

Factors and Multiples

Lesson: #4

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Grade Level: 6 - 8

Sunshine State Standard: MA.A.3.2.1, MA.A.3.3.1, MA.A.3.2.3, MA.A.5.2.1, MA.A.5.3.1

Materials: (Students will not need these materials for the distance learning lesson, but will need them if you plan on playing this in your classroom.)

- Students:
 - Copy of Product Game (Game Board), paper clips
 - Copy of Number Ray worksheet
 - Copy of Factor Multiple Song
- Teacher: PPT Presentation

Objectives:

1. To review multiplication facts.
2. To develop an understanding of the relationship between factors and multiples.
3. To discuss strategies in playing the Product Game.

Vocabulary: Factors (Divisors), Multiples, Product, Integers, Factor Pair, Common Factor, Greatest Common Factor, Common Multiple, Least Common Multiple.

Lesson Plan:

Activity 1:

Divide students into two teams. Go over directions for Number Ray Detectives. Teams take turns guessing numbers that go on the special number rays. As students play this game, they should see that factors of the number are on the left side of the number, and the multiples of the number are to the right of the number. "F" stands for factor and there are just a few factors. "M" stands for multiple, and there are many millions of multiples.

Answer key for Number Ray Detectives:

For the 6 Number Ray

1, 2, 3, **6**, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84, 90, 96

For the 8 Number Ray

1, 2, 4, **8**, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96

For the 12 Number Ray

1, 2, 3, 4, 6, **12**, 24, 36, 48, 60, 72, 84, 96

After students have played this game, they can fill out the Number Ray worksheet which is just a graphic organizer that helps them visualize where the factors of a number are on the number line, where the multiples are on a number line.

Students can use the Number Ray worksheet as a resource when they are trying to simplify fractions and when they are trying to find common multiples. This can also be used as a tool for students who are still struggling with multiplication facts.

Sing the Factor Multiple song to the tune of "I've Been Working on the Railroad."

Activity 2:

The Product Game is a two-person game in which players circle factors then find the product of those factors. The game is over when one player gets four numbers in a row. To play the game you will need the game board (found at the end of this lesson) and colored pencils, and two paperclips.

Before playing the Product Game, students should have a good understanding of the difference between a *factor* and a *multiple*. This can be done by asking the students to give you all the factors and some of the multiples of a certain number. For example if you used the number 12:

Factors

1, 2, 3,
4, 6, 12

Multiples

12, 24, 48,
0, -12, 144, etc...

Factors

Make sure that when each factor is given you ask for the pair for that factor.

For example, if a student responds that 6 is a factor of 12, ask the student how they know that.

A student response should be: "Because $2 \times 6 = 12$ ".

Here is a good question for students to think about when discussing factor pairs.

Every factor of a number should have a pair except for square numbers. Why?

Multiples

When asking for multiples of the number, make sure that the students justify each of their responses.

For example, if a student responds that 48 is a multiple of 12, ask the student how they know that.

A student should respond: "Because $4 \times 12 = 48$ ". Students should be told that if you multiply 12 by any integer then the product is a multiple of 12.

Make sure that zero is mentioned as a multiple, and have the students realize that zero is a multiple of every number. Also bring up a few negative multiples of 12. A good way to elicit these responses would be to ask: "Does anyone know a multiple of 12 that is less than 12?"

Once you feel that the students have a good understanding between the terms factors and multiples it is time to play the Product Game. (If your class needs the review, you may want to take some time before the factor game to review some of their times tables)

Rules for the Product Game:

1. Player A marks a number (with a paper clip) in the factor list. Player A does not mark a square on the product game grid because only one factor has been marked; it takes two factors to make a product.
2. Player B marks another number in the factor list (it could be the same number that is already marked) and then shades or covers the product of the two factors on the grid.
3. Player A moves any paperclip to another number on the factor list and covers up the new product.
4. Each player, in turn, moves a paperclip and marks a product. If a product is already marked then that player does not get to mark a number for their turn. The winner is the first player to mark four squares vertically, horizontally, or diagonally.

After giving the students ample opportunity to play the Product Game, you may want to challenge the students to play you in a round. After (or during) the game between you and the students you may want to take the opportunity to talk about strategy while playing the Product Game. Allow students to express their ideas about a good strategy behind the game. Ask questions like:

- Is it better to go first or second in the Product Game?
- If your opponent needs the 81 square to win, which factors should you not put a paperclip on?
- Is it important to know what numbers your opponent has? Why?
- Is it important to know what numbers your opponent needs to win? Why?
- Is it important to know what numbers you have? Why?
- Is it important to know what numbers you need to win? Why?
- If you had to choose first what number would you choose? Why?
- etc....?

At this point it may be a good idea to have students start making their own Product Game. To do this you can first give the students a set of factors to use to make their game board. For example,

List of factors: 1, 2, 3, 5, 7, 8, 10, 11

The students will hopefully come to realize that in order to make a complete game board then they need to account for every product possible from their set of factors. For the above list of factors the following products will have to be included in the game board.

$1 \times 1 = 1$

$2 \times 2 = 4$

$3 \times 3 = 9$

$5 \times 5 = 25$

$1 \times 2 = 2$

$2 \times 3 = 6$

$3 \times 5 = 15$

$5 \times 7 = 35$

$1 \times 3 = 3$

$2 \times 5 = 10$

$3 \times 7 = 21$

$5 \times 8 = 40$

$1 \times 5 = 5$

$2 \times 7 = 14$

$3 \times 8 = 24$

$5 \times 10 = 50$

$1 \times 7 = 7$

$2 \times 8 = 16$

$3 \times 10 = 30$

$5 \times 11 = 55$

$1 \times 8 = 8$

$2 \times 10 = 20$

$3 \times 11 = 33$

$1 \times 10 = 10$

$2 \times 11 = 22$

$1 \times 11 = 11$

$7 \times 7 = 49$

$8 \times 8 = 64$

$10 \times 10 = 100$

$11 \times 11 = 121$

$7 \times 8 = 56$

$8 \times 10 = 80$

$10 \times 11 = 110$

$7 \times 10 = 70$

$8 \times 11 = 88$

$7 \times 11 = 77$

Students will have to be careful to make sure that every product is included and not to have two squares for the same product. This information should not be given to the students, they should just be given the list of factors and told to make a game board using that list. Observe the students and see what strategies they come up with in making the game board and what problems arose and how they dealt with those problems.

After discussing how to make a proper game board let students choose their own factors to make their personal game boards.

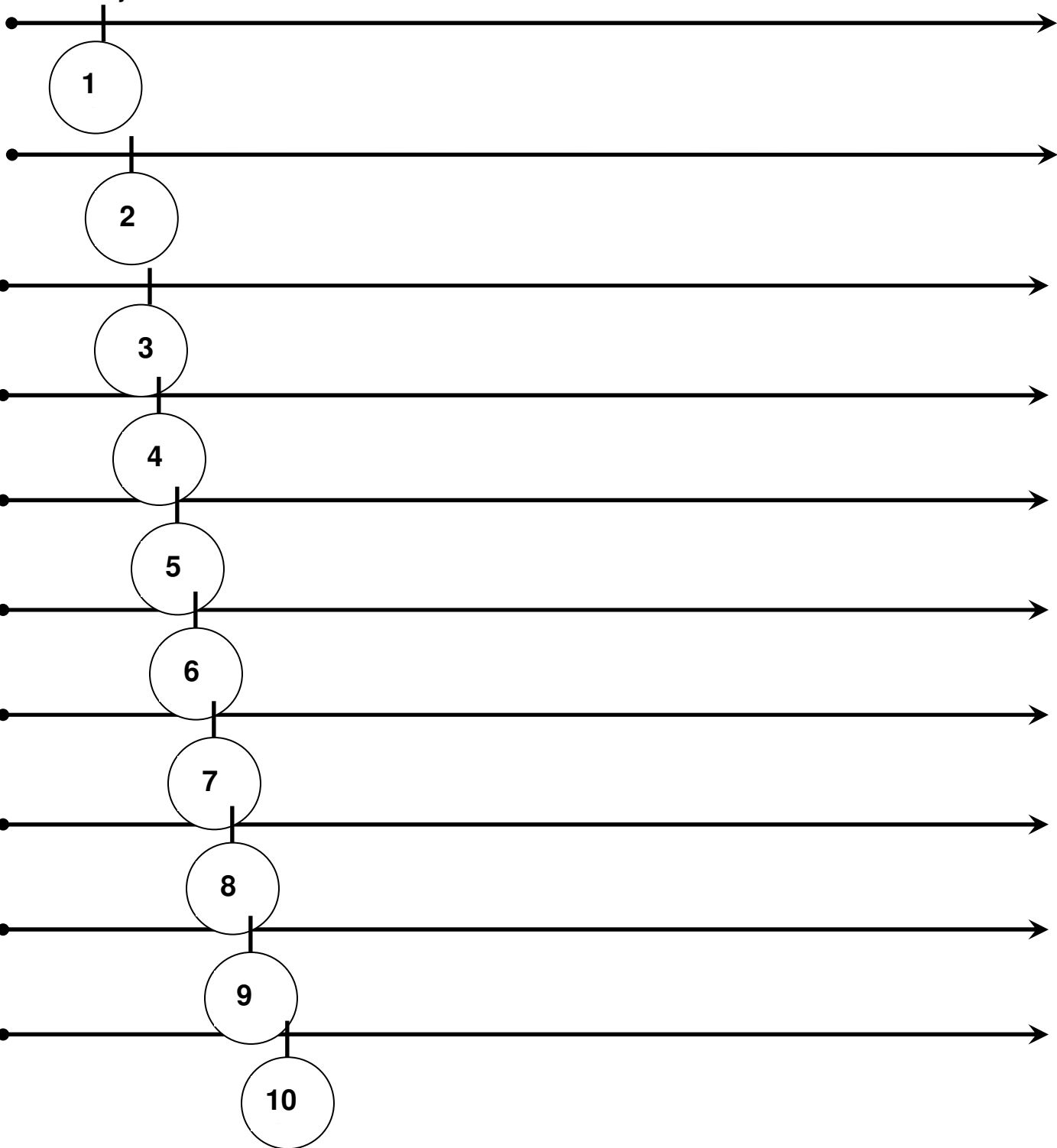
Product Game (Game Board):

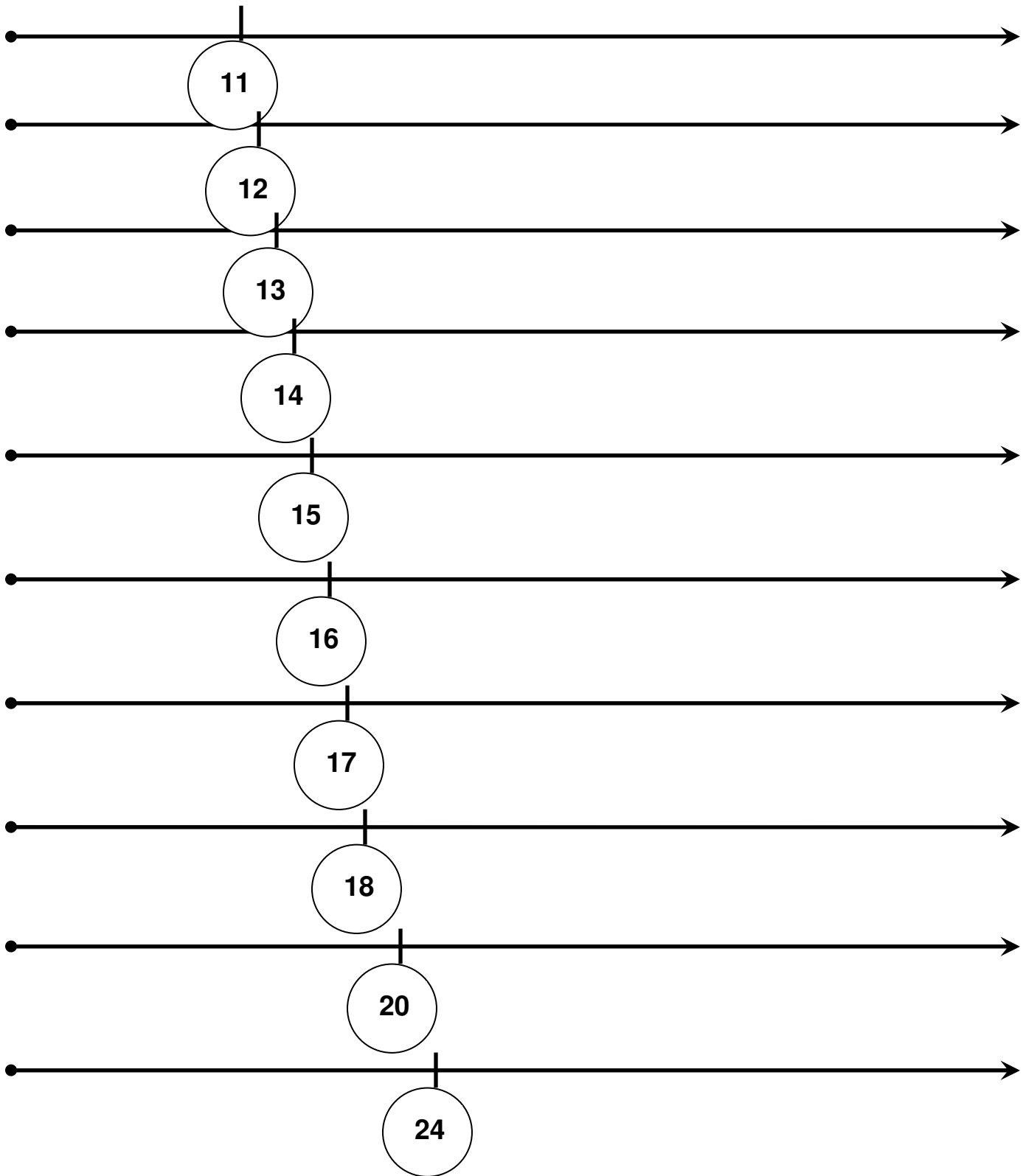
1	2	3	4	5	6
7	8	9	10	12	14
15	16	18	20	21	24
25	27	28	30	32	35
36	40	42	45	48	49
54	56	63	64	72	81

Factors:

1 2 3 4 5
6 7 8 9

Number Ray worksheet





Factor Multiple Song

(Tune of "I've Been Working on the Railroad" Written by Joann Barnett)

I've been looking for some multiples
All the live long day
Multiples go on forever
To infinity they say.

Listing multiples of numbers
Requires that you multiply
Keep multiplying by the number.
Now we'll let you try.

The number times a one,
The number times a two,
The number times a three, and four and five.
The number times a six,
The number times a seven,
Multiplying all your life.

Now let's find the factors of a number.
The factors are just a few-ew-ew-ew.
Factor times a factor gives the number.
Finding factor pairs is all you do.

Singing, many millions of multiples,
Factors are just a few-ew-ew-ew.
Many millions of multiples (*Hold out the last line for
infinity*)
Factors are just a few-OOH!