Fractional growth factors

Profession, Teacher

Early Field Experience Lesson Plan Fractional Growth Factor CMP Math 8th Grade Ms. Tanisha Wilson Fifer Middle School Tanisha Wilson MTSC 403 Fall 2011 CONTEXTUAL FACTORS Student Characteristics There 28 students and they are in 8th grade CMP math class. There are some students in this are inclusion so there are two teachers in the classroom. There is a regularmathematicseducationteacher, and there is a special aid teacher. The students in this class have to take two mathematics classes each day, a CMT course and a prep course which will help them score high on their DCAS scores.

They are from different nationality backgrounds and they understand English well. There is one student in the class who has a wheel chair and the desk is arranged for him to sit comfortably by the door. Overall the students in this class are well behaved and eager to learn mathematics. Grouping Patterns Student's seats are arranged in groups of four. Students will work in groups of four and a class as a whole will whole. Prerequisite Knowledge Students should already be able to identify the growth factor in the problem with reasoning, the y- intercept, and what everything number in the equation represent.

Students are also expected to know what exponential growth mean and are able to graph and factor with exponential growth with whole numbers. Instructional Materials Smart board, smart responders, paper, pencil LEARNINGGOALSMathematical Learning Goals Students will build on their knowledge of exponential growth. Students will think about exponential growth with the fractional (or decimal) growth factors and know when it is appropriate to round the number to the nearest decimal place and why.

Students will know how to find the fractional exponential growth using the formula P= a (b)x. NCTM Content Standards

Grades 6-8 Algebra * Identify functions as linear or nonlinear and contrast their properties from tables, graphs, or equations. * Model and solve contextualized problems using various representations such as graphs, tables and equations. Delaware Standards Math GLE Standard 2 Algebraic Reasoning * Compare the rates of change in tables and graphs and classify them as linear or nonlinear. * Use tables, graphs and symbolic reasoning to identify functions as linear or nonlinear. DIRECT Diversity- there will be different ways to solve the problems so students would be given many ways to practice and choose which method fits best.

Interpersonal Communications- students will follow a method that the teacher in the class uses which is called Think, pair, share. Students would think about their answer, pair up with their group members to discuss what each other got, and then share their answer with the whole class. Reflection- students would reflect on what is going on in the class by exit cards at the end of the lesson. Students will also receive extra practice by doing a homework assignment. Effect teaching and assessment Strategies- students would be asked questions leading to them figuring out the formula.

At the end of the lesson there would be exit cards to assess what the students have learned in today’s lesson. Content and Pedagogical Knowledge- this is like a review lesson. Students already have prerequisite knowledge on the same material. The only difference with this lesson is that the growth factors for the problems we will be working on today are fractional. Technology- students would use smart responders in the

beginning of the lesson to determine if their answers were correct or not. We will also be using the smart board to see the problems needed in order to keep the lessons going. Mathematical Proficiency Strands

Understanding mathematics- student's will be asked multiple questions based off of the problems they have done in previous lessons and the lessons we are doing today so I could know if the students are understanding the mathematics we are covering the in class. Applying concepts to solve problems- students would be given two solve problems and asked how they came up with their answer with explanations of how they got the answer. Reasoning logically- students would be given a real life situation as a solve problem and the answer they come up with have to logically fit the situation given in the story.

Engaging- students will be engaging with each other to discuss their thoughts of the solve problems by doing the think, pair, share. Assessment Plan In the previous investigation, we studied exponential growth of plants, mold, and a snake population. In the growth factor and the starting value, we could make predictions. The growth factors in these examples were whole numbers. In this investigation, we will study examples of exponential growth with fractional growth factors. Students will have an understanding on how to find the exponential growth of a Rabbit population with fractional growth factors.

Examples will be shown that students understand the lesson by using the growth factor table, being able to determine what is the growth factor and when is it appropriate to round it up to if necessary and students will be able to connect the chart and table to a formula for the exponential growth rate.

Pre- Assessment Students will be given a chart that looks like the previous charts we have went over. The difference with this chart is that the growth factor is not a whole number. Students will have to find the equation based off of the chart. They would put their answer into the smart responder.

Once everyone’s answers are calculated into the smart responder, we will receive a percentage of how many students got the correct answer in the class. We will then discuss why that is the correct answer. Additional Assessment 1 Students would be given a problem on the smart board with a table which will represent the exponential growth of rabbits. Ask students the following questions... 1. What is the growth factor? Explain how you found your answer. 2. Assume this growth pattern continued. Write an equation for the rabbit population p for any year n after the rabbits are first counted. Explain what the numbers in your equation represent. 3.

How many rabbits will there be after 10 years? How many will there be after 25 years? After 50 years? 4. In how many years will the rabbit population exceed one million? Do not give students the answers. Have students come up with the answers on their own, then they could discuss with a classmate, then the whole class would discuss the correct answer and why. While students are working in groups, the teacher would be walking around and looking at student’s notes to see their understanding. If you see that there is more than one approach to the answer, then call on the different students with the different approaches so there could be variety.

Post Assessment The class would sum up what we did in today’s lesson by answering the exit cards with a question similar to the one we did in class. Students must answer the question in details. The teacher will explain to the

students that the main point of the lesson today is to recognize that the growth factor may not always be a whole number. By the end of this lesson, students should be able to solve a problem dealing with exponential growth with the growth factor not being a whole number. OPENING 5 Minutes8: 00-8: 15 Rationale Students will be shown a chart on the smart board and will be asked to find the growth factor and the equation for the table. Since the students are already familiar with exponential growth using whole numbers, I want student's to see that not all exponential growth would have a whole number as the growth factor. The opening activity is a reflection on the same type of formula they have been working on, the only difference is that the growth factor would not be a whole number.

Students would focus on the growth factor and being able to put it into an equation which will support the table. Students will be assessed by using the smart responders. The smart responders will allow the teacher to know the percentage of students who got the correct answer before beginning the lesson. | Materials Smart board, smart responder, pencil, and paper Activity Description When the students first walk into the classroom, they will be asked to grab a smart responder. (The smart responder allows the teacher to see the percentage of how many students got the correct answer).

Based off of the results on the smart responder I will have a short discussion of what is the growth factor, the y-intercept, and why important to know those numbers in order to create a formula. The table is as followed… X| 0| 1| 2| 3| Y| 30| 57| 108| 206| Differentiate Instruction One student from each group will get up to get the smart responders for their group and return them when we are done. Students will be able to do this because there is a

student in the classroom with a disability; he is in a wheelchair so I do not want him to feel left out in any way.

Therefore, each group will have to go through the same procedure. Another differentiate instruction we will do is go over the correct answer into details because there are some students in the class who are inclusion. I do not want to move too fast with the class as a whole so I will continue to review the material and monitor ALL students understanding of the lesson before moving on. What is the growth factor in this table? Possible Student Responses| Possible Teacher Follow-ups| 1. 9| Did everyone get that answer? | No. | What did you get as the growth factor? | At first I got1. then I divided the next two consecutive numbers which is 108/ 57 and I got 1. 894736834, so the growth factor is not the same with each number. | Did anyone else get that? | Yes| Well I’m happy you pointed that out. What is the difference between this table and the previous tables we have been doing these past few weeks? | The growth factor is not the same for every outcome is not the same exact number| What is different about the numbers though? | They are a decimal and not whole numbers. | Ok. Good point. Is 1. 894736 close to 1. 9? | Yes| When you divide 206 and 108, what is your outcome? 1. 907407| Is that close to 1. 9? | Yes| So what could you tell me about this growth factor now? | That the outcomes are very close to each other but they are not the exact same| So imaging if you wanted to round your growth factor to the nearest whole number, put the number 2 into your formula, what are your results? | 30*2= 6060*2= 120120*2= 240| Are your results accurate compared to what we need on our table? | No. | Why is that? | Because when you keep multiplying by 2 instead of 1. 9 the result grows bigger and bigger

and it does not match what we need. What do you suggest we do if we wanted to put these numbers into an equation that will have the closest possible outcome? | Round it to 1. 9? | Why 1. 9? | Because what was the first exact outcome and when we divined the next consecutive numbers, they are close to 1. 9| Ok great job. So when this happens we will round up to the nearest outcome and in this case it is 1. 9| BODY #1 30 MinutesTime: 8: 15- 8: 45 Rationale The purpose of this activity is for students' to have a visual with a story of rabbits reproducing and is able to form an equation with the table given to them.

This activity will build on the students' knowledge of exponential growth and at the same time introducing with fractional growth factors. It is important for students to understand that the growth factor will not always be a whole number and what they should do when they face this problem. This activity develops the learning goal of student's being able to think about fractional growth factor and why should they round it to the nearest decimal place instead of the whole number. Materials Graphic Calculator, pencil, paper, smart board Activity Description

Students will be sitting in groups of four. During this activity, student's will do a think, pair, share for every question asked to them before discussing it with the class as a whole. Think, pair, share is a way for students to actually THINK about their answer and why do they think that will be the correct answer; they should also be taking down notes at this point. PAIR is when they talk amongst their partners and share what they came up with and then compare answers. If anyone answer is different, then they will discuss why are their answers different.

SHARE is when the whole class has a discussion about all of the possible answers and come to an agreement and understanding of the correct answer. Students will be assessed while doing think, pair, and share. The teacher would be walking around the class taking notes about the student's understanding and mentioning anything that stands out or may be confusing about the lesson to the class. This will just be personal notes for the teacher to know the student understands of the lesson. | The activity will begin with the " did you know" which will be shown on the smart board.

Did you know? In 1859, a small number of rabbits were introduced to Australia by English settlers. The rabbits had no natural predators in Australia, so they reproduced rapidly and became a serious problem, eating grasses intended for sheep and cattle. In the mid-1990s, there were more than 300 million rabbits in Australia. The damage they caused cost Australian agriculture $600 million per year. There have been many attempts to curb Australia's rabbit population. In 1995, a deadly rabbit disease was deliberately spread, reducing the rabbit population by about half.

However, because rabbits are developing immunity to the disease, the effects of this measure may not last. Students will think about the " did you know" problem and then a table will be shown on the board based off of the problem. If biologists had counted the rabbits in Australia in the years after they were introduced, they might have collected data like these: Growth of Rabbit Population Time (yr)| Population| 0| 100| 1| 180| 2| 325| 3| 583| 4| 1, 050| Students would be asked the following questions followed by a mini class discussion for each question. 1. What is the growth factor?

Explain how you found your answer. 2. Assume this growth pattern continued. Write an equation for the rabbit population p for any year n after the rabbits are first counted. Explain what the numbers in your equation represent. 3. How many rabbits will there be after 10 years? How many will there be after 25 years? After 50 years? 4. In how many years will the rabbit population exceed one million? Differentiate Instruction There are some students in this class who are inclusion which mean that they need extra help with understand the concept of the material.

There is an inclusion math teacher in the classroom as well but her attention is strictly for those students'. The activity has question and answers so that way everyone in the class could participate in lesson and contribute their understandings. Students will also have to think about the answer on their own at first before working in pairs which will be helpful for the teacher who is walking around to see the students understanding individually. The inclusion student's will also receive peer help along with teacher sponsoring. What is the growth factor of rabbits reproducing represented by this table?

Possible Student Responses| Possible Teacher Follow-ups| 1. 8| Why 1. 8? | Because divided the first two consecutive numbers which is 180/100= 1. 8 so every year the rabbits times itself to 1. 8| So did you get 1. 8 every time you divide the consecutive numbers? | No, when I divided 325 by 180 I got 1. 805555556, when I divided 583 by 325 I got 1. 793846, and when I divided 1, 050 by 583, I got 1. 801029. They were all close to 1. 8 so I rounded it up like what we did for the warm up. | Great job, my only question is why did we round it up by 1. 8 and not 2? Because we are dealing with fractional growth factors even though these are decimals. | But what if you didn't know you

was dealing with fractional growth factors and you had to solve this problem, why wouldn’t you round your growth factor up to the nearest whole number? | Because if I rounded my growth factor up to the nearest whole number then the result for the growth amount for populations of rabbits of the next year would not be around the number given. | I don’t really understand what you mean; may you please demonstrate to the class using your calculator? |

The student would demonstrate to the class using his/ her calculator Year 1100*2= 200not close to 180 Year 2200*2= 400not close to 325 Year 3400*2= 800not close to 583 Year 4800*2= 1600not close to 1050 So why do we round to the nearest appropriate decimal? Possible Student Responses| Possible Teacher Follow-ups| Because if we were to round it to the nearest whole number, then the growth factor will not be close to the next years population rate. | Correct. What is the equation used for this growth factor? | 100(1. 8x)| Why? | Growth factor is 1. 8 and we raise that by time which is x| Ok great job. |

CLOSINGTime: 2 minutes Learning Goal(s) Students will build on their knowledge of exponential growth. Students will think about exponential growth with the fractional growth factors and know when it is appropriate to round the number to the nearest decimal place and why. Students will know how to find the fractional exponential growth using the formula P= a (b)x. Review Based off of what we learned today students will be able to draw connections from the previous lessons with exponential growth factors and now know how to find the exponential growth with the growth factor not being a whole number.

Students are to state why they are rounding up the number to the nearest decimal (if needed). Students will have to answer the Exit Cards before leaving the class. 1. Why isn’t the growth factor of exponential growth always a whole number? 2. If you were to round up your decimal or fraction to the nearest whole number and put it into the equation P= a(b)x, what will your outcome be and explain why. Students would be assessed on their understanding of today’s lesson and making sure that they meet the learning goals thinking mathematically. | Follow-up Activities

Students will be assigned a homework assignment. 1. In parts of the United States, wolves are being reintroduced to wilderness areas where they had become extinct. Suppose 20 wolves are released in northern Michigan, and the yearly growth factor for this population is expected to be 1. 2. a. Make a table showing the projected number of wolves at the end of each of the first 6 years. b. Write an equation that models the growth of the wolf population. c. How long will it take for the new wolf population to exceed 100? 2. a. The table shows that the elk population in a state forest is growing exponentially.

What is the growth factor? Explain. Growth of Elk Population Time (year)| Population| 0| 30| 1| 57| 2| 108| 3| 206| 4| 391| 5| 743| b. Suppose this growth pattern continues. How many elk will there be after 10 years? How many elk will there be after 15 years? c. Write an equation you could use to predict the elk population p for any year n after the elk were first counted. d. In how many years will the population exceed one million? Homework will be checked during the next class meet. ATTACHMENTS “ Growing Growing Growing” book pages 33-36