Exponent Unit- Lesson 1

Grade: 9th

Subject: Algebra

Materials: worksheets, colored cards, cards for game, markers for drawing

Technology Needed: calculator and smart phone

Instructional Strategies:

- ☐ Direct instruction
- ☐ Guided practice
- ☐ Socratic Seminar
- ☐ Learning Centers
- ☐ Lecture
- ☐ Technology integration
- ☐ Other (list)
- ☐ Peer teaching/collaboration/ cooperative learning
- ☐ Visuals/Graphic organizers
- ☐ PBL
- ☐ Discussion/Debate
- ☐ Modeling

Guided Practices and Concrete Application:

- ☐ Large group activity
- ☐ Independent activity
- ☐ Pairing/collaboration
- ☐ Simulations/Scenarios
- ☐ Other (list)
- ☐ Hands-on
- ☐ Technology integration
- ☐ Imitation/Repeat/Mimic

Explain:

Standard(s)

HS.N-RN.1

Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

Objective(s)

The student will be able to identify the base and exponent.
The student will be able to define and create his/her own expression containing exponents.

Bloom's Taxonomy Cognitive Level: knowledge, synthesis

Differentiation

Below Proficiency: I can modify the worksheet and give filled out notes.

Above Proficiency: Challenge these students to teach others, and do not give as many hints with the creation problem.

Approaching/Emerging Proficiency: The lesson is mostly designed for them. I can scaffold my hints and challenge these students to ask peers questions.

Modalities/Learning Preferences: visual, kinesthetic, social

Classroom Management- (grouping(s), movement/transitions, etc.)

While greeting the students as they come into class, I will hand them a colored slip of paper that will align with a spot or pod of desks in the room. This will easily group students for their learning stations.

When trying to gather the class back to me, I will use my attention getting strategy of placing my finger on my nose (like nose goes) and the rest of the students should mirror me and place their finger on their nose and get their eyes on me. (We can use any method similar to this that I would let each class decide.)

I will have a turn in tray or envelope at each station, so the students can put whatever it is they worked on at that station directly into the envelope/turn in tray so they do not drag it around the entire classroom or get distracted by it.

Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)

Students should be able to work well in groups. I expect students to be respectful and helpful towards each other.

Minutes	Procedures
60?	**Set-up/Prep: Prepare the learning stations and notes for the lesson. Also cut the color sheets and place them around the room. Prepare the cards that will be used in the exponent card game.**
7	**Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)** Greet Students at the door handing them their specific color. Bell ringer: If I were to ask you to multiply 5 times itself 20 times, how would you write this? I will give you a couple minutes to come up with a creative way to do so without actually writing out five times itself 20 times. (After a couple of minutes)- Now I want you to turn to your partner and share with each other what you created. Also, you're your partner, discuss why a system or method to write this would be important in the real world. After sharing, we will discuss as a class the different methods we came up with and where this could be used.
13	**Explain: (concepts, procedures, vocabulary, etc.)** Here is where I will introduce the correct method of writing these numbers down. I will explain to them what the exponent is and represents, establish the vocabulary of base and power/exponent, and explain the special cases of when the exponent is 0 or 1. Additionally, we will cover the terminology and how to say things. For example, is a number is raised to the 2 or 3, it can be said squared and cubed, respectively. Also, one says 15^5 is read as fifteen to the fifth or fifteen raised to the 5th (power). Then, I will demonstrate some examples of exponent problems. I will also show the students how to use their calculators to calculate an exponential problem. $12^3 = 12 \cdot 12 \cdot 12 = 1728$ **(here the base is 12 and the exponent is 3 and 12x12x12=1728 is known as expanded form)**

Exponent Unit- Lesson 1

	$10002452420^0 = 1$ (base is 10002452420, exponent is 0) $0^0 = 0$ (this is a special case and the only time when the exponent is 0 the answer isn't one, when base is 0.) $8^1 = 8$ (base 8, exponent 1)
5- to explain stations 20- 5 min at each station **Total = 25**	**Explore: (independent, concreate practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)** This is where we will have the group learning centers. I will set up 4 areas around the classroom. Each area will have a color that will coordinate with the ones given at the beginning of class. At one station, the group will create a situation where exponents would be needed. (ex: to describe the distance to the moon, to describe how small a bacterium is, the amount of ways someone could arrange a 4-letter word (word meaning 4 letters side by side, does not have to be an actual word and letters can repeat) out of 8 letters) As I monitor this group, I may give hints or provide an example if they are stuck. Additionally, if they cannot think of anything I will allow the students to use their smart phones to search for a problem/situation that exponents would be used in. The second station would have a worksheet that will be completed individually. But, I will encourage students if they are stuck to ask their peers for help. The third station will consist of a type of card game like war (thus, the game would be played in pairs) . I would have multiple "cards" with exponential expressions on them. The students would divide the cards equally and flip one at a time and then have to determine which value is bigger. The student with the greater value wins the round and collects both cards. Then, the student with the most cards or plays the opponent out of cards wins. The fourth station will challenge students to draw pictures that represent the given exponential expression. These pictures will need to be school appropriate but can be drawn in whatever way the students interpret the expression to be.
5	**Review (wrap up and transition to next activity):** I will have the students stay at the last station they are at, and ask each group to explain the problem they created. If a group did not create a situation or come up with anything, then I will ask what was the most challenging part about it? Wrap-up: After they share their problems/difficulties I will highlight that tomorrow we will learn how to multiply and/or divide exponents with the same base. Also, if you did not finish your worksheet with the group, you are to complete it and turn it into me tomorrow at the beginning of class.

Formative Assessment: (linked to objectives) **Progress monitoring throughout lesson- clarifying questions, check- in strategies, etc.** I would be monitoring each groups' progression and would ask the students to clarify what is to be done at each station before it begins.	**Summative Assessment (linked back to objectives)** **End of lesson:** I will be able to collect each groups' worksheets, situation they created, and the pictures they drew that represented exponents. The individual worksheets will display how well the students are doing with the new content.
Consideration for Back-up Plan: Having the winners and losers of the card game play each other if they are done too quickly. Assist or provide hints for the station with the creation question. Allow students to use phone if they have been trying for 3 minutes and have not come up with anything. Give examples of drawings or sketches of exponential expressions. If groups don't work out to be four groups of four it can easily be manipulated for the card game to work, as one can play it with 3 or more, the game will just go faster.	**If applicable- overall unit, chapter, concept, etc.:** The material covered today will be on the first quiz.

Reflection (What went well? What did the students learn? How do you know? What changes would you make?):
I modified the creation station to a station that just simply had the students brainstorm any situation where exponents can be used. I also may change the group stations to just three and then give the exponent worksheet after group work is completed. I think this may help groups focus and work well together. Additionally, there will not be two stations with worksheets on them. Furthermore, I think limiting the stations will allow a better and more fruitful group discussion about the stations. Then, after our discussion, I will give out the worksheet and allow time for the students to work on the worksheet in pairs or independently. I liked that I posted instructions on the board about the groups and the agenda, however I need to have a more organized lecture time when reviewing the basics of exponents.

Exponent Unit- Lesson 1

Name: _____ **Period:** _____

Directions: Please calculate the following problems. Please identify the base and the exponent and write each problem in expanded form.

1. $8^4 =$

Answer:

Base- 8

Exponent- 4

8x8x8x8 = 4096

2. $6^5 =$

Base- 6

Exponent- 5

6x6x6x6x6= 7776

3. A window washer is assigned to wash 7 rows of windows. Each row contains 7 windows. He is to wash these windows 7 times a month. How many windows does the window washer wash in a month. (i.e. $4^3 = 64$ should be the form of your final answer). Please show all your work.

Answer: $7 \cdot 7 \cdot 7 = 7^3 = 343$. (expanded form is not required but hopefully I can see this in their work)

Might see $7^2 \cdot 7 = 343$ I will give partial credit but explain to them that if written in expanded form, it is the same as 7 cubed.