

Lesson Topic: Multiplication – Area model introduction (Arrays)

Concept/s in Focus:

- Multiplication is joining equal groups to make a total.
- Multiplication is the same as repeatedly adding equal groups e.g. $2+2+2$ is 3 twos
- Multiplication can be represented as equal rows (*an array*). The first number is the number OF rows and the second number is the number IN EACH row e.g. 2×5

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Introduction / Teacher Background Information:

Multiplicative understanding is built is the idea of unitising which is about being able to see a group of objects as a unit. The unit can be a collection of objects (a set), it can be a row (in an array) or it can jumps (along a number line). These three models can be used to represent multiplicative situations. The set model uses equal groups, the area model involves equal rows and the linear model is about jumps of equal distance. In each multiplicative situation e.g. 2×5 there will be a number that indicates the number OF groups /rows /jumps and another number that indicates the number/distance IN EACH group / row / jump. The two numbers used to represent a multiplicative situation indicate a count (how many) and a quantity (how much).

In this lesson the focus is on the area/array model and creating grids that have an equal number of rows. The order the numbers are presented in the multiplicative situation is important. The first number indicates the number OF rows and the second indicates the number IN EACH row. In this lesson, students will simply be representing multiplicative situations as arrays. The focus is not on the total in this lesson but the structure of the array.

Australian Curriculum Links: ACMNA031

Resources:

Whole Class Activity:

- The Mat
- Pieces of paper e.g. A5 or other material that are close to filling the spaces on the Mat (to create the array using individual pieces of paper)
- A copy of the file: [Multiplication recording table \(rows\)](#) copied onto A3 (if desired). This table can just be drawn up on the whiteboard during the lesson.
- Whiteboard

Hands-On Activity:

- Grid paper A4 1.2cm squares per student. File [1.2cm squares – whole page](#)
- 2 sets of cards that 2 Set of Cards that indicate the number OF rows and the number IN EACH row. File [Multiplication cards Number OF rows and IN EACH row](#). (Copy each set of cards on a different colour paper so each selection will ensure students pick one from each set).
- Colouring pens / highlighters

Independent Activity:

- Grid paper A4 1.2cm squares per student. File [1.2cm squares – whole page](#)
- 2 sets of cards that 2 Set of Cards that indicate the number OF rows and the number IN EACH row. File [Multiplication cards Number OF rows and IN EACH row Small](#). (Copy each set of cards on a different colour paper so each selection will ensure students pick one from each set)

Whole Class Activity:

- Have the students sit on the floor around The Mat.
- Use pieces of paper to mark an array of 2 rows of 5 on The Mat.

? *What do you notice about what I have done on The Mat?*

- Accept any answers but listen for answers that talk about the number of rows / number in each row. Students may answer that there are 10 pieces of paper which is correct but redirect them to the structure of the array. This lesson is not focussing on the total.

? *How would you describe what we have made? (Listen for replies about it being a rectangle or an array)*

- Draw a simple table on the whiteboard with two headings: Number OF rows, Number IN EACH row. Or use the file Multiplication recording table (rows) copied on A3
- Record a description of the array on the Mat under the headings. The table should look like this:

| Number OF rows | Number IN EACH row |
|-----------------------|---------------------------|
| 2 | 5 |
| | |
| | |
| | |

- Reinforce the idea OF rows as going across the array and the number IN EACH row as the number of columns.
- Point to the 2 in the table.

? *What we have made is called an array.*
Where is the 2 in this array? (Listen for responses that indicate the number OF rows going across the Mat)

- Point to the 5 in the table.

? *Where is the 5 in this array? (Listen for response that indicate the number IN EACH row or the number of columns)*

- Remove the pieces of paper from The Mat.
- Represent another array example in the next row of the table using different numbers e.g. 3 rows of 4 (Keep using 2 different numbers otherwise it will be difficult to differentiate between the rows and columns i.e. don't choose 3x3)

| Number OF rows | Number IN EACH row |
|-----------------------|---------------------------|
| 2 | 5 |
| 3 | 4 |
| | |
| | |

- Choose a student to use pieces of paper to represent this new array.

? *[Student name] can you make the array that has 3 rows and 4 in each row please?*

- Have the student place the pieces of paper onto the Mat.

? Has [Student Name] made an array that matches this (point to the table)?

- If the student has made the array the wrong way around i.e. 4 rows of 3 refer the class back to the table.

Can we see 3 rows? Remember rows go across the array. (No)

? *I can see what [Student Name] was thinking though. What has [Student Name] done? (They have 4 rows instead of 3 rows but they do have 3 in each row)*
[Student Name] has made the array the wrong way around. [He/She] has made an array that is 4 rows of 3 not 3 rows of 4. [Student name] can you change it so it is 3 rows of 4?

- If the student struggles ask for a volunteer to help modify the array to show 3 rows of 4.
- Repeat this activity with a variety of different arrays that fit onto the Mat.
- Reinforce the concept that the two numbers have different jobs – one tells the number OF rows and the other tells the number IN EACH row.
- Continue making arrays on The Mat until it seems most of the class understand the ideas of making arrays when given a number OF rows and a number that is IN EACH row.

Hands On Activity:

- Provide each student with a copy of the whole page of 1.2cm squares and check they have colouring pencils / highlighters of different colours.
- Use the Multiplication cards Number OF and IN EACH row cards (or just write combinations of number OF rows and IN EACH row on the whiteboard). The idea is to randomly generate some combinations of dimensions for a number of arrays.
- If possible, project a copy of the 1.2cm squares whole page file onto a whiteboard or use an A3 copy or draw an array on the whiteboard to model this activity for at least the first example.
- Select one card from each set to indicate an array with a number OF rows and a number IN EACH row e.g. 5 rows and 6 in each row. Show the students the selected cards or write the combination on the whiteboard so they can all see it.

? *Your job is to colour in an array on your sheet of squares that has 5 rows and 6 in each row. Off you go...*

- Move around the desks and check the students are shading 5 rows of 6 not 6 rows of 5 even though the total is the same. The focus is on the role of the two numbers. If a student has incorrectly represented the array the other way around redirect them without telling them what to change e.g. use some / all of these prompts

What were you asked to make? Can you read it from the board please? (5 rows and 6 in each row)

*Have you made 5 rows? Remember rows go across the array. (Emphasis the **5 rows of 6** by stating it again but not telling them what to make)*

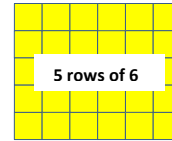
? *I am looking for 5 rows.. Have you made 5 rows?*

*I think you have made six rows instead of 5 rows.. I want to see **5 rows of 6 squares**. If help is still needed.. count the number of rows the student has coloured and point to each as you count. *See you have 6 rows. I want 5 rows but I do want 6 squares IN EACH row. Does that make more sense?**

Do you think you can make 4 sixes now?

- Of course, because the grid they are shading in is a loose sheet of paper it can be turned to represent the correct rows and columns as multiplication is commutative. The focus is to help the students to realise that the numbers in a multiplication situation are different and have particular roles – not just for them to colour in the correct number of squares.

- Share some of the students' arrays by holding them up or if possible, projecting them. Complete this array yourself on the whiteboard or on the A3 larger copy of the grid.
- Model recording the multiplicative situation on the shaded array you have made or use a student's example.
- Record **5 rows of 6** in the middle of the shaded array.



- Choose another pair of cards (or select a student to choose two cards – one of each colour) or just choose a different number of rows and number in each row for the students to represent and state what the new array is e.g. 1 row of 8
- Ask the students to change colour of the pencil/highlighter they are using and to show this new array on their grid paper.

? *Make sure you are making 1 row that has 8 squares in each row (not 8 rows with 1 square in each row)*

- Check that the students are getting the idea.
- Continue selecting cards and having the students represent the arrays on their grid paper.
- In the sets of cards that are being used for this activity there are 2 cards that use 0 as the number OF rows or the number in each row.
- When one of these cards is selected just act like there is nothing different and watch what the students do. If needed, prompt them to have a go (even though of course they should not colour anything.. draw out the intrigue about these examples

? *Why are you just sitting there? Here is the new array to make. Colour it in on your grid please. I want (insert array example being used) e.g. 0 rows of 4 or 6 rows of 0 (whatever the example is)*

- Allow the students to get into the conversation and hopefully they will say something like “but we can't make 0 rows..” or “we can't make rows that have 0 squares in each”.
- Agree with them and use this to pre-empt learning that will come later about multiplying by zero as always being zero no matter what the multiplier or multiplicand is.
- Complete enough examples to either fill the students' grid paper or until you feel they have understood the concept.

Independent Activity:

- Provide each pair of students with another copy of the file [1.2cm squares – whole page](#).
- Each student to selects a colour of pencil or highlighter that is different to their partner's choice.
- Provide each pair of students with a set of Multiplication cards Number OF rows and IN EACH row – (Small) cards (copied onto different colour paper so they can easily choose one of each for each turn).
- Instruct the students about how the activity will work.

You are going to try to make the greatest number of arrays that you can on the grid of squares that you have between you. You are going to be making your arrays on the same piece of paper.

? *You will take turns selecting two cards – one [colour of the number OF row cards] and one [colour of the number IN EACH row cards]. This will tell you how to make your array on the grid of squares.*

Then your partner will have a turn and draw their array on the grid paper.

Keep making arrays until someone chooses an array that they can't fit onto the grid paper.

Keep using your colour so you can find your arrays.

If you can't draw your array, you lose. Or the person who makes the most arrays wins.

- Students can label each array as done in the Hands On activity for each array e.g. 5 rows of 6

Understandings to look for:

- Students who can see that multiplication is repeated addition – in this lesson as repeated rows with a particular number of squares in each
- Students who understand the role of the two numbers in a multiplication situation as indicating the number OF rows (How many) and IN EACH row (How much)
- Students who identify that multiplicative situations making rows creates rectangles (link to area)