Lesson Title \_\_Multiplying and dividing in scientific notation\_\_

Grade Level: 8\_\_\_\_\_\_

**Number of Class Periods**: 2 (Day 3 of 5)

Text or Resource and Relevant Pages \_\_\_\_\_TLMGM\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Overview**: Students will learn how to multiply and divide numbers in scientific notation. Students will be able to derive from the rules by themselves by looking at an example of a solution to a number that was the answer to a multiplication or division problem. Students will be able to answer a question about multiplication and division problem on their exit ticket and homework. Students will be able to also to come up with a problem on their own and to be able to solve and explain the problem if asked to do so on the board in class the next day.

Continuity:

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| --- | --- | --- |
| Previous Lesson:  Students learned about writing numbers form standard notation to scientific notations from the rules I gave them about scientific notation. | The Lesson:  Students will learn how to multiply and divide numbers in scientific notation using rules that I would give the students. | Upcoming Lesson:  Students will continue from the previous lesson, also multiply and divide number in scientific notation for word problems. |

Objectives:

A. Mathematical Content Objectives

1. Student will understand multiplying numbers and decimals. Also dividing numbers and decimals in scientific notation.

2. Students will learn the rules for multiplying and diving numbers in scientific notation and will be able to understand the rules.

B. Ongoing Objectives

1. Students will solve problems, reason, communicate, represent, and make connections among mathematical ideas.
2. Students will continue to develop collaborative skills in sharing materials, their thinking, and listening and responding thoughtful to others.
3. Students will build on their knowledge of real numbers and the laws of exponents they learned in the beginning of the semester.

C. Common Core Standards

(Expression and Equations, CCSS.Math.Content.8.EE.A.4) Students will perform operations with numbers expressed in scientific notation. Including problems where both decimals and scientific notations are used. Using scientific notation and choose units of appropriate size for measurements of very large or very small quantities.

Materials:

* Pencils
* Pens
* calculators
* notebooks
* worksheets
* Computer program
* Exit Slip

Use of space:

After explaining to the students on how to multiply and divide in scientific notation (rules) I would handout worksheets for students to do. Then I would do the cooperative learning technique of think pair and share. The classroom would have computers that was brought to them so that every student can work on the worksheet with the program maple to check their solutions. Maple is a program that would only be used in class and not be used at home. The maple program would be only being used some of the times in the school year. The classroom desks that students are sitting in will be columns of 4 equal rows that so that students can move their tables to the left or to the right so that they can work with a partner for the activity after the lesson.

Launch:

| Learning Activities/ Teacher’s Questions | Expected students responses | Teachers Support |
| --- | --- | --- |
| Ask students to begin to think about some questions that they will later be able to answer. |  |  |
| How do we know if the answer is in scientific notation? | We could review the rules on how to convert numbers from standard form to scientific notation. | Students can work together with other students so that can compare answers and learn and help each other. |
| What is the difference between multiplying and dividing numbers in scientific notation. | The difference is multiply is when the first factors gets multiplied together and the exponents are added together while dividing is when the first factors are divided then the exponents are subtracted. | Students can review the example problem that I went over on the board to help them determine the difference between multiplying and dividing numbers in scientific notation. |
| What if the number when multiplied is a number greater than 10? How would students convert the number back into scientific notation? | Moving the decimal point back then multiplying the second factor to get a new first and second factor. | Students can work in pairs to help each other solve this problem when they get up to it. |

**Explore**: Students will be working alone then working in pairs the students will get Worksheet 1 in which students can work together and share their answers so that they better understand how to multiply and divide in scientific notations.

| Learning Activities/ Teacher’s Questions | Expected students’ reactions/responses | Teachers Support |
| --- | --- | --- |
| What do you think the rules for multiplying numbers in scientific notation are?  Provided with an example. | Multiplying the first and second factors. | Put up an example on maple and ask students to student the problem for a few minutes. Then to give me an answer on what the rules would be. |
| What do you think the rules for dividing numbers in scientific notation are?  Provided with an example. | Dividing the first and second factors. | Put up an example on maple and ask students to student the problem for a few minutes. Then to give me an answer on what the rules would be. |
| Using the worksheets that was handed out to everyone. They would begin to understand the differences between multiplying and dividing in scientific notation. | I can see that sometimes when divided or multiplied the first factor is less than but always greater than 1, | Ask the students that are having trouble to look at the rules that were given in the beginning of class.  Ask student to work with another student if still need help. |
| What is the relationship do you see from a question about multiplying and a question about dividing numbers in scientific notation? | When multiplying numbers, the numbers are sometimes smaller or bigger depending on what the question is asking to do. When dividing it also depends on what the question also. | Students must explain their reasoning on the worksheet or on their notebook on why did they say that. |
| Ask a student to come up to the board with the partner they were working on to answer and explain how they answered the question. | First we started multiplying the first factor then we checked the base if they were the same then we add the exponent. The multiplied number would came out with an answer then we made sure the answer was a number between 1 and 10 if not we would need to move the decimal point to the left. | Students are able to understand how to multiply and divide numbers in scientific notation if they are able to understand and explain on the board to the entire class on how to solve one of the problems from the worksheet. |
| After finishing the problems from worksheet 1 and 2 was students able grasp how to multiply and divide numbers in scientific notation. | After finishing both worksheets and working in pairs for both of the worksheets the students have an understanding on how to multiply and divide numbers in scientific notation now. |  |
| Asking Students how would they come up with the rules for multiplying and dividing numbers into scientific notation by given the solution first. | I can see the answer is a big number so probability 2 numbers multiplied together then the second factor is large. So the exponent is multiplied or added together. | Before giving students the rules ask them to try to derive it themselves. |

**Share and Summarize**:

| Learning Activities/ Teacher’s Questions | Expected Student’s Responses/Reaction | Teachers’ Support |
| --- | --- | --- |
| Students will summarize what they learned about multiplying and dividing numbers in scientific notation. | I can see the difference between multiplying and dividing numbers in scientific notation. The numbers when divided are getting smaller while the numbers that are getting multiply are getting bigger. | Students can use their notes and from the worksheets. |
| Students will summarize what was the positives and negatives of the multiplying and dividing numbers in scientific notation from the worksheet. | Multiply and dividing big numbers were confusing at first but then I got the hang of it. The positives were that multiplying and dividing by smaller decimal or whole numbers were easier to calculate on a calculator or by hand. |  |
| Students will compare and contrast their findings when working together during the activity. | I work better and my partner helps me find any errors that I made when we talk about the problem and explain to each other what we did. | Students can use the worksheet for help |
| Students will be able to come up to the board with their partner and be able to explain the way they answered the question. | I can explain what happens when the numbers are multiplied and divided. |  |
| What would happen when the first factor is multiplied, the number is greater than 10. Would students know to convert the number to a number less than 10? | I believed that since after we multiplied the first factors we would need to convert the first factor to a number between 1 and 10. | Students should remember what a number in scientific notation looks like. |

**Embedded Assessment**:

Are students able to multiply and divide numbers in scientific notation? Can the students convert the answers if not in scientific notation into scientific notation if necessary?

**Application or Extension**:

What happen if all the exponents were negative numbers? Explain your reasoning on what would happen and have the students working in the original pairs from before during the activity. Continue on more about this in the next lesson when we start talking about multiplying and dividing numbers in scientific notation for word problems.

**Adaption**:

All students working in pairs for the activity. Using the material provided for the students that are English-language learners will be able to understand the material because the material is simple to understand and also would be reviewing any words that students don’t understand. The students that have physical disabilities will be working with students that will be using verbal directions from the disabled student to be working together on the worksheet.

**Assessment**:

On this Friday quiz student will be working on questions asking them to answer question converting numbers from standard form to scientific notation and explain. Also questions asking students to multiply and dividing numbers in scientific notation for word problems and also explaining why are they multiply or dividing.

**Evaluations**:

To be done after teaching the lesson. Question to consider: What strategies or tools supported student learning? Did any student have trouble multiplying or dividing numbers? Were students to understand the steps for multiplying and diving numbers in scientific notation? What would improve this lesson for the future students? What parts of the lesson were successful for the students and weren’t successful for the students? What needs to be kept in mind for subsequent planning?

**Attachments**:

Worksheet 1

Worksheet 2

Exit Ticket

Homework Assignment