GOAL (WI Teacher Standards #1, 2) – 4.OA.4 : Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number.

OBJECTIVE (WI Teacher Standards #1, 2)
- Students will be able to find factors and multiples of numbers.
- Students will be able to identify square numbers.
- Students will be able to solve multiplication facts.
- Students will be able to identify and use patterns in the Multiplication/Division Facts Table.
- Students will be able to develop a deeper understanding of ways to solve multiplication problems.

VOCABULARY
- Factors: numbers that are multiplied together are the factors of the final number.
- Product: final number that you get when you multiple two numbers together.
- Multiples: a number that can be divided evenly into the given number.

ASSESSMENT (WI Teacher Standard #8)
- I will be noting who answers questions on target (+), off target (-).
- During the participation portion of the lesson, I will be observing and taking notes on the ways the students come up with to solve multiplication problems. This will give me a sense of their thinking and strategies they are able to use to solve these types of problems. This is a formative assessment that I will use to help develop my further lessons.
- I will have them write do a quick multiplication problem sheet (one or two problems) and ask them to show me a way they are able to solve multiplication problems other than by memorization. (This is another way to collect information on what the students know and are able to do in order to instruct my future lessons).

MATERIALS NEEDED (WI Teacher Standard #3, 7)
- Overhead of Multiplication/division facts table
- Markers
- Students will need their math notebooks
- Worksheet for homework.

TIME NEEDED: 45 minutes – 1 hour

PROCEDURE (WI Teacher Standard #7)
Engagement (3 minutes)

1. Introduction (WI Teacher Standard #6)
   - We are going to start a multiplication unit in math today. I will also be in three times next week for math so I can continue the unit with you.
   - Today we are going to review what we already know about multiplication. We will also be working with some multiplication terms that some of us might have heard before and if not we will learn about them today and find other ways to solve multiplication problems.
Demonstration (15 minutes)

2. Developing the Lesson (WI Teacher Standard #4)

- Students will take notes in their math notebooks.
- Show students the multiplication/division facts table. *How many have seen one of these before?*
- Point out the * and the / and why they are used:
  o (asterisk) an asterisk is used to show multiplication.
  o This may be seen on computer keyboards so there is no confusing between the letter x and multiplication.
  o In algebra the x is also used in mathematics to mean something different than multiplication.
  o Math also uses the (/) slash symbol to mean the same as ÷ and .

- Discuss *Factor*
  o The numbers across the top row and along the side column are called factors.
    ▪ Factors are numbers that are multiplied together are the factors of the final number.
    ▪ Ex. 3*2=6. 3 and 2 are factors of 6.
    ▪ Use these for further examples: 9 (1, 3, 9) 32 (1, 2, 4, 8, 16, 32)

- Discuss *Product*
  o The numbers inside of the column and rows are all the products.
    ▪ A product is the final number that you get when you multiple two numbers together.
    ▪ Ex. 3*2=6. 6 is the product of 3 times 2
    ▪ Use these for further examples: 4*2=8 What is the product?

- Discuss *Factor Pairs*
  o Factor pairs are the pair of numbers that are multiplied together to get a given number.
    ▪ Ex. 3 and 2 is a factor pair of 6. *Are there any others???????* (1 and 6 is a factor pair of the number 6).
  o Numbers can have a few factor pairs or many factor pairs.
  o Use these for further examples: What are the factor pairs of 18?

- Discuss *Multiples*
  o Multiples are found if you look at a number and its row or if you look at a number and its column. So multiples of 10 are 10, 20, 30 and so on.
    ▪ Use these for further examples: What are some multiples of 8?

- Discuss *Square Numbers*
  o A square number is a product of a number multiplied by itself.
    ▪ Ex. 4*4=16 therefore 16 is a square number.
  o The square numbers can be found on the diagonal of our multiplication/division facts table.

- Discuss *Turn-Around Facts*
  o All the products on the right side of the diagonal are the same as those on the left side of the diagonal – these are called Turn-Around Facts.
    ▪ Ex. 6*3=18. Find the 18. Now there is another 18 below our square numbers, and that that shows us that 3*6 also equals 18. So if you know one fact, you also know the turn-around fact.
    ▪ Illustrate with a picture, how the picture position doesn’t change the product.

- Show visually how much the students should already know!
  o *What are some things that you may already know about multiplication? What are some shortcuts that you know?*
    ▪ Zero facts are not on here because anything times 0 equals what?
- If a number is multiplied by 1 what do you get? Cross out the 1 facts.
- To find a number times two we double it. Cross out the 2 facts.
- To find 10 times a number, a zero is added. Cross out the 10 facts.
- All facts to the left of the square numbers are the same as those above the square numbers because they are the turn-around numbers so they can be crossed out. Cross out numbers left of the squares.
  - Circle the numbers that are not crossed out. This isn’t really that many facts to know any more!

**Participation (20 minutes)**

- Although the fastest way to solve multiplication problems is by memorization, there are other ways we can find out the product if we are not sure of the answer.
- Have students find a way other than memorization to show that $5\times8=40$ or $3\times4=12$ or $2\times3=6$ in small groups for a 3-5 minutes.
- Have students show examples on the board and explain their thinking. Discussion about ideas.

  **Ways that may be brought up**
  - drawing a picture
  - counting
  - using known facts
  - patterns
  - See attached sheets as well of ways I was able to come up with representations of multiplication.

3. **Closure** (WI Teacher Standard #6) (2 minutes)

- Today we looked at the multiplication vocabulary that we are going to be using in the next couple of lesson that will help us understand multiplication better. We also used the multiplication/division facts table to see how much we already knew! And we found out we knew a lot! We are going to keep practicing our multiplication facts so that we can work on more difficult problems in the days to come.
- Hand out homework.