Surviving Dragon City By Knowing Operations with Rational Numbers

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Rationale

I currently am in my ninth year of teaching 7th grade mathematics at an urban middle school in Charlotte, North Carolina. The state of North Carolina has implemented the new Common Core Standards effective this school year. I strive to not only meet the standards as they relate to content but also implement strategies that should be addressed with Common Core related assessments. I have tried to teach in a way that allows my students to conceptually understand what is going on for many years now. I have sought out professional development and increased my own understanding of my content so that I could pass it on to my students.

I teach two honors and one regular math class. To clarify, an honors class in 7th grade is designed to prepare students for Algebra 1 in 8th grade. In an honors level math class both 7th and 8th grade Common Core standards are addressed. In a regular math class only 7th grade standards are covered. My school is a full IB magnet school with a current enrollment of 1,175 students. All students were on grade level as 5th graders in order to be accepted into the full IB magnet program as 6th graders. My honors classes typically have a high percentage of students who are identified involved in the TD (Talent Development) program. I have neither exceptional children nor students who have difficulty speaking English.

The middle years of education offer unique challenges to teachers. Students are experiencing adolescent development and their bodies are changing as much as their minds and views on life. In mathematics, moving students from “concrete” thinking to “abstract” is critical to the success of each individual student. Given the topics of their math curriculum, students cannot physically handle or touch things in order to see the answers. They have to stretch their mind beyond what they see in the classroom and envision the outside world and the applications of mathematics in that world without actually being there. One of the most crucial concepts of mathematics that students must master is rational numbers.

I am keeping with the theme of the seminar “Entertaining With Math” and developing a unit that “entertains” students while they learn. My unit will have the theme of “Dragon City.” While I was in high school I got involved in a game called Dungeons and Dragons TM. The game consisted of player characters controlled by the people playing the game. I found myself lost in the game for hours and hours with no concept of time. Students in today’s world find this in the playing of video games. I wanted to design my unit so that students could develop characters and each character would then participate in visiting "Dragon City" and while doing this they would learn math!

Math Magic

What would a visit to a fabled Dragon City be without math magic? A student who is successful working with decimals, percents and fractions should understand place value. I have a few of my favorite math magic tricks that will help support a student's knowledge of place value. Here I would have a teacher dress as a wizard and come into the classroom and perform these feats of magic! Try to conceal the identity of the wizard by having he or she write down their answers and never speak, adding to the mystery. You as the classroom teacher can be an assistant and give instructions to the students on what to do. Perhaps a scroll could be made up and given to the teacher by the wizard.

The first involves taking any four digit number of the students' choice. The student then takes the number and moves the digits around anyway they want to get a new number. The student then subtracts the smaller number from the larger number to get the difference of the two numbers. The student will then tell the teacher what three of the digits are (assuming a four digit number was the result) and the teacher will guess the missing number. It is important that the student not choose 0. To keep from this, the teacher can state, "Let's be sure we remove something rather than nothing. So, let's remove any digit other than 0." You will see why this is necessary as I explain the method.

Example: 3,451 (Starting number)

The digits are moved and we get 1,543 as our second number. Take the difference of the two numbers 3,451-1,543= **1,908.** The student would say 190 or 801 etc. They do not need to say the numbers in order. The teacher will quickly add the numbers given and determine how far below a multiple of nine the numbers given are. The teacher will make up the difference. In our example a student might say 801 which is a multiple of nine when added together so the missing number is a nine. If the students said 190 then theses digits add to ten so the missing number would be an eight to get our total to eighteen.

The math of this is based on the fact that our number system is a base ten number system. Our number with digits represented as *abcd* is actually $1{,}000a + 100b + 10c + 1d$. When the digits are moved around and subtracted watch what happens. If we started with *abcd* and then moved them to be *dcba* we are actually doing the following:

$$1{,}000a + 100b + 10c + 1d$$

<u>*-1a-10b-100c-1,000d*</u>
999a+90b-990c-999d

We can see that our answer will always be a multiple of nine!

The second trick is based off the same idea. Write down the words: dragon, lord, Beleg, dragonfire, knowledge, fly, algebra, armorers on the board. The students will be directed to pick one of the words and count the number of letters in the word. They will then take that number and multiply it by five. They will then add three to their running total. They will now multiply their total by two. They must now have a friend whisper very quietly to them a digit from 0-9. They will add this number to their current total. When pointed at by the wizard they will then state their final total. The wizard will point at the word and write down what number was whispered to them, or the wizard might just hold up his/her fingers to indicate the number.

Here is how the trick is done:

X represents the number of letters in a word selected. If you notice all the words have a different number of letters. The algebra is pretty easy to write out.

$$2(5x+3) + y = \text{number given}$$

Y represents the number whispered. If we carry out distributive property we would get $10x + 6 + y$ = the number given. If we subtract six from both side we take the final number given and subtract six then we get $10x + y$ = the number given minus 6 .We take the answer and we see that x will be the tens or hundreds and y will be the ones in our answer.

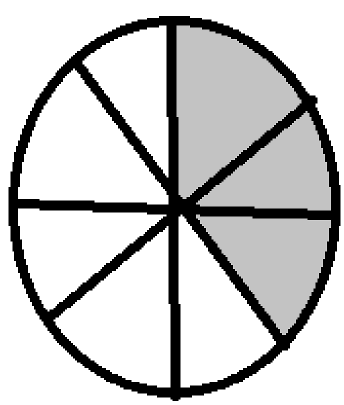
Example: *We choose knowledge so we have 9 letters we then get 45, then 48 then 96 and let's say our friend whispers 8 we now have 104 as a total. We subtract six to get 98 and we see that the word was a nine letter word and that eight was the numbered whispered.*

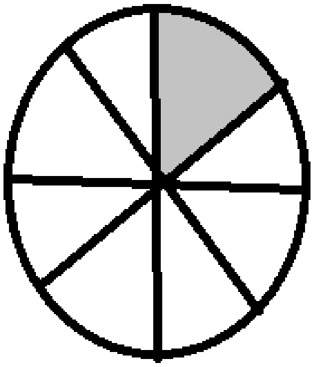
Fractions

The unit will begin with a review of fractions. Teachers should be mindful not to concentrate on the numbers here but the concept. Fractions can represent a part to a whole or a part to a part. Fractions can be very complicated to students who are not comfortable with them. In Algebra and even pre-algebra teachers often write division by using a fraction bar yet when teaching the order of operations it is treated as a grouping symbol and even more complicated it is used to represent the ratio of one number to another. A fraction written as – could be a part to a whole.[i] A good way of thinking of this would be one piece of pizza from a pizza consisting of eight slices. If you think of the operation one divided by eight then the resulting fraction of 0.125 is the answer. Students should not see this as different from the one piece out of eight pieces as we are just now expressing the one piece of pizza as 0.125 which of course is the fraction —— which when simplified is–. The ratio – could still mean one piece of pizza out of eight slices. Ratios have to be described so that the reader knows what is. The ratio – could mean the number of boys to girls in a club. This would mean that there was one boy and eight girls in the club. If I wanted to express the number of boys to the number of club members then the ratio– would be correct. The ratio of girls to boys would be expressed as –. It is important to realize the order with which the ratio is expressed as related to the order with which the ratio is expressed in writing.

To begin, I'd review basic fractions at the level most students find comfortable and familiar. Later, the idea of fractions will extend beyond dealing with ratios, part to part, or using the fraction bar as a grouping symbol. I like using pizza as an illustration of fractions because most if not all students have eaten or at least seen pizza. Unless you ate the entire pizza yourself, you have divided the pizza which involves fractions. As such, cutting pizza offers a natural context for fractions and one in which students are familiar. Students can understand and visualize 3 of 8 slices of a pizza being eaten; it isn't much of a conceptual jump to see this as 3/8 of a pizza being consumed.

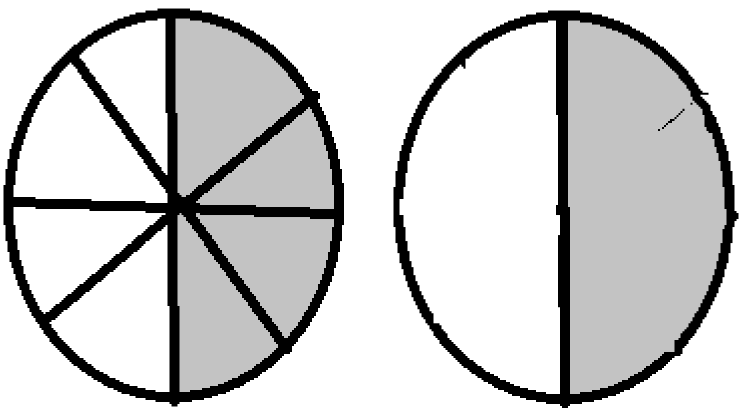
This enables us to then move to basic addition of fractions (slices of pizzas) with fractions with the same denominator. This is a concept that all of your 7^{th} grade students should already have mastered. Where we get a little more involved is why does 1/8 + 3/8 = 4/8 and not $4/16^{th}$? Students should be able to respond to this in an intellectual manner. They should also be able to explain why 4/8 is equivalent to ½. I would suggest having students to use artwork here. Students who resist drawing because they feel they are not good should be comfortable with circle fractions. There is not a lot of skill necessary for such drawings. Below I have an example of what you might hope to get from a student to explain the aforementioned concepts.





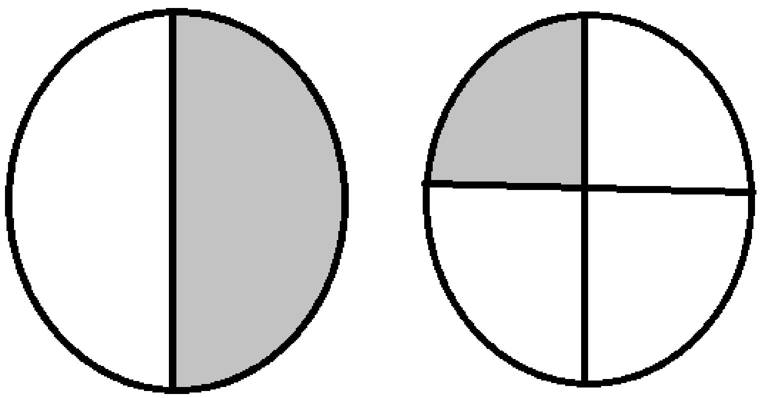
Student response: 1/8 + 3/8 = 4/8 because I have equal parts for both fractions meaning eight pieces make a whole so I am adding one piece to 3 pieces of the exact same size. In a sense I am able to combine like terms. I do not add the denominators because they simply are a size indicator or what constitutes a whole or one. By only adding the numerators I am adding the number of sections being combined.

The students should then explain that 4/8 is equivalent to ½ by showing this with drawings.



The area covered by 4/8 is the same area covered by a circle with ½ shaded thus making the two fractions equivalent.

Adding fractions with unlike denominators requires the students to get a common denominator. They will know this from previous instruction. What I want is for the students to explain why they have to get a common denominator. They should be able to tell you that adding fractional pieces of different sizes is difficult unless they are thought of as what relationship they have to a common whole or one. For instance adding ½ and ¼ is a very easy concept for most students to think of mentally and actually determine the answer without using computation. It is a perfect example of how to show students the importance of like denominators. Students can easily see



That ½ is equivalent to 2/4, if the circle was divided into fourths. By rewriting the equation to 2/4 + ¼ we are now adding fractional parts that are all the same size and we have a total of 3 of them which is represented by ¾ .

Fractional representations of the pizza where the numerator is less than the denominator mean that less than the "one" pizza is being discussed. This concept is important. Students must recognize that if the numerator is less than the denominator the fraction represents less than one. This idea can obviously be built upon to the next step of greater than one. Here a whole pizza with another slice from another pizza of equal size might be discussed giving us 9/8. What this represents is vitally important to student understanding. What the nine represents and what the eight represents must be discussed. The eight represents the "one" or how many slices make up a whole pizza. The nine represents the amount of slices we have. The conclusion that should be reached is that if the numerator is greater than the denominator then there is more than one pizza involved in the problem. What would it mean if we had written 9/9 when we had one pizza and the extra slice? This obviously would have meant that the concept of the "one" had changed. The new definition of "one" would be a pizza and a slice. This does not make sense so that is why the fraction is written as 9/8 to keep the definition of how many slices constitute the "one" at eight.

Converting Fractions to Decimals

The next step is to show how fractions can be turned into decimals. This is great practice for long division which is a skill many students lack. Students should recognize that fractions are, in fact, simply division problems. ½ can be written as 1÷2 and it means the same thing. Of course an infinite number of fractions would result in the same decimal equivalent. As long as the quotient is the same when the numerator is divided by the denominator then the fractions are equivalent. Introducing the concept of ratios by using equivalent fractions demonstrates that no matter how big the numbers if they are proportional ratios then in simplest from they are same value. If I have 1,000,000 boys and 2,000,000 girls then the ratio is still simply 1 boy to every 2 girls. Students should then solve the problem through long division. The resulting answer of 0.5 is an illustration of how a fraction can be turned into a decimal. In other words when two real numbers are divided the quotient will be the decimal representation of the ratio of those two numbers.

There is another way of turning fractions into decimals that few teachers use or are even aware of. This is a method of repeated multiplication. As a side note it is a real easy way to turn fractions into other base number systems as well but I will not get into that here. Take 1/7 for instance if I want to turn this into a decimal, which is base 10, then I simply multiply by 10.

1/7(10) = 10/7 or 1 3/7

I take the whole part and this is the value for tenths in my decimal so 0.1

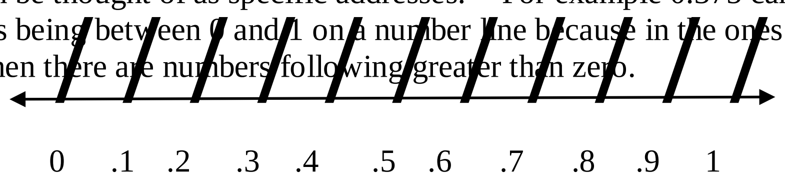
I take the fractional part or remainder if you will and multiply it by 10 to get 30/7 or 4 2/7. You now have 0.14 and then continue with 2/7 (10) to get 20/7 or 2 6/7 you now have 0.142. You then do 6/7 (10) to get 60/7 or 8 4/7 to get 0.1428. You then do 4/7 (10) to get 40/7 or 5 5/7. You now have 0.1425. You multiply 5/7 (10) to get 50/7 or 7 1/7 and this gives you a final answer of 0. .[ii] Your students should notice they do not need to continue since the pattern will repeat. This helps students to really see what a rational number is. We tell them that a rational number terminates or repeats in a decimal representation. They seem to get the terminating decimals like 0.5 and repeating decimals like 0. but to see a pattern in a fraction like 1/7 is a little difficult. The thing that contributes to the problems is the calculators so prevalent in classrooms that students rely on. Calculators round the last digit that appears when the answer is larger than the screen limit. An example might look like this if you have the fraction 2/3 it appears as 0.66666667. Students who are not aware of this might make the argument that this is not a repeating decimal.

I think it is important to discuss why repeated multiplication works. Obviously students should be given the opportunity to investigate it first rather than the teacher explaining it. It works because of basic mathematic rules. If I take a fraction 1/7 and multiply by 10 it is the same as dividing by 1/10. The first “whole” part I get represents how many times 1/10 goes into 1/7. When I take the “remainder” or fractional part and then do the same this represents the hundredth place and so on.

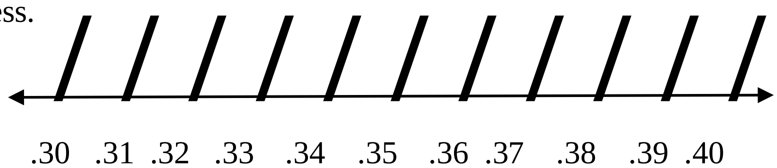
Students should be reminded of their lessons in elementary school where a remainder was written as R something. At their current level of mathematics the remainder will be expressed differently. Two examples of what may be focused on here are how to solve 7/3 two ways, through long division and fractionally. With long division the answer is 2 and fractionally the answer is 2 1/3. Both are accurate representations of the answer. What they mean should be discussed. The main idea is that there are a little more than two wholes present. Perhaps if we refer back to the pizza example we could say that there are two pizzas made up of three slices each and an extra slice. This might give a visual representation to some students. Bring this back to the “one.” What is the one here? Of course it is 3/3. Dividing integers is not difficult but the relationship of the answer to the fraction is critical. A decimal that is less than one would have a fractional representation where the numerator is less than the denominator. A decimal that is greater than one would have a fractional representation where the numerator was greater than the denominator. Getting students to understand this is an important concept.

Decimals

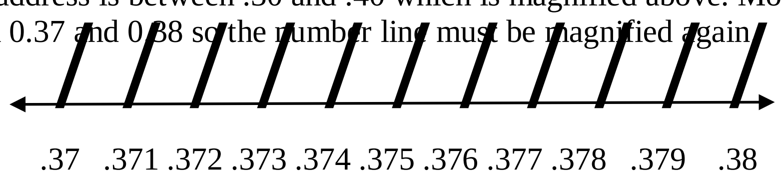
We can think of the decimal as an address on a number line. Roger Howe indicated that decimals can be thought of as specific addresses.[iii] For example 0.375 can first be thought of as being between 0 and 1 on a number line because in the ones place there is a zero and then there are numbers following greater than zero.



The first address between 0 and 1 we identify is 0.3 so the decimal has to be between 0.3 and 0.4. If the view is magnified then the area between 0.3 and 0.4 has to be looked at for the address.



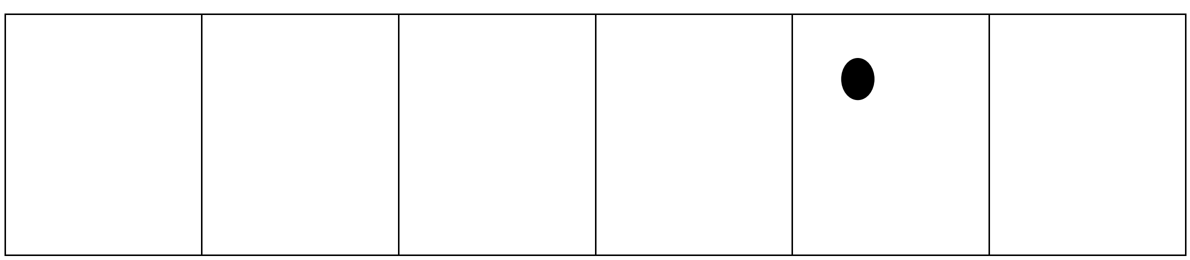
The second address is between .30 and .40 which is magnified above. More specifically it is between 0.37 and 0.38 so the number line must be magnified again.



The final address is now located. Students should realize that all number addresses found between 0 and 1 will be percentages less than one hundred percent. Number addresses that are above 1 and before 2 will be one hundred and something percent and so on.

Place values must then be discussed. A great way to discuss place values is by using exploding dots. Jim Tanton of the St. Marks School created exploding dots and it is a creative and fun way to explore place value. The concept is simple. There is a machine that has chambers in it. The idea is that the machine has some numerical value assigned such that when a certain number of dots exist in one box they explode and a dot occurs in an adjacent box. One example comes from our own decimal system.

If ten dots go into the machine in the first box then they explode from the first box and one dot appears in the second box. Having the students first do this with a machine that explodes when two dots are in the same box and the result is one dot in the next box to the left will lead to the discovery when written there is no number above one. The teacher should explain that this is binary or the base two number system. Explore various numbers systems and then return to base ten number system. I have included an example below illustrating how the number ten can be arrived at. If ten dots are put into the first box they explode and then one dot appears in the second box. This actually represents the number ten. Students should then explore this with various examples.



Use exponential representation to show why. 10^1 is ten, 10^0 is one, and 10^{-1} is one tenth. Written in decimal form they are in order 10, 1 and 0.1 in fractional form they are in order 10/1, 10/10 and 1/10. Write above the box the exponential value of each box.[iv]

Try to give students examples and have them write out the value of the number. Do this with negative exponents included so that they can see how numbers to the right of the decimal point are determined. The obvious place value of importance here is the one hundredth place. Define decimal and discuss what a decimal point is. The fact that decimal means base ten is helpful in defining the value of each place. The decimal point is a separator to indicate a fractional part of the number. When students have decimals they should be able to identify the place of each number. For example 0.342678 would have the 3 in the tenth's place, the 4 in the hundredths' place, the 2 in the thousandth's place, the 6 in the ten thousandth's place, the 7 in the hundred thousandth's place and the 8 in the millionth's place. The pattern should be discussed here and referring back to exponents may help. Many students will be confused as to why there is no oneth's place. If we can represent a number in decimal form then expressing it as a percent is a simple task. Exploring decimals here is important. If a number is multiplied by ten what happens to it? The fact that the decimal moves one spot to the right is a key concept. Why does it move one spot to the right? What if the number is multiplied by one hundred or a thousand how many spots to the right does the decimal move? This can be explained by referring back to the place to the right of the decimal. Examples can be provided with whole numbers or real numbers. Show that 3 multiplied by ten is 30 and 3 multiplied by one hundred is 300. The decimal spot is simply moving to the right a certain number of times based on the power of ten the number is being multiplied by.

Defining place value can also be done with addition utilizing the powers of ten and the commutative and associative rule for addition as well as the distributive rule Roger Howe explains in his essay that there is a very easy way to show students what they already do in a different format which shows clearly the idea of place values. An example might be
as follows:
12,678 + 3,406 is the problem given.
So we rewrite this as (1 x 10,000 + 2 x 1,000 + 6 x 100 + 7 x 10 + 8 x 1) + (3 x 1,000 + 4 x 100 + 6 x 1). The numbers here can be regrouped to be (1 x 10,000) + (5 x 1,000) + (10 x 100) + (7 x 10) + (14 x1).
This of course gives us:
10,000 + 5,000+ 1,000 + 70 + 14 which has to be broken down to
10,000 + 6,000 + 70 + 10 + 4
10,000 + 6,000 + 80 + 4
which totals 16,084 using base 10.

What if a number is divided by a power of ten? What happens to the decimal point? Show that 300 divided by ten is 30 or 300 divided by 100 is 3. The decimal moves to the left the power of ten that the number is being divided by. Roger Howe defines a decimal fraction as any fraction whose numerator is a nonnegative integer and whose denominator is a power of 10 and *a and m* are not negative. An example of this would be 3/100 or 3/10 or 3/1000.

All numbers are not decimal fractions. Next the concept of percent should be introduced. I have found the cent part of the word a good focus. We all know one cent is 1/100 of a dollar. We also know that when we say for example 55 miles/ hour we say per when we see the fraction bar. So presto change per- cent is /100. The focus on one hundred is vital to understanding percents.

Percent means any number over one hundred or divided by one hundred. Moving away from over should be done as soon as possible. At a certain level of math division should be shown as 5/6 means five divide by six. When discussing percents the fraction of a number divided by one hundred indicates the number we call percent. An example would be 65/100 which is sixty five percent (65%). The concept of “one” should then be discussed. In terms of percents the “one” is obviously one hundred. If the numerator is less than one hundred it is less than one hundred percent. If the numerator is greater than one hundred it is greater than one hundred percent. Look at 165/100 which is 165%. Key concept here is that whenever the numerator can be written over the denominator of one hundred we know our percent without any problem. This does not always happen and we have fractions that can be expressed in terms of the numerator over one hundred very easily.

If we had a pizza composed of eight pieces and three pieces were eaten what percent of pizza is remaining? The first step is to identify what is the “one” or the whole in the problem. Obviously a whole pizza consists of eight pieces so eight is the whole or the “one.” The three represents a part of the whole. Since we ate 3 pieces there are 5 pieces remaining. The fraction represents what we have left of our pizza. We have to refer back to converting fractions into decimals by recognizing our fraction is simply division we divide 5 by 8 and get 0.625. This is critical to understanding. The decimal 0.625 is actually but we want to write it as a numerator over one hundred. We have to recognize what value is in the hundredths place. In this example it is 2. The decimal must be moved to reflect a fraction divided by one hundred in order to discover our percent. To move the decimal to the right two places we multiply by one hundred. The resulting 62.5 is our percent! Students should realize that once a fraction (division statement) is expressed as a decimal it can then be multiplied by one hundred to express it as a percent. This concept should be practiced so that students are comfortable expressing different representations such as decimals and division statements as percents.

With the new common core standards I think it is really important to teach students how to look at percents. In the above example we knew we ate three pieces and we wanted to know what percent was left. Instead of determining what percent of the pizza was 3/8ths and then subtracting it from 100% we can do this in one step by determining what percent of the five pieces were. This idea should carry over to all percent problems. When an item is on sale for 35% off we do not need to figure out 35% of the price and subtract it we can simply find what percent of the price is 65% since that is what we will pay for. What it effectively does is reduce two steps to one step and reduce the opportunity for a mistake.

Dragon City

Setting the background for this is part of the fun. What we have is a city that was recently discovered hidden from the world! It is ruled by the last Dragons on earth who sought peace and long life from the human world that was so barbaric and always hunting them from a lack of understanding. Their city was revealed and a human (or so we think) was sent to the UN (United Nations) to discuss what the Dragon Lords would like to have happen. Here I would suggest perhaps creating a video of a dark figure introducing the idea and history of Dragon City and explaining what the students will be doing and what will happen. I would think it would have a much greater effect on the students. Try to use a dark robe and hide the face of the "human messenger" and disguise the voice or have a stranger do it. They would like to rejoin the planet as a functioning city. They have long watched our world and they feel that they can help. Anyone that knows Dragonkind knows that they are extremely intelligent and not the brutes made out in Hollywood or in most books. They can speak and communicate quite well. They are saddened by the current state of education in the world and they want to help! They will allow teachers to magically transport their students to their city where they will experience a series of challenging educational situations.

The first step will for each student is to create a representation of themselves that the Dragons will magically make happen! The students will determine their new identities by solving mathematical problems. Below is a list of identities the students will get based on a series of mathematical calculations. A percentage will be assigned to each identity and students will have to figure out, using a deck of cards how to make it work so they can draw a card and determine their identity.

Prince
Princess
Duke
Duchess
Lord
Lady
Knight
Storekeeper/Merchant
Healer
Midwife
Citizen

Percentages will be established to become a certain identity

<u>Boys</u>

Prince	6%
Duke	8%

Lord	10%
Knight	12%
Storekeeper/Merchant	16%
Healer/Wizard	10%
Citizen	38%

<u>Girls</u>

Princess	6%
Duchess	8%
Lady	10%
Knight/ Warrior Maiden	12%
Storekeeper/Merchant	16%
Healer/Wizard	10%
Citizen	38%

Students will use a deck of cards to determine their identity. They must decide how they can use the deck to determine percentages. They will then choose cards to fall within the above percentages and then another student will shuffle the card and they pick. For instance a student decides to reduce the number of cards to fifty. He says that each card represents two percentage points. He has removed the Ace of spades and Ace of Clubs. He might decide that The Ace, one and two of hearts are the ones that if they were selected would make him a prince. Three out of fifty represents six percentage points.

Students should be encouraged on the "Big Day" to dress up in costume as they visit "Dragon City" it will make the event much more exciting.

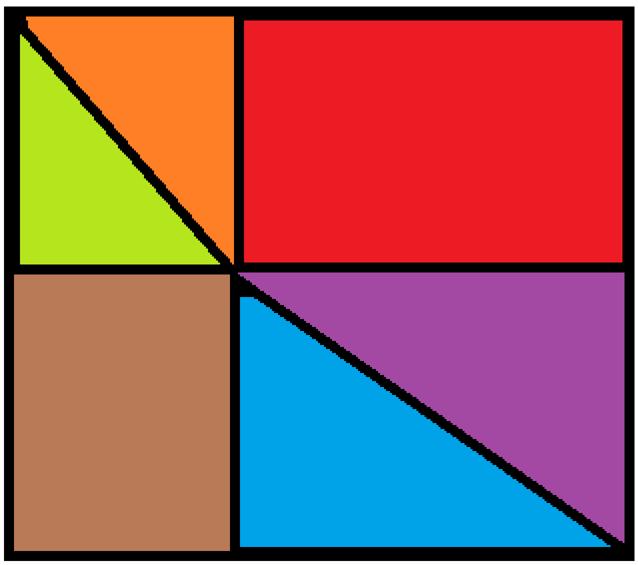
The event could be done by one class or multiple classes. The size of it can be large if a large space was converted to Dragon City. Perhaps the art students could help make the city with cardboard and scenery to befit the scenarios presented. Dragon City would have a rustic feel but modern amenities, after all the dragons are not stupid they appreciate and have watched the advancements in the human world.

The event will involve students visiting different stores and marketplaces in Dragon City. They must complete the requirements set forth for them in each store in order to have their Dragon Card completed. If they are not able to complete their card they may face the wrath of Beleg the Dragon King! He has sacrificed his own Dragonkind to help the humans in their pursuit of education and he expects all students to be successful!

Mission

Scenario 1

Students will be given a card with a shape on it and numbers. They must then assemble the cards correctly (like a puzzle) and



They may then be asked to determine the fractionally part of the rectangle for the green triangle or the probability of hitting it with a dagger thrown at the board.

Welcome to The Firestorm General Store

- As the store manager when customers come in you should hand them a card. This card will describe five problems a customer must solve in order to move on.
- When completed with the Dragon card the customer must hand in their solution and have it checked off by the store manager. The manager will keep all solutions with the customer's name on it. The manager will sign off on the customer's card so they can move on.

Problem 1

You have entered the Firestorm General Store because you crave a peanut butter and jelly sandwich. The bread costs $.98 a loaf, the peanut butter costs $2.89 and the jelly costs $ 3.49. How much will all this cost you?

Problem 2

You realize that you need to have a more balanced meal so including the price of the goods in problem #1 you but some 3 lbs of fruit for $.59 a pound. How much is your total bill now?

Problem 3

WAIT a minute you need milk to drink with all that and the milk is $2.79. You need to find out what you total bill is now including the milk.

Problem 4

You forgot that your family asked you to get some fish for supper and the fish costs $1.89 a lb. If you buy 5 lbs of fish what is your total bill now?

Problem 5

After your total purchase you must add an 8% sales tax. This will be your final answer.

Welcome to the Dragon's Den

Restaurant

As a restaurant manager I will need you to give each customer a problem sheet. They will solve all the problems and hand them in for you to check. They may not continue until they have gotten all the problems correct. Once they have the problems correct please check off their Dragon Card and keep their answer sheet.

Problem 1

You have entered the Dragon's Den Restaurant and ordered the following items:

Steak -------------------$19.89

Soda-------------------$1.99

What is your current bill?

Problem 2

Your friend joins you and orders the following:

Chicken-----------$12.99

Soda---------------$1.99

Since you are generous you offer to pay. What is your total bill?

Problem 3

You both realize that you feel like an appetizer so you order some chicken wings ($6.99) and shrimp ($10.99). What is your total bill now?

Problem 4

The shrimp arrives and doesn't taste very good. The manager apologizes and agrees to take 30% off of your total bill. What is your total bill now?

Problem 5

You agree that the waiter has done a great job so you decide to tip him 15% of your bill. What is the total amount that you paid?

Welcome to the Dragon Wing

Post Office

As a Post Office manager I will need you to give each customer a problem sheet. They will solve all the problems and hand them in for you to check. They may not continue until they have gotten all the problems correct. Once they have the problems correct please check off their Dragon Card and keep their answer sheet.

Problem 1

You enter the post office and want to buy 20 stamps at $.47 a stamp. How much will it cost you?

Problem 2

You want to ship a package to a friend for the holidays and it will cost $.79 a lb to ship your package which weighs 25lbs. How much will this cost you plus the stamps you bought in problem 1?

Problem 3

You forget to add insurance to your package and this costs $1.50 per one hundred dollars worth of insurance. You want $500.00 worth of insurance. How much will the insurance cost?

Problem 4

Add the cost of the insurance to the total from problem # 2 this is your current total. How much is it?

Problem 5

Your friend agrees to give you $10.00 towards your bill, How much do you have to pay now of your own money?

Welcome to the

Dragon Claw  Cineplex

As a Theater manager I will need you to give each customer a problem sheet. They will solve all the problems and hand them in for you to check. They may not continue until they have gotten all the problems correct. Once they have the problems correct please check off their card and keep their answer sheet.

Problem 1

You have arrived at the theater with a bunch of friends. There are 9 of you in the group and you all purchase a ticket that costs $7.99. How much was the cost of all the tickets?

Problem 2

You buy the following at concessions:

Popcorn -------------------$ 4.99

Soda------------------------$ 2.99

Candy----------------------$ 1.99

How much was your purchase at the concession booth?

Problem 3

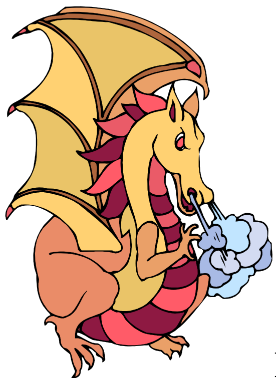
How much was the ticket and purchase at the concession booth?

Problem 4

You play some games in the arcade and spend $5.75 to play 5 games. About how much did it cost to play each game?

Problem 5

While in the Movie Theater you spill your soda and have to buy another one. How much have you spent all day at the movie theater in total? This includes ticket, concessions and arcade.

Dragon's Treasure  Department Store

As a Department Store manager I will need you to give each customer a problem sheet. They will solve all the problems and hand them in for you to check. They may not continue until they have gotten all the problems correct. Once they have the problems correct please check off their card and keep their answer sheet.

You have $250.00 to spend on holiday shopping spend wisely!!!!!!!!!!!!!!

Problem 1

You buy 5 CDs for $8.99 each and a CD carrying case for $5.99. How much have you spent?

Problem 2

You buy 5 DVDS for $12.99 each and some popcorn for $1.99. How much is your total bill now (include problem 1)?

Problem 3

You see that a sale is on for video games and they are selling them in groups of 5 games for $124.95. How much would the price of one game be at this rate?

Problem 4

You buy two games from the group mentioned in problem 3. What is your current total?

Problem 5

You decide to buy a gift card with the remaining money left over from the $250.00. How much would you gift card be?

Works Cited

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Liping, Ma. *Knowing and Teaching Elementary Mathematics.* Mahwah, NJ: Lawrence Erlbaum Associate, 1999.

Reiter, Harold and Holshouser, Arthur. "Games and Number Representations." *Games and Number Representations.* Charlotte: Personal.

Tanton, James. "Exploding Dots." *www.jamestanton.com.* 2009. http://www.mathteacherscircle.org/resources/materials/JTantonExplodingDots_EducatorsVersion.pdf (accessed November 2, 2012).

[1]1999, Ma
[2] 2012, Reiter
[3] 2008, Howe.
[4] 2009, Tanton

Teacher Recommended Resources

Ma, Liping. *Knowing and teaching elementary mathematics teachers' understanding of fundamental mathematics in China and the United States*. Mahwah, N.J.: Lawrence Erlbaum Associates, 1999.

This book is appropriate for middle school teachers who seek a better understanding of basic concepts in mathematics. It provides reasoning and support for basic procedures that are taken for granted such as why we take the reciprocal of a fraction and change to multiplication when dividing.

Tanton, James. *Thinking Mathematics! Volume 1 Arithmetic_Gateway to All*. Princeton: James Tanton, 2009.

Excellent book to explore exploding dots.

Student Recommended Resources

None Recommended

List of Materials for Classroom Use

- Wizard outfit for participating staff member
- Students will create their own costumes for the culminating activity
- With cooperation from the art department creating storefronts or even an imaginary city would make the unit's culminating activity really exciting
- Deck of cards