Math With Sport Cards

Reasons for Math With Sport Cards:

- Give you an opportunity to share something you care about-sports cards-with your children
- Makes math fun and engaging
- Provides real-world application

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Common Core Math Standards tell us that Kindergartners need to:

Count aloud to 100

Count and write numbers to 20

Count Objects

Compare numbers using the terms more, less, and equal

Classify objects, describe and compare attributes

Here are some things you can do with sports cards:

Have child count the cards

Have child place the cards on a grid of numbers, 1-20, to learn the correspondence of the numeral said and the number that is written

Have the child count the number of people they can see on each card (if there is a crowd in the background this is not advisable)

Classify the cards. For example, cards with players in action and cards with players who are posing. Players with hats, players with helmets, and players with nothing covering the head. Cards with players and cards with coaches—have them tell you how they know the difference. Cards with footballs, cards with baseballs, cards with basketballs, cards without any sports ball. Cards with players wearing green, red, blue, white, gray, black. Cards with players wearing stripes, solid colors, or some other category. You get the point, have the children organize the cards into categories and then explain to you the attributes of the cards in that category. Remember, each card has two sides.

Once cards have been sorted into categories, children can count the number of cards in each category and then begin to make comparisons. Which categories have more, less, or equal numbers.

Have children identify the numbers which are on jerseys. Even is they don't know the number "53" they can recognize the numbers 5 and 3.

As a bonus, you can reinforce reading by having the child identify letters they see on the card. Once they have identified a letter, ask them what letter comes directly before that letter when they say the alphabet and what letter comes directly after the letter when saying the alphabet. On most cards, the words on the front of the card are written with UPPERCASE letters. Make a grid of the lowercase alphabet and have the child match to the grid.

Most importantly of all, have fun!

Common Core Math Standards tell us that 1st Graders need to:

Make up story problems to show both addition and subtraction

Write equations showing both addition and subtraction

Begin to understand place value: ones, tens, and hundreds

Represent and interpret data

Here are some things you can do with sports cards:

Certainly 1st graders can practice doing all of the things done as a Kindergartner. In fact, organizing and sorting the cards is often the first step for practicing the 1st grade standards.

Once the cards are sorted into categories, help your child make up story problems with the cards. For example: "There are 9 cards with players wearing helmets. There are 5 cards with players wearing caps. How many more players are wearing helmets?" or "Eight cards show players in action. Nine cards show players posing for the camera. How many players are shown altogether?" The stories can go on and on.

When the child has completed the stories, have them write equations showing the arithmetic they used. For example, 9 – 5 = 4 represents the first problem while 8 + 9 = 17 represents the second. Have them practice sharing the problem they created with you verbally saying, "Nine minus five equals four" and so on.

Place value is a key concept children must learn and there is no better place to start than in 1st grade. Have the child focus on the two-digit number on the jersey or find a two-digit number on the back of the card. Make a grid like the one below. Have two tokens (this can be scraps of paper), one for the ones column or place and one for the tens column or place. If the number is 27, the child would begin by counting in the one's column, and when he/she said, "10", the token under the tens' column get pushed into the grid. The child returns the token to the one's column and continues to count, pushes the ten's token forward when he/she states "twenty" and then returns to the one's column to count the last seven spaces. When finished, the grid now represents the number 27. To use this grid, simply turn the card so the grid is vertical.

Tens	1	2	3	4	5	6	7	8	9
Ones	1	2	3	4	5	6	7	8	9

1st Graders also begin to learn about data, how to represent it and how to interpret it. Certainly it would be a good thing to point out how the cards have data represented in columns and rows, it is also important to understand that most of the data on these cards are for older children. But pointing out the arrangement of data will help your child understand how he/she might organize data.

For example, the children could create a grid which would show different ways they categorized the cards. (Note: It would be faulty for them to classify the card in multiple ways and then believe the data show an excessive number of cards. This is especially important when children are telling the "data story".)

Here is a sample grid.

	Posed Shots	**Action Shots**	**No Pictures**
Backs of Cards	12	5	9
Fronts of Cards	5	21	0

Sample statements that could be made to interpret the data:

- There are 26 cards being examined.
- Fronts of cards had more action shots than backs of cards.
- Nine backs of cards had no pictures.
- There are 7 more posed shots on backs of cards than fronts of cards.

Discuss with children what information they could NOT share with the data they collected. In this case, they could not say that all of the cards without pictures on the back are baseball cards. The data does not tell them that. They would have to be able to identify types of cards in the data table for that to be visible.

Looking at data, it is important to remember that interpreting and being able to make statements regarding the data is the goal.

Most importantly of all, have fun!

Common Core Math Standards tell us that 2nd Graders need to:

Problem solving with both addition and subtraction

Write equations showing both addition and subtraction

Estimate lengths and relate length in word problems

Represent and interpret data

Partition rectangles into rows and columns

Here are some things you can do with sports cards:

2nd graders can practice the skills supported in the first-grade activity description, and they too will need to categorize and sort the cards. This is an initial step which will help you understand what they are thinking. For Kindergarten and 1st, focus was placed on sorting the cards by the front of the card, beginning with 2nd grade, begin to look at the back side of the card where the data are recorded. Look for entries which measure things—yards, first downs, years. The concept of length originates in 2nd grade.

Help children develop stories which will require addition or subtraction to solve. Once they have the story, have them write and say the equation which fits the story. For example, John had 48 sports cards, Jorge had 59 cards, and Susie had 74 cards. (This is the story part.) There are several of problems you could write based on this data: "How many more cards did Susie have than Jorge? Than John? If John and Jorge put their cards together, how many more cards would they have than Susie? (This is a two-step problem—first add, then subtract.) Encourage your child to think about the "story" the numbers tell. This will help the practice be more relevant and help them get in the habit of "telling the story" represented in the data.

Standard measurement, inches, feet, yards, miles and centimeters, meters, and kilometers, is introduced to children in the 2nd grade. Have your child measure the card. Have them look at the stats on the back of the card and if there is an indicator of yards, go outside and measure that with your child. Show them the length of a first down. Show them how many feet are in a homerun hit over the fence. Show them how big a basketball court is. You are helping them to develop what Gardner calls Spatial Intelligence. Have them make comparisons such as how many first downs would you need to make to hit the ball of the fence (then name the park so you can find out how many feet to the fence.) Discuss why there are variables.

The back of the card, in most cases, is the best place to look for the partitions (rows and columns) in a rectangle (the whole card itself). Discuss the layout of the card and why it would be done the way it is. Some cards may have only two columns-a picture and a paragraph, while others will have rows and columns of data. Cards that have "headers" and "footers" have additional rows for the child to

consider. Discuss the difference between a table and a narrative (paragraphs which tell you what can be seen in the table. Ask the child which format they think provides information more quickly and orderly.

Have your child make a sports' card of their favorite player. Discuss the layout and how they will represent data.

Have your child make a sports card of themselves. If they play soccer, softball or some other sport, encourage them to focus on information that would be interesting to others. If they don't play a sport, have them make a personality card and share some important information about themselves. Have them think about the data they will share and selecting the layout that makes the most sense.

Ask your child to redesign a sports' card and come up with a whole new card, thinking about how to partition the rectangle that is the card they have to work with. If you use 3" x 5" cards, this would be the right size.

Most important of all, enjoy the time you spend together!

Common Core Math Standards tell us that 3rd Graders need to:

Problem solving with both multiplication and division

Multiply by 100

Solve two-step word problems

Represent and interpret data

Develop a basic understanding of fractions—understanding the relationships between numerators and denominators

Here are some things you can do with sports cards:

Although 3rd graders are learning about multiplication (repeated addition) and division (repeated subtraction), reviewing addition and subtraction with them is necessary for them to maintain those skills as well. You will also begin by having your child sort the cards, using both the front and the back, into categories. Although it will be easier for them to sort cards by the sport itself, encourage them to think about ways to integrate the sports together.

Multiplying by 100 is simple as long as you understand about the zeroes. If you aren't sure how to explain this to your child, there is a great, FREE resource. There is an amazing instructional video by the Khan Academy. You can find this video by Googling Khan Academy Multiplying 1-digit numbers by 10, 100, and 1000. This is the link: https://www.khanacademy.org/math/arithmetic/arith-review-multiply-divide/arith-review-mult-10s-100s-1000s/v/multiplying-1-digit-numbers-by-10-100-and-1000. Once this pattern is understood, then ask your child to look at individual data points on the card and tell you what it would be if that data point were multiplied by 100. Have them avoid data points which represent percentage. An example would be a data point that gave 14 yards as the average length of the football carry. The questions is, "If the player carried the ball for 14 yards 100 times, how many yards would the player gain?" "If the NBA player scored an average of 33 points per game, how many points would you expect them to score in 100 games?"

Two-step word problems can be developed by your child. The child should select a data point across several sports' cards which represent the same variable or category (number of games played, number of years played, active during the same year). They should select this data point for at least three players/cards. A problem they create could have them add, subtract or multiply a data point which will then be acted upon by a question. For example, look at the "G" column which represents the number of games played. Here is a simple T Chart the child could make:

Player	Games Played
Dan Plesac	321
Franklin Stubbs	791
George Bell	1,330

A two-step problem with this data could be, “Does George Bell have more or fewer games than Plesac and Stubbs combined? If yes, how many more?” The child must first add, then subtract. Or you could ask the children to find the average number of games played by these three players. The two steps would be adding first to find the total number of games played and then dividing by 3 since that is the number of players you added together.

Understanding a fraction is an important foundational step for working with decimals and percentages. Helping children understand that the denominator, the bottom number represents the total number of pieces to make a whole is step number 1. When looking at sports cards and finding the data chart, often times the bottom line is totals. For example, using the data from the table above, Plesac played in 321 games, Stubbs in 791 games, and Bell in 1,330 games. In each case, this number would represent the denominator for that player if we were talking about the fraction of this total number of games was played in a specified year. The numerator, the top number of the fractions, represents the number of those parts in the denominator that are taken. So, in 1984, Stubbs fractional part of 791 is 87 or 87/791. In reading this, the / is stated as “of”, or 87 of 791. For Bell, 1984 represents 159/1,330 or 159 games of his career total of 1,330 games. Repeating this process of comparing seasons to totals with other players will help to solidify the concept of fractions with your child.

Looking at data, it is important to remember that interpreting and being able to make statements regarding the data is the goal.

Most importantly of all, enjoy your time together!

Common Core Math Standards tell us that 4th Graders need to:

Generate and analyze patterns

Understand factors and multiples

Solidify understanding of place value

Understand fraction equivalents and how to order fractions

Convert measurement, for example feet to yards, feet to miles, etc.

Represent and interpret data.

Here are some things you can do with sports cards:

Fourth graders will need to learn the items listed above. Notice how place value, measurement, patterns, fractions and representing and interpreting data have been developed in earlier grade levels. If need be, go back and do some of those activities with your 4th grader to be sure he/she has a firm understanding of the basics before moving forward.

Throughout these suggestions we have looked at patterns. Patterns have been used by the children to guide organization and classification. From the basic classification of cars by action or headshots, children have had an opportunity to continually classify and reclassify the cards. The next stage is to prompt questions about relationships and the factors that influence the patterns. Patterns are everywhere and helping children identify them and then understand them is a life skill.

Patterns children might notice is that fewer games were played by "rookies" in baseball than once they were established. They might notice a pattern in football cards that the stats given relate to the position played. They might notice that free throw percentages range between 70 and 80. These are just a few of the patterns they could identify. Help them to see if there are patterns and trends. Have them also provide an explanation for "why" they think the data are as they are.

Place value with whole numbers was first examined in first grade. In 4th grade, place value also extends to understand tenths, hundreds, and thousandths. A great place to start is in FT% and FG%. FT stands for Free Throws made, which FG stands for field goals made. In both cases, there is a formula which is applied: FT (free throws made) / FTA (total number of free throws attempted) x 100 or FG (field goals made which is a combination of 2 point + 3 point shots) / FGA (total field goals attempted) x 100. This not only becomes another fraction, when you multiply by 100 to get the percentage, the % sign essentially stands for the decimal point at the beginning to the fraction written: 34 made FT/68 attempted field goals = 68/100 or 68% or .68.

Consider having your child create a basketball court, a football field and a baseball diamond. Have them use graph paper (¼ inch = 1 yard for instance.) Have them compare the sizes of the playing field in

square feet or yards. Have them consider why there would be this difference. Have them create a chart which shares the results they have found and then have them explain the chart to you. Ask them to include on the chart not only the number of yards but the number of inches and feet as well.

If you really are ambitious, help them learn how to convert Standard Units of Measure (inches, feet, yards and miles) into Metric units. Here is a chart which may help.

MATH CONVERSION CHART – LENGTHS

METRIC CONVERSIONS					
1 centimeter	=	10 millimeters	1 cm	=	10 mm
1 meter	=	100 centimeters	1 m	=	100 cm
1 kilometer	=	1000 meters	1 km	=	1000 m

STANDARD CONVERSIONS					
1 foot	=	12 inches	1 ft	=	12 in
1 yard	=	3 feet	1 yd	=	3 ft
1 yard	=	36 inches	1 yd	=	36 in
1 mile	=	1760 yards	1 mi	=	1760 yd

METRIC -> STANDARD CONVERSIONS					
1 millimeter	=	0.03937 inches	1 mm	=	0.03937 in
1 centimeter	=	0.39370 inches	1 cm	=	0.39370 in
1 meter	=	39.37008 inches	1 m	=	39.37008 in
1 meter	=	3.28084 feet	1 m	=	3.28084 ft
1 meter	=	1.09361 yards	1 m	=	1.09361 yd
1 kilometer	=	1093.6133 yards	1 km	=	1093.6133 yd
1 kilometer	=	0.62137 miles	1 km	=	0.62137 mi

STANDARD -> METRIC CONVERSIONS					
1 inch	=	2.54 centimeters	1 in	=	2.54 cm
1 foot	=	30.48 centimeters	1 ft	=	30.48 cm
1 yard	=	91.44 centimeters	1 yd	=	91.44 cm
1 yard	=	0.9144 meters	1 yd	=	0.9144 m
1 mile	=	1609.344 meters	1 mi	=	1609.344 m
1 mile	=	1.609344 kilometers	1 mi	=	1.609344 km

Data mining refers to getting all of the data from something which you might need to tell a meaningful story after you analyze the data. Sports cards are a treasure drove of data which needs to be mined. When your child completes one way of looking at the data, ask them to take another vantage point. This will not only help them learn to analyze data, it will also help them to understand there is more than one way to view things. This is a key understanding when developing 21st century work place skills. Have children mine the data, figure out how to share in a meaningful way, and then tell the story they have learned from the data.

Common Core Math Standards tell us that 5th Graders need to:

Analyze patterns and relationships

Operations with multi-digit numbers

Decimals to hundredths—including correlation between fractions, decimals and percentages

Convert measurement, for example feet to yards, feet to miles, etc.

Represent and interpret data.

Here are some things you can do with sports cards:

5th graders will need to learn the items listed above. Notice how place value, measurement, patterns, fractions and representing and interpreting data have been developed in earlier grade levels and continue, in more sophisticated ways, with 5th grades. Learning is a spiral and touches each grade level, building upon the experiences of previous years.

In looking at patterns, have your child chart the longevity (years as a pro) and create three separate T-Charts, one for football, one for basketball, and one for baseball. Have them look for patterns of longevity and then compare what they find in one sport with the others. (Have them include information from all of their cards.)

Football

Harris	1972-84
Bortz	1983-94
Toon	1985-92

Basketball

Bowie	1988-98
Corbin	1985-2001
Mashburn	1993-2004

Baseball

Stubbs	1984-95
Mesa	1987-2007
Lake	1983-93

Using baseball cards have your child look at the column "AB" for total times at bat. Then have them make comparisons to the numbers of games played to determine the number of times each game the player had an opportunity to bat. To calculate effectiveness, start with the total AB and find the numbers of singles, doubles, triples, homeruns separately and then collectively and calculate the percentages. Remember the formula in 4th grade, it applies here.

The AB is the denominator—this is the number of opportunities the player had to hit the ball. The number of singles or doubles, or triples, or homeruns, becomes the numerator, and then multiply by 100. In the case of Tony Phillips, he has an AB 3,725. His total number of homeruns is 58. 58/3,725 x 100 will give you his percentage of success with home runs. Start by dividing 58 by 3,725 and then multiplying the answer by 100 and you have 1.56% or .0156 in decimals. These calculations will give your child in both operations with multi-digit numbers and decimals to hundredths and beyond.

Another pattern to look for is in awards and honors such as MVP. Looking at different careers and considering all of the stats should help youth to develop a pattern for success which includes game statistics, awards and achievements, longevity, and so on. Collecting and analyzing all of these amazing facts helps the importance of data and the story data tell.

To more clearly make conversions in measurement, have your child look at total yardage gained for football players. Have them make a model of that distance using ¼ inch graph paper. Then repeat the process with all of the players. Have them then share with you the information this graph brings to light. Then have them take this data (which is in yards) and calculate this distance in inches, feet, and miles for standard measurement and then again for metric.

Looking at the data on the nine cards they have for each sport, have your child create an avatar who combines the best characteristics of each of the nine. They should be prepared to "make-a-case" for the characteristics represented by data points, of the avatar they created. This is called making an argument from evidence. Have them share their argument with the entire family.

Most important of all, enjoy!

Common Core Math Standards tell us that 6th Graders need to:

Understand the concept of ratios (for example if you are comparing the number of wings on a bird to the number of beaks on that same bird, the ratio is 2:1

Look at variables and solve problems

Calculate surface area

Graph data, selecting the best graphic for the data you have to help it be understood by others

Represent and interpret data.

Here are some things you can do with sports cards:

6th graders will need to learn the items listed above plus have a working knowledge and understanding of the skills and concepts taught in previous grades.

Certainly youth will need to organize the data from the cards in ways that have been mentioned in other grade levels and in ways that are unique to them. Identifying variables which make the same category of data collected tell different stories, is necessary. Variables can influence the results or the assumptions being made. For example, when comparing the overall stats of players in the same sport, variables could be the position they played, the number of years they played as a professional, the strength of the team they were on, and so on. When presenting the story data provides, these variables can make a difference to the story itself. These variables add increments of meaning and must be considered when looking at the data. This probably means your child needs to do a little internet research to have a more complete picture. This should become part of the data collection and interpretation.

Graphing data can be done in a variety of ways. So far, most of the data looked at has been in the form of a table with columns and rows. Other ways to demonstrate data include pie graphs (circles with different colored and sized pieces) a bar graphs which represents data in bars of varying lengths, and a line graph which could represent data for one player over time, with each line sharing the information of a particular year. Ask your child to demonstrate the same information in a variety of graphic representations. Talk with them about the "best" or "most effective way to present the information they want to share.

Youth can also use ratios to show data and trends. For example, the number of games played compared to the number of "at bats" will let you know how many times in a game the player had an opportunity to make a play. For example, in 412 games Steve Lake was up to bat 952 times. 412:952. This is an unwieldy number so let's get it into more reasonable form 103:238 is the same ratio as 412:952, but more comprehensible. Both numbers were divided by 4. When you see this ratio, you could say on average Steve Lake batted 2 times per game. Even though that is not exact, it does allow a

generalization about his performance. You would then perhaps want to know about his peers and see how his performance compares. When you look at his entire card there is a reference the he "collected a career best, 4 hits including double and homerun in Phillies' 10-9 win at New York in June of 1991". Does that information add insight into information about Lake's career. When you explore his success with singles, doubles, triples, and homeruns for his entire career, you have a much clearer picture of the athlete. This is how all 6th graders need to know in math comes together in a data story with depth rather than just surface analysis.

If you have access to more than the 9 cards which come in this kit, expand your youth's data source. This will allow them to make even more intentional data analysis.

It is important to understand that there is a difference between arithmetic and math. According to Math Media, "**Arithmetic** is **to** mathematics as spelling is **to** writing." ... (2) it uses signs, symbols, and proofs and includes **arithmetic**, algebra, calculus, geometry, and trigonometry. The most obvious difference is that **arithmetic** is all about numbers and mathematics is all about theory." The dictionary tells us the following:

a·rith·me·tic
(1) the branch of mathematics that deals with addition, subtraction, multiplication, and division,
(2) the use of numbers in calculations

math·e·mat·ics
(1) the study of the relationships among numbers, shapes, and quantities,
(2) it uses signs, symbols, and proofs and includes arithmetic, algebra, calculus, geometry, and trigonometry.

Understanding the relationships is key to making sense of the "math story" which is being told. Provide your child with plenty of opportunities to make sense of that story.

Most of all, enjoy your time together.