Math magic games for middle school students.

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This curriculum unit is recommended for:
Elementary and middle school: 6th,7th, 8th math.

Keywords: integers, rational numbers, math magic, games, engagement, motivation, positive incentive, leisure, learning, methodologies and techniques.

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: I would like to join two of my passions: mathematics and magic. While I studied my college degree in Science Physics and I was also member of a magic club from my home town in Spain. I realized that many magic card tricks I learnt at that time, were based on mathematical concepts.

I have worked for four years as a middle school math teacher and I have realized that the level of engagement of my students was remarkably higher the days I prepared my lesson performing a math magic game.

Showing the fun side of mathematics to children and teenagers is the key to motivate them to know more and get deeper knowledge of anything in general and math in particular. Combining games, magic, technology and interactive methodologies is the way I have realized the students respond better in order to advance and learn in a significant way.

I plan to teach this unit during the coming year to 72 students in seventh grade math CCSS and NC Math I.

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Introduction.

A full Magnet Spanish Dual-Language Immersion Program is offered at Collinswood Language Academy for grades K-8. This two-way immersion program is one in which students from two different language backgrounds receive academic instruction in two "target" languages (English/Spanish). Collinswood provides a challenging academic program that fosters the acquisition of curricular concepts in both languages. Collinswood was the first Spanish Dual-Language program in the state of North Carolina, and now serves as a model school for developing dual-language programs in the Southeast United States.[1]

Academic instruction is based on the North Carolina Standard Course of Study curriculum. Within our instructional day, certain percentages of the day are devoted to academic instruction in a specific language. In kindergarten students are immersed in Spanish for most of the day except for 30-45 minutes of English literacy instruction. In first through eighth grade, students are taught academics 50 percent of the day in Spanish and 50 percent of the day in English.

Student learning is the chief priority for Collinswood Language Academy. All students can learn when a variety of instructional approaches, special services and resources are used to support individual learning styles. Assessment through a variety of means allows students to demonstrate mastery of essential knowledge and skills and enables teachers to adjust instruction to meet the needs of students. Learning a second language leads to higher thinking skills and cultural appreciation.

Continuous improvement through high expectations of staff and students' increases school performance. Students need to be actively involved in solving problems, producing quality work, and applying their knowledge in new contexts.

Diversity is valued and promoted at Collinswood as students bring their own cultural backgrounds and languages as well as unique gifts and needs. Exposure to diversity enhances the students' acceptance of individual differences as well as their cultural appreciation.

This school year 2016-17 I am the math teacher of four blocks. The first and second are the Honors ones, the third is the standard one with all inclusion EC students. In these groups I teach CCSS 7^{th} grade math level. In the 4^{th} block I have my advanced class and I teach CCSS 7^{th} grade math and NC Math I level.
I have 19 students in my first block, 16 in the second one, 17 in the third one and 20 in

my advanced group. Sixty per cent of my students have Hispanic origin, thirty per cent have Anglo-Saxon roots and ten percent have African-American background. I will use the activities developed in this unit with all my blocks.

My main motivation to prepare this curriculum unit is to join two of my passions: mathematics and magic. The main goal is to show the fun side of mathematics to my students in order to motivate them to know more and get deeper knowledge of anything in general and math in particular. Students are able to learn the ideas and concepts they have to achieve in the academic course while they enjoy and have fun developing the activities proposed in this unit.

Teaching strategies, methodologies and activities:

I have started teaching this year the main topic about how to add and subtract negative numbers. The strategy I have used in order to motivate and encourage my students how to learn this mathematical idea has been using the playing deck of cards.

Not too many students had seen before a deck of cards so I started showing one of them and explaining how many cards are on it, the different kind of suits and also assigning a number to the figure cards.

The deck of cards has been useful to choose numbers in a random way and afterwards add or subtract them. I explain to them that cards with black color suit, as spades or clubs, are going to represent positive numbers and cards with red color suit, as hearts and diamonds, are going to represent in this first topic negative numbers.

The deck of cards has been also useful to spread randomly students over the class in different groups. The tables of my classroom are set in groups of four. There are in total five groups or, as we called them at class time, stations.

When I want a student to solve a math problem on the board, I can also choose it in a fast and random way using the deck of cards. Every station has a number from 1 to 5 and each student has got a number from 1 to 4 in each station. I just need five cards numbered from one to five. Any student can be asked to pick one card with the first aim of randomly choosing the station and afterwards, depending on how many students are on the selected station, from the same pack of cards it is chosen the student that it is going to be selected to solve the problem on the board. If the problem is well solved, the student and the whole station will achieve house points. House points are a positive incentive that provide prices and awards to students at the end of each quarter.

Math games:

Introduction:

I have enclosed in this unit two games: “War of integers” and “War of fractions”. The first idea to develop my first math game with a playing deck of cards “War of integers” came from a basic game named “Integer war” I found in the YouTube portal: Teacher Tube math. This game was just conceived to add cards, not using tables were players had to record the math operations neither using the math operation spinner.

Once I introduced the game of “War of integers” to my students, I had the chance to see how engage they were playing this game while I was achieving the main goal: my students were learning math while they were having fun. Afterwards I realized it could be a good idea to adapt this game to my next CCSS unit related to math operations with rationale numbers. That was the beginning of my second math game “War of fractions”.

1. War of integers.

At first, in this game named “War of integers” I had in mind just to practice addition of integers but later on, I realized my students could also play practicing the other fundamental math operations: subtraction, multiplication and division.

Students of all my groups have been encouraged to bring a deck of cards from home and play in stations this game. Each station uses a deck of cards and students have to receive at first the same amount of cards. Every turn each student shows one card face up from their respective packs and the student who shows the card with the highest absolute value starts the game. This student has to add all the cards that are face up on the table. If the student does it well, he/she gets those cards and keep them in a save place as bonus points. If he/she does not do the math well, the classmate who realizes about the mistake can provide the correct answer and gets the bonus points. Black cards represent positive numbers and red cards negative numbers. A, J, Q and K represent 1, 11, 12 and 13 numbers respectively.

I have organized this kind of class as a playoff contest were students who win in their respective stations, they are selected to play the great finale and finally get house points.

2. War of fractions.

As I explained in the introduction of this section, this game is inspired in the game “War of integers” and adapted to rationale numbers. I also introduced new rules for the game and other features.

After several years of experience teaching math for middle school students I contrasted the level of enthusiasm and engagement when they had to solve and complete worksheets of operations of integers and the difference of using this game with a playing deck of cards.

Using the worksheet all students had to do the same exercises and for them it was just a duty without an immediate reward. On the other hand, using the game "War of integers", students had to create their own exercises with a deck of cards and solve them while they are competing with other classmates in order to win the game. (Winning the game students also receive house points. This system of positive incentive that just work for middle school students, provides them awards at the end of each quarter to the house that has gathered more points every period).

Once the topic of operations on integers was accomplished, the following topic to cover was operations on rational numbers. After getting the experience of playing the game with my students and the level of success achieved it, I thought it could be a good idea to develop and adapt this game for fractions. The game would be renamed as "War of fractions".

In this second version I tried to improve the game, writing down the rules and instructions of the game and including a table where students had to write down the value of the cards randomly chosen and the operations they had to do in order to get the correct answer. It has been really useful for students to become more organized in their work and to keep track of what students were doing during time they played the game. In some occasions there were arguments between students who were doing the math operations mentally and just saying the answer with their voice. In case a student does not agree about the answer of the rival, I had to referee and it was impossible to determine who was right because they did not write down the value of the cards neither the operation involved in the piece of paper provided.

Attending to a CMS training in Collinswood named: "Using the Sheltered Instruction Observation Protocol (SIOP) to plan and implement effective instruction for dual language learners" related to new teaching strategies and ways of learning based on academic conversations. I had the chance to learn some new strategies and techniques and confirm some ideas I have had discovered by myself in my everyday teaching experience with my students.

The lecturer of this workshop, Barbara Kennedy showed some data regarding the goal of how students learn more and better nowadays. The conclusion of this research confirms that students achieve this goal, in the topic they are learning, when they have to use all the language competences: listening, reading, writing and speaking.[2]

One of the techniques I like the most was using a spinner. From that idea I developed a math operations spinner in order to randomly choose the math operation that every couple of players had to use in each round of the game "War of fractions".

During my "one on one talking" with my seminar leader Harold Reiter, I got a wonderful idea from him in the latest version of the game. In order to know which player was going to start the round, every player had to pick two cards up. Those cards symbolize a couple of fractions. The highest value fraction determines which player begins the round.[3]

As the first version the game “War of integers”, War of fractions has also been successful. Students got even more engaged and enjoyed with the new way of randomly choose the math operation with the spinner.

I used this activity in my official first CMS observation this academic year. It was included as a second activity of the observed session on October 25th 2016 by Collinswood’s Assistant Principal Mr. McIver. I have included the Lesson Plan of this session as an appendix.

In the post conference, Mr. McIver complemented me for the hard and good worked developed as a facilitator of the session. The students performed well the activities participating through academic conversation methodology and showing a high level of engagement.

I have attached at the end of this CU, in the appendix 2, the complete game set of the last version of the game “War of fractions”, the first page includes the rules and instructions of the game, the second one the playing sheet table and the third one the math operations spinner. I have also attached a picture of an actual example, completed by two of my second block students, as a tool for the evaluation of this activity.

These are the instructions and rules of the game “War of fractions”: Students will randomly get the math operation with the spinner each turn. There are four possibilities: addition, subtraction, multiplication and division.

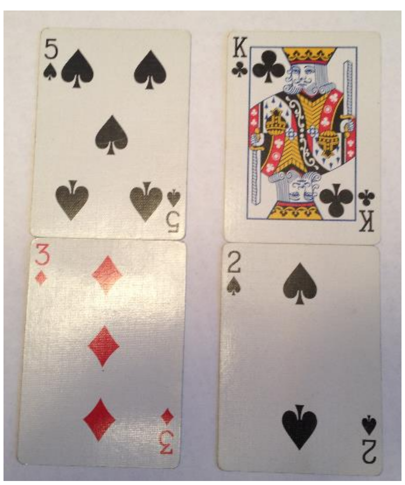
Rules and instructions:

1. Students play in couples.
2. Each student starts with a half shuffled deck of cards.
3. Each player picks two cards up from its pack. The first card will be the numerator and the second one the denominator. The player with the highest rational number begins the round.
4. Red cards (diamonds and hearts) symbolize negative numbers and black cards (spades and clubs) positive numbers.
5. Every round the math operation to work on will be randomly choose with a spinner.
6. Players have to write down the value of the cards in the table attached with the math operation randomly obtained from the spinner.
7. There is a time limit to solve the math operation. 2minutes for addition and subtraction and 1 minute for multiplication and division.

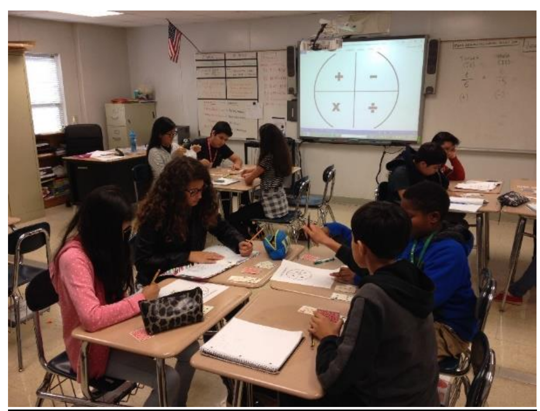
8. Both players have to solve the operation. If the player who begins the round gets the wrong answer or overpass the time limit, the other player has the chance to win the round if she/he has got the correct answer on time.
9. The winner of the game will be the player with more number of rounds beaten.
10. Table with an example of a first round attached. Mark which player have won each round.

    Example of how it has to be filled up the table in a playing round:

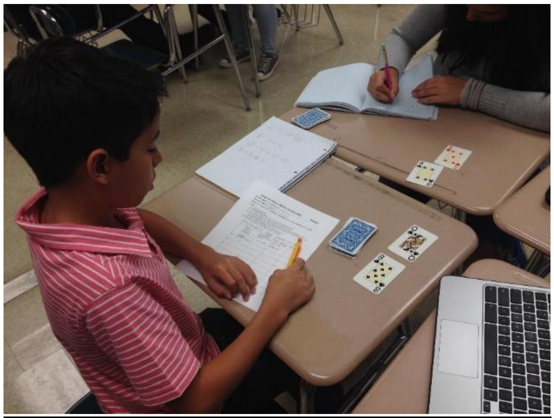
Round number	Player number	Card Value (written as a fraction)	Operation (+,-,x,/)	Solution
0	Example: **Player 1**: 5 of spades and 3 of diamonds **Player 2**: King of clubs and 2 of spades	Player 2 starts the round because: 5/(-3) < 13/2	Spinner: The paper clip falls on addition operation symbol. Note: 5/(-3) =(-5)/3. (-5)/3 + 13/2 (-10)/6 + 39/6	29/6



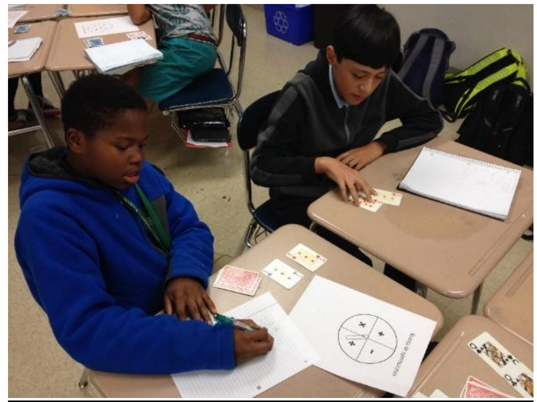
Player 1: 5 of spades and 3 of diamonds
Player 2: King of clubs and 2 of spades



Playing war of fractions. (Block 3)



Collinswood seventh grade students playing war of fractions. (Block 2).



Collinswood seventh grade students playing war of fractions. (Block 3).

Math magic games:

Introduction:

I have got very good ideas during the sessions of the seminar and from the books and documents I have searched related to math, magic and games connected to algebra in the topic: Fractions, placed value and digit problems.

Martin Gardner's books have inspired me a lot and I have got very good ideas from there but during the time I have utilized to search, I have had the chance to discover new books and resources from new authors in the libraries of Davidson College, UNCC, public libraries from Madrid and Juan March Foundation.

I have to mention a special book recommended by some good friends from the Magic Association I belong in my hometown in Madrid. They suggested I had to get and read this book: "Educando con magia" (Educating with magic) by the Spanish educator and magician Xuxo Ruiz Domínguez.[4]

I have performed these mathmagic games with my family and friends and in different schools. In this section you will find a selection of my favorite and most successful ones. The level of engagement of the audience and feeling of magical illusion achieved depends on how much you practice before you perform them and in the quality of the presentation.

1. Prediction of number 1089.

Material: A piece of paper, a board, an envelope and a marker.

What the students see: The prediction it can be written in a piece of paper and put it inside an envelope or a balloon. A student thinks a three-digit number. It cannot be a palindrome number. The number is written on the board and we subtract to this number the one that is read from right to the left. For example, if the chosen number is **123** we will subtract the number 321. The result of this operation has to be a positive number, in this case the result is 321 - 123 = **198**. Now we add to this number the same number, but read from right to the left again, that it is 891. The next operation it will be the addition. 198 + 891=**1089.**
The prediction will be watched by a volunteer student during the whole show and it will be disclosed at the end of the math magic show.

Explanation: This game is based on a place value problem. My seminar leader, Harold Reiter, explained in the session dedicated to place value problems the math that is behind this magic game. Following the instructions the performer will always get the same final number: 1089
. I also got information about how to perform this game from the Spanish author Fernando Blasco in his book "Matemagia".[5]

2. A wonderful mind. A magic square.

Material: A printed magic square 8x6. A small piece of paper to cover one of the numbers of this table of numbers.

What students see: The teacher shows to the students a big table with fifty random numbers. The magician asked for one volunteer to participate in the game. The student has to cover one of the numbers of the table with an eraser or pencil sharpener. The mathmagician can guess the number just looking to the table for few seconds.

Explanation: There are two options to perform this mathmagic game. The first one is memorizing all the bunch of numbers of the table in the correct order. The second, easier than the first option, is understanding the pattern that is made of the numerical table.

20	49	61	11	40	31
55	17	47	34	69	14
27	48	41	8	33	23
6	35	26	15	44	56
29	64	9	50	12	42
3	28	18	22	43	36
10	39	51	1	30	21
45	7	37	24	59	4

This game is based on a linear equation formula. The math magic secret is simple but very well hidden. The number that is covered X can be guessed if you move three squares in a diagonal direction. If you moved upwards the number you get will be (X+5) if you move downwards in a diagonal direction, the number you get will be (X-5).

3. Clouds of numbers.

Material: There are five cards numbered from 0 to 4 on the back part. Each card has written down sixteen different random numbers.

What the students see: A volunteer student thinks just one number from 1 to 31. I show him/her five "clouds of numbers". The student has to check with attention in which clouds the thought number is and give these "cloud number cards" to the math magician. The teacher uses his/her magic powers, get concentrated and guess the number by art of magic.

Cloud 0:

1	5	17	11
21	9	3	25
19	7	15	23
13	27	29	31

Cloud 2:

4	23	6	29
12	13	5	28
15	30	21	7
22	20	31	14

Cloud 1:

2	23	6	27
10	11	22	31
15	26	14	30
18	3	19	7

Cloud 3:

8	14	28	11
30	13	9	26
10	24	15	27
12	25	29	31

Cloud 4:

16	24	26	30
25	31	22	17
28	19	27	29
23	18	20	21

Explanation: This game is based on place value problem. Specifically, in the binary numerical system.

The magic secret is behind the properties of the binary system. You can get all numbers from 1 to 31 adding the first five powers of number 2. (1+2+4+8+16=31). Each of these powers is located only just one time in the upper left corner of every numerical cloud. The spectator tells the magician in which numerical clouds the number thought appears. The math magician has to secretly add the numbers that appears in the upper left corners of the numerical clouds that the spectator has pointed out. The math magician can write down in a mini board the thought number and afterwards ask the student to say loud of voice the thought number. The mathmagician shows the mini board and receives a big applause from the classroom.

4. Quick prediction. Number 34.

Material: In a piece of paper. The volunteer student writes a matrix of number 4x4 with the numbers from 1 to 16.

What the students see: The volunteer has to stare to the magician and try to transmit a number telepathically. The mathmagician writes a PREDICTION down in a piece of paper and gives to another volunteer student that it has to put in his/her pocket till the end of the game. The prediction number will be shown at the end of the game.
The game starts with the volunteer putting a circle on the thought number. The column and the row of this number are crossed out. Other student can choose another number that it is not crossed out and we proceed like in the previous step. At the end there will be four random circled numbers. The first volunteer has to sum them and this result coincides magically with the predicted one.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

Explanation: This game is based on matrix theory. Following the instructions, the predicted number will always be the same: 34.

5. Magic Knot in a piece of string game.

Material: Three pieces of one-meter string.

What students see: The mathmagician chooses two student volunteers. Each one takes a piece of string. The teacher shows how to get a knot taking the end piece of the string with both hands. The students have to follow the same steps. Only the teacher, by art of magic, is able to get the knot in the piece of the string.

The challenge: Each volunteer has to get a solid knot in the center of its own rope, taking each extreme of the rope with one hand and without release any extreme at any time. The knot has to be real one.

Explanation: It is based on knot topology theory. The challenge is impossible. The only way to do it by yourself is holding the rope sides having previously crossing out your arms.

With the help of the volunteer is also possible following these steps: The magician takes the rope and passes the right side of the rope over the left hand. Afterwards passes the rope behind the arm and introduce the right hand into the two loops formed. Tell the audience that you do not want to do any tricky movement so ask a volunteer to grab both sides of the rope with each hand. By art of magic, the real knot appears in the center of the rope.

You can find the presentation of this trick in magiaymatematicas.blogspot.com in the section of mathmagician Fernando Blasco. Other games and curiosities related to this math field can be: The Seven Bridges of Königsberg problem that it was solved by Euler and Möbius strips, which have only one surface and one edge, are a kind of object studied in topology.

6. Deck of cards Number Seven Game.

Material: A deck of cards of 40 cards from 1 to 10 with four suits.

What students see: The magician asks the students to think about their favorite number. The teacher asks to one students if he/she knows the good luck number and the bad luck number. Afterwards the mathmagician explains to the audience that this game is based on the good luck number or lucky number 7. The number seven is special number because there are seven days on one week. There are seven main colors in the rainbow. There are seven capital sins and also the magnificent seven!

The deck of cards is randomly shuffled. A volunteer shuffles and cuts and it has to count on the table SEVEN cards. He/she has to remember the card number in the position number seven and put the remaining pack of cards over it. The magician takes the whole deck of cards and explains that it is going to be developed a ritual in order to disclose the card randomly chosen by the student.

The teacher makes a countdown from 10 to 1 showing the cards and revealing them on the table starting with the deck of cards with the faces down. If the number of the count coincides with the actual number printed on the card, the magician stops the count down and starts a new pack following the same procedure. It has to be done three times. Afterwards checks the final composition. If the countdown was completed the pack of ten cards has to be put faces down on the table. The value of this kind of pack is one. The packs in which the countdown were not accomplished, the value of these kind of packs is the value that the face of the final card is shown. Finally, we add the value of these three packs. This total number will be the number of cards that the magician will count from the remaining pack of cards and disclosing the card that was randomly chosen by the student at the beginning of the game.

Explanation: This game is based on a placed value math problem. The mathmagic is kept secret with a good presentation. Never revealing that we are using a specific number of cards. Following the instructions, the game is automatic. The spectator's card is set in the position 33rd from the top. Following the steps of the ritual, the mathmagican always will find the chosen card.

7. You will get sick of this number! Game.

Material: A piece of paper, a board and a calculator.

What students see: The math magician starts the game telling the following story to the students: "Sometimes happen that you can get fed up with something you like a lot if you use it too many times. That happened to me with the number 8. For that reason, when I have to write down all the numbers from 1 to 9, I always jump the number 8."

The magician asks a volunteer about his/her favorite number. The magician secretly multiplies that number by nine and asks the student to perform with the calculator a multiplication.

E.G: The student chose number 3. Nine times three is 27. The student has to calculate the following multiplication: 12345679 x 27= 333 333 333.

Explanation: This game is based on number theory properties. It is an automatic mathmagic game. Following the instructions, it always works.

List of materials for classroom use:

Resources for students:

Math games*:* war of integers and war of fractions: deck of cards, play sheet, notebook, pen and math operation spinner.

I have included the materials the teacher and the students will need to perform the math magic games:

1. A wonderful mind. A magic square: A printed magic square 8x6. A small piece of paper to cover one of the numbers of this table of numbers.
2. Clouds of numbers: There are five cards numbered from 0 to 4 on the back part. Each card has written down sixteen different random numbers.

3. Quick prediction. Number 34: In a piece of paper. The volunteer student writes a matrix of number 4x4 with the numbers from 1 to 16.

4. Magic Knot in a piece of string game: Three pieces of one-meter string.

5. Deck of cards Number seven game: A deck of cards of 40 cards from 1 to 10 with four suits.

6. You will get sick of this number! Game: A piece of paper, a board and a calculator.

7. Prediction of number 1089: A piece of paper, a board, an envelope and a marker.

Resources for teacher:

I will use the materials previously mentioned in the resource for student's section in order to perform the math magic game to the students. Afterwards they have to try to figure out what the magic secret is.

I will also use the Smart board, the white board and the mini board; in order to present and explain the how to do the games and also perform the math magic games.

Appendix 1

CCSS.MATH.CONTENT.7.NS.A.1.A
Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged*.

CCSS.MATH.CONTENT.7.NS.A.1.B
Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.1.C
Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.1.D
Apply properties of operations as strategies to add and subtract rational numbers.

CCSS.MATH.CONTENT.7.NS.A.2.A
Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.2.B
Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.2.C
Apply properties of operations as strategies to multiply and divide rational numbers.

CCSS.MATH.CONTENT.7.NS.A.2.D
Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Appendix 2

War of fractions. Playing cards game. Instructions.

Player 1: ___________________________.

Player 2: ___________________________.

Spinner mode: Students will randomly get the math operation with the spinner each turn. There are four possibilities: addition, subtraction, multiplication and division.

Rules and instructions:

1. Students play in couples.
2. Each student starts with a half shuffled deck of cards.
3. Each player picks two cards up from its pack. The first card will be the numerator and the second one the denominator. The player with the highest rational number begins the round.
4. Red cards (diamonds and hearts) symbolize negative numbers and black cards (spades and clubs) positive numbers.
5. Every round the math operation to work on will be randomly choose with a spinner.
6. Players have to write down the value of the cards in the table attached with the math operation randomly obtained from the spinner.
7. There is a time limit to solve the math operation. 2minutes for addition and subtraction and 1 minute for multiplication and division.
8. Both players have to solve the operation. If the player who begins the round gets the wrong answer or overpass the time limit, the other player has the chance to win the round if she/he has got the correct answer on time.
9. The winner of the game will be the player with more number of rounds beaten.
10. Table with an example of a first round attached. Mark which player have won each round.

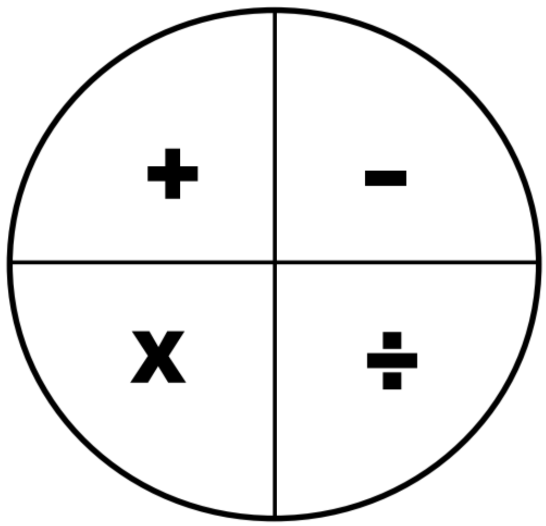
War of fractions. Playing cards game. Table.

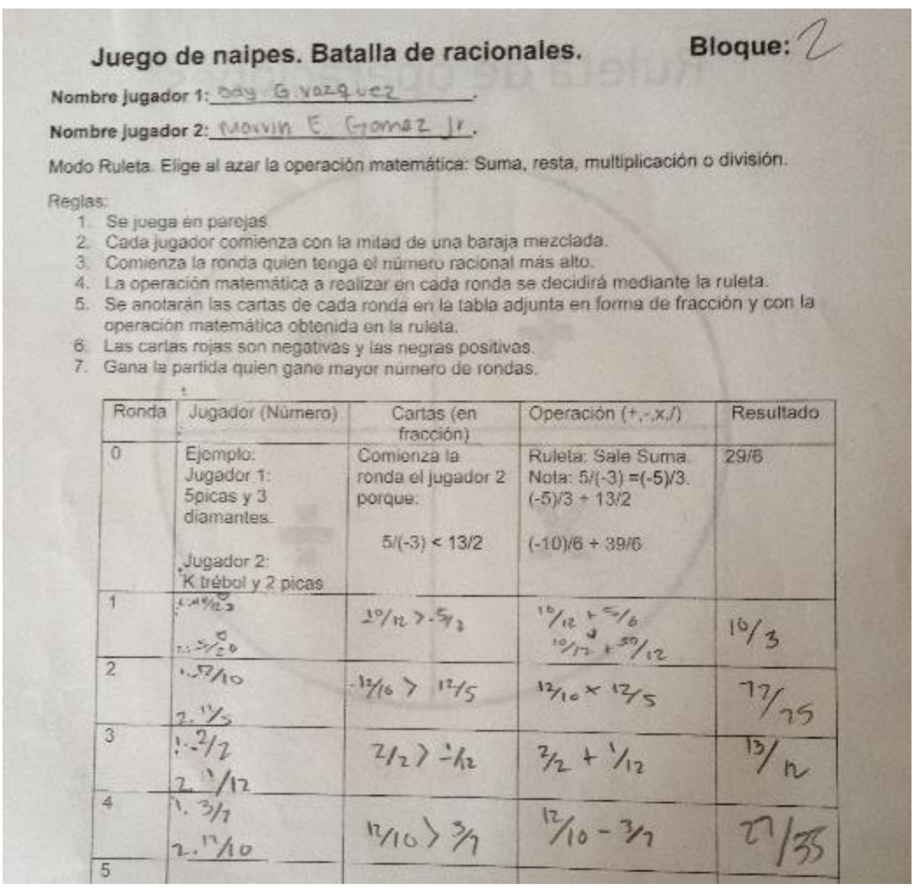
Player 1: ___________________________.

Player 2: ___________________________.

Round number	Player number	Card Value (written as a fraction)	Operation (+,-,x,/)	Solution
0	Example: **Player 1**: 5 of spades and 3 of diamonds **Player 2**: King of clubs and 2 of spades	Player 2 starts the round because: 5/(-3) < 13/2	Spinner: The paper clip falls on addition operation symbol. Note: 5/(-3) =(-5)/3. (-5)/3 + 13/2 (-10)/6 + 39/6	29/6
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

Spinner of math operations





Juego de naipes. Batalla de racionales. **Bloque:** 2

Nombre jugador 1: Day G. Vazquez

Nombre jugador 2: Marvin E. Gomez Jr.

Modo Ruleta. Elige al azar la operación matemática: Suma, resta, multiplicación o división.

Reglas:

1. Se juega en parejas
2. Cada jugador comienza con la mitad de una baraja mezclada.
3. Comienza la ronda quien tenga el número racional más alto.
4. La operación matemática a realizar en cada ronda se decidirá mediante la ruleta.
5. Se anotarán las cartas de cada ronda en la tabla adjunta en forma de fracción y con la operación matemática obtenida en la ruleta.
6. Las cartas rojas son negativas y las negras positivas.
7. Gana la partida quien gane mayor número de rondas.

Ronda	Jugador (Número)	Cartas (en fracción)	Operación (+,-,x,/)	Resultado
0	Ejemplo: Jugador 1: 5picas y 3 diamantes. Jugador 2: K trébol y 2 picas	Comienza la ronda el jugador 2 porque: 5/(-3) < 13/2	Ruleta: Sale Suma. Nota: 5/(-3) =(-5)/3. (-5)/3 + 13/2 (-10)/6 + 39/6	29/6
1	1. -10/12 2. -5/3	10/12 > -5/3	10/12 + 5/6 10/12 + 30/12	10/3
2	1. -12/10 2. 12/5	12/10 > 12/5	12/10 × 12/5	77/25
3	1. -2/2 2. 1/12	2/2 > -1/12	2/2 + 1/12	13/12
4	1. 3/7 2. 12/10	12/10 > 3/7	12/10 - 3/7	27/35
5				

COLLINSWOOD LANGUAGE ACADEMY

CMS Lesson Plan

Teacher: Oscar Pastor

Date: Oct 25th 2016	**Vocabulary:** Integer, rational number, multiplicative inverse or reciprocal. **Homework:** Invest in your child campaign. No Homework week.
Subject: Math **Material/Technology Needed:** Smart Board. Google slides. Play sheet, spinner and playing deck of cards.	

CCSS/ES Obj.#:

CCSS.MATH.CONTENT.7.NS.A.2.B
Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.

CCSS.MATH.CONTENT.7.NS.A.2.C
Apply properties of operations as strategies to multiply and divide rational numbers.

Purpose/Objective of the Lesson: There are two parts.

First part. Students make a presentation in groups about how to divide negative numbers and they are able to show their academic conversation skills and the knowledge achieved in the workshop.

Second part. Students understand how to put in order fractions with negative numbers using the concept of least common denominator. Afterwards they have to apply properties of operations as strategies to multiply, divide, add and subtract rational numbers.

Language Objective: Students show their oral and team work skills presenting their work in teams in

Spanish.

Essential Question/I Can Statement: How I can divide negative numbers? How I can use negative numbers to solve problems from the real life?

21st Century Life Skills Emphasized (Highlight your emphasis-choose one):

Accountability, Adaptability, Ethics, Leadership, People Skills, Personal Productivity, Personal Responsibility, Self-Direction, Social Responsibility

Students show the final product of a workshop related to division of negative numbers. They have worked in this workshop developing their social and academic conversation skills. In this session they show and explained as a team their google slide presentation to the rest of the class. Every team has 4 participants and every one of them have to talk and explain the work done.

Intentional Emphasis on Student Academic Conversations:

How are you planning to *engage students* in this process during *this l*esson?

First part: Best presentations will be uploaded in the seventh math weebly and sixth grade honors students will have the chance to use them as a resource to learn and advance in their math knowledge.

Second part: Students will have the chance to play a game with a playing deck of cards in order to learn and have fun while they are learning. Winners of the game will get house points.

Link to Prior Learning:

CCSS.MATH.CONTENT.7.NS.A.2.A
Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

Warm Up: Lesson will start with the presentations.

Lesson Input/Modeling:

What intentional teaching strategies are you using to reach/engage the varying *levels* of your students? How are you intentionally checking for student understanding? How are you clarifying meaning for students as you teach?

There are four teams. Every team has shown its presentation in google slides. The evaluation will be based on the minimum content:

Slide 1: Name of the participants of the team.

Slide 2: Rule of division of negative numbers.

Slide 3. Word problem 1. (+) / (+) = (+) Statement and solving explanation.

Slide 4. Word problem 2. (+) / (-) = (-) Statement and solving explanation.

Slide 5. Word problem 3. (-) / (-) = (+) Statement and solving explanation.

While a team is presenting, the rest of the students will pay attention to the presentation and work on the solution of at least one of the problems proposed by each team in their respective presentations. The classmates will have to work on the problem. One of the members of the team who are presenting will collect the answers from the other teams and check if they are right or wrong. Afterwards they will solve the problem showing the solution and the explanation.

Guiding Questions:

Differentiated questions using Revised Bloom's Taxonomy (R-Remember, S-Synthesis)

Second part: Game War of fractions.

1. How can I put in order fractions with negative numerator or denominator?

2. How can I add or subtract fractions with negative denominator?

3. What are the rules of the game war of fraction?

4. Which sign represents a red card? And what about a black card?

Class Activity

Guided Practice:

What are we going to do together prior to moving to Independent Practice?

First is the google side presentations.

Explain the rules of the game War of fractions.

Independent Practice:

What are you going to assign students so they can demonstrate mastery of what you just taught?

How are you differentiating student tasks based on the current level(s) of your students?

Students have to solve the word problems of their classmates and discuss among how to get the correct solution.

Students will play a playing card game and show mastery in how to put in correct order negative fractions and how to operate on them.

Summary/Closure:

How are you going to check that students learned what you planned for them to learn prior to leaving your classroom?

The play sheet of the game war of fractions will be collected at the end of the class as an exit ticket.

The presentations will be evaluated and will be an assignment graded.

Bibliography:

Martin Gardner, Elwyn R. Berlekamp, Tom Rodgers. 1999. *The mathemagician and pied puzzler: a collection in tribute to Martin Gardner.* New York: Natic Mass. A.K. Peters.

This book comprises an imaginative collection of pieces created in tribute to Martin Gardner. Perhaps best known for writing Scientific American's "Mathematical Games" column for years, Gardner used his personal exuberance and fascination with puzzles and magic to entice a wide range of readers into a world of mathematical discovery.

Fulves, Karl, and Joseph K. Schmidt. *Self-working Card Tricks: 72 Foolproof Card Miracles for the Amateur Magician*. New York: Dover Publications, 1976.

In this book you can learn what a self-working math card game is. It is basically a game that does not depend upon legerdemain or special abilities on the part of the magician, but a magic game that works automatically because of the mathematics inherent in the card deck itself.

Flansburg, Scott. *Math Magic for Your Kids: Hundreds of Games and Exercises from the Human Calculator to Make Math Fun and Easy*. New York: W. Morrow and, 1997.

In *Math Magic for Your Kids*, Scott Flansburg explains many games to help kids develop a positive attitude about numbers, the necessary foundation on which they will build math skills for the rest of their education.

Blasco, Fernando. *Matemagia: Los Mejores Trucos Para Entender Los Números*. Madrid: Temas De Hoy, 2007.

Fernando Blasco, uses ropes, cards, coins and beakers to recreate that illusion that also uses to explain that subject not always well received. With this book the author aims to bring the reader to these two wonderful disciplines, one artistic and another scientific, through amazement and entertainment.

Domínguez, Xuxo Ruiz, and Juan Tamariz. *Educando Con Magia: El Ilusionismo Como Recurso Didáctico*. Madrid: Narcea, 2013.

This book has been very useful in the development of this curriculum unit. Many ideas about how to teach using magic at the classroom and how to perform math magic games, in order make math more comprehensive and attractive to students, comes from this book.

Diaconis, Persi, and Ron Graham. *Magical Mathematics: The Mathematical Ideas That Animate Great Magic Tricks*. Princeton: Princeton University Press, 2012.

Magical Mathematics reveals the secrets of fun to perform card tricks, and the profound mathematical ideas behind them. The authors provide easy, step by step instructions for each trick, explaining how to set up the effect and offering tips on what to say and do while performing it.

Barbara Kennedy. *Using the Sheltered Instruction Observation Protocol (SIOP) to plan and implement effective instruction for dual language learners.* CAL SIOP workshop notebook, 2016.

In the notebook of this workshop, the author shows some data regarding the goal of how students learn more and better nowadays. The conclusion of this research confirms that students achieve this goal, in the topic they are learning, when they have to use all the language competences: listening, reading, writing and speaking.

Webgraphy:

http://math2.uncc.edu/~hbreiter/CTI2015/

This is the personal website of my seminar leader Harold Reiter. The most valuable modules to develop my CU have been the following ones: Place value, fractions and area model.

http://magiaymatematicas.blogspot.com/?_sm_au_=iVVshkWLLh7SHPNP

This web gathers a collection of information related to mathmagic. The author, the Spanish mathmagician Sergio Belmonte, links articles and material on Magic and Mathematics, open to debate and constructive opinion on these two fascinating disciplines.

http://schools.cms.k12.nc.us/collinswoodMS/Pages/AboutOurSchool.aspx

This is the link to the school where I work: Collinswood Language Academy. In this website I have found most of the information from the main introduction of this CU.

https://www.youtube.com/watch?v=XWOmJ5xCLw0

This YouTube video provided me an inception idea about the games “War of Integers” and subsequently “War of fractions”.

http://www.corestandards.org/Math/Content/7/introduction/

Here is where I got the key teaching standards of my CU. I have selected the ones related to main math game “War of fractions”.

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[1] Colllinswood Language Academy, *General information about the school.*

[2] B. Kennedy, *Plan and implement effective instructions for dual language learners*, *4.*

[3] Harold Reiter, *FUNdamentals Ideas in Math for Grades PreK-12.*

[4] Domínguez, Xuxo Ruiz, and Juan Tamariz. *Educando Con Magia: El Ilusionismo Como Recurso Didáctico*.79-102.

[5] Blasco, Fernando. *Matemagia: Los Mejores Trucos Para Entender Los Números*.31-34.