Reflects application of critical thinking ▪ Has clear goal that is related to the topic ▪ Is pulled from a variety of sources and accurate	▪ No spelling, grammatical, or punctuation errors ▪ High-level use of vocabulary and word choice	▪ Information is clearly focused in an organized and thoughtful manner. ▪ Information is constructed in a logical pattern to support the solution.	▪ Multimedia is used to clarify and illustrate the main points. ▪ Format enhances the content. ▪ Presentation captures audience attention. ▪ Presentation is organized and well laid out.
3	▪ Is well thought out and supports the solution ▪ Has application of critical thinking that is apparent ▪ Has clear goal that is related to the topic ▪ Is pulled from several sources and accurate	▪ Few (1 to 3) spelling, grammatical, or punctuation errors ▪ Good use of vocabulary and word choice	▪ Information supports the solution to the challenge or question.	▪ Multimedia is used to illustrate the main points. ▪ Format is appropriate for the content. ▪ Presentation captures audience attention. ▪ Presentation is well organized.
2	▪ Supports the solution ▪ Has application of critical thinking that is apparent ▪ Has no clear goal ▪ Pulled from a limited number of sources ▪ Has some factual errors or inconsistencies	▪ Minimal (3 to 5) spelling, grammatical, or punctuation errors ▪ Low-level use of vocabulary and word choice	▪ Project has a focus but might stray from it at times. ▪ Information appears to have a pattern, but the pattern is not consistently carried out in the project. ▪ Information loosely supports the solution.	▪ Multimedia loosely illustrates the main points. ▪ Format does not suit the content. ▪ Presentation does not capture audience attention. ▪ Presentation is loosely organized.
1	▪ Provides inconsistent information for solution ▪ Has no apparent application of critical thinking, few sources ▪ Has no clear goal ▪ Many factual errors, misconceptions, or misinterpretations	▪ More than 5 spelling, grammatical, or punctuation errors ▪ Poor use of vocabulary and word choice	▪ Content is unfocused and haphazard. ▪ Information does not support the solution to the challenge or question. ▪ Information has no apparent pattern.	▪ Presentation appears sloppy and/or unfinished. ▪ Multimedia is overused or underused. ▪ Format does not enhance content. ▪ Presentation has no clear organization.

Works Cited

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Sanchis, Gabriela. "Welcome! - History of Math." Welcome! - History of Math. http://hom.wikidot.com (accessed November 20, 2012).

Stapel, Elizabeth. "Purplemath."Purplemath. http://www.purplemath.com (accessed November 20, 2012).

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[1]Bruno 1999
[2]Brooks, Dickey, Sullivan, 2009
[3] Hand, 2008
[4]Charles, 2011
[6]Stapel, 2012
[7]Holliday, 2003
[8]ESPN, 2012
[9]Michael Madden, 2012

Teacher Resources

Brooks, Debbie, Peggy Dickey, and Jan Sullivan. "LEARN NC." LEARN NC. http://learnnc.org (accessed November 20, 2012).
This website was used help with the real-world applications with systems and the descriptions of specific vocabulary as it relates to systems of equations.

Bruno, Leonard. Math & Mathematicians: *The History of Math discoveries around the World Volume a-h*. New York: UXL, 1999.
I used this book to find the history of linearand systems of equations.

Charles, Randall I..*Prentice Hall Algebra 1*. Advance copy. ed. Boston, Mass.: Pearson/Prentice Hall, 2011.
I used this algebra book for examples of systems of equations.

Chartier, Tim."Math Movement - Giving the NFL a rating."Davidson College Forum. http://forum.davidson.edu/mathmovement/2011/05/19/nfl-ratings/ (accessed November 25, 2011).
Dr. Tim Chartier assisted me with the graphics and relating systems to sports.

"ESPN: The Worldwide Leader In Sports." ESPN: The Worldwide Leader In Sports. http://espn.com (accessed November 20, 2012).
This website was used to access the statistics on the professional players.

Hand, David. *Statistics*. New York: Sterling, 2008.
This book was used to show the relation with systems using matrices.

Holliday, Berchie. *Algebra 1*. New York: Glencoe/McGraw Hill, 2003.
This book was used to help me with various demonstrations of solving systems.

"Michael Madden on HubPages." Michael Madden on HubPages. http://michaelmadden.hubpages.com (accessed November 20, 2012).
This website assisted me with understanding the roles of sportscasters.

Sanchis, Gabriela. "Welcome! - History of Math." Welcome! - History of Math. http://hom.wikidot.com (accessed November 20, 2012).
This website assisted me with understanding the roles of statisticians.

Stapel, Elizabeth. "Purplemath."Purplemath. http://www.purplemath.com (accessed November 20, 2012).
This website assisted me with relating systems of equations in real-life application.

Student Resources
There are no student resources.

Materials Needed for the Curriculum Unit
Video Camera
Access to MovieMaker
Access to Youtube