Lesson Plan – Numbers as Blocks

Introduction

This scene introduces blocks as a way of visualizing the calculations within the Times Tables. Blocks are used throughout the remainder of the App as it is a very effective way of visually representing the concept of groups and objects within those groups. The scene also reinforces the concept of Number Families (also known as fact families) this time for the 3, 5 and 15 family. In the context of the Times Tables, a number family is a group of 4 equations that contain the same three numbers. The objective of this session is for each student to be able to visualize each times table problem as x groups with y objects in each of those groups.

The students will learn that the order of factors does not change the product, which is the foundation knowledge for the skill of swapping numbers around to solve problems using the easiest Times Tables. As an example, the overall objective by the end of the App is for each student to be able to solve 5 times 8 by swapping the numbers and solving as 8 times 5, which is much easier. This not only improves the efficiency of the calculation; it also takes much of the stress out of learning the times tables.

In addition, when teaching the concept of number families, the connection should be made that division is the opposite of multiplication. If you know that 5 times 3 equals 15 then you also know that 15 divided by 5 equals 3. Building these connections in the brain will help when the students go on to learn division. Whilst the App touches on division throughout, its primary purpose is to learn the Times Tables. You may wish to teach division math facts at the same time as multiplication facts. If so, then just extend the lesson plan for each Times Table to include division activities.

Learning Outcomes

- Each student can visualize the a times tables problem, as groups that can be counted and objects within those groups that can also be counted
- Each student grasps the concept that multiplication is simply a quicker way of adding the same number multiple times.

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- Each student understands that if you swap the numbers around in multiplication you get the same product, or answer (commutative property).
- Each student understands that division is the opposite of multiplication.
- Each student understands the concept of number families (fact families). They are thrilled that knowing the relationship between 3 numbers will give them the answer to 4 equations.

Resources Required

- The App on a device
- Overhead projector or TV Monitor connected to the device (if teaching in a Group)
- Paper and pens/pencils for students
- Cardboard for poster
- Coloured pencils or crayons

Scene

- This activity involves watching the "Numbers as Blocks" scene. After login, select the "Introduction" button followed by the "Number Families" button.

Lesson

Time	Task
20 mins	**Key Concepts** Select the "Numbers as Blocks" Button and watch the video (5 minutes). At the conclusion of the video, ask the student/s: **"What were Mike the Monkeys key messages within the video?"** Responses should include but not be limited to: - Counting can be used to determine both the number of groups and the number of objects within those groups - Blocks are a great way to visualise a Times Tables problem as they are objects of the same size

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- Multiplication is simply a quicker way of adding the same number several times
- Division is the opposite (or inverse) of multiplication
- If you swap the numbers around in multiplication you get exactly the same answer (commutative property). That is 5 times 3 is the same answer as 3 times 5.
- Number families are helpful in remembering math facts
- If you know a multiplication number family then you know how to calculate 4 equations, being the two multiplication equations and their opposite division equations.

You may want to watch the video a second time to reinforce these messages before progressing to the next activity.
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<tr><td>30 mins</td><td>

<u>Exploring Multiplication</u>

This activity can be done as individuals or in groups of up to 4 students.

"It's now time to further explore the concept of multiplication which is a quicker way to add groups of the same size, this time using blocks instead of number lines.

Mike the Monkey showed how adding 3 a total of 5 times was the same as solving the problem 5 times 3. You task is to do use the same process by drawing blocks to solve (write these on the board or paper):

- 3 times 6 or 3 groups of 6

- 3 Times 7 or 3 groups of 7 and

- 3 Times 8 or 3 groups of 8.

Use a separate piece of paper for each of the 3 questions and write the question on the top of the sheet.
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	Use light colours if you can as you will be drawing over the top these blocks later on. Ask each student or groups to present back each of the 3 examples. With each solution ask: - When you look at this solution on the number line, what is the answer to 1 times or 1 group? - What is the answer to 2 times or 2 groups? - And finally, what is the overall answer to the question being for 3 times or 3 groups? Wrap this activity up by asking the student/group: - Do you feel you can now visualize what a times table question looks like with blocks? - Do you think that drawing blocks is an efficient way to work out the answers to a multiplication problem? - What do you feel would be a quicker way to multiply? If you are having a break at this point, then ask the students to keep their workings in a safe place as they are needed for the next activity.
30 mins	**Exploring the Commutative Property** This activity can be done as individuals or in groups of up to 4 students and is done on the sheets of paper as the previous examples. If you have had a break between this and the previous activity, then start by watching the "Numbers as Blocks" scene again. "This activity involves swapping the numbers around and solving them on the same number lines that we used before. Place the solution to these ones above the previous solutions on the number line." - On the sheet where you solved 3 times 6, I need you to write 6 times 3 and show how you would

	solve this by drawing over the top of your original blocks.
	- On the sheet where you solved 3 times 7, I need you to write 7 times 3 and show how you would solve this by drawing over the top of your original blocks.
	- On the sheet where you wrote 3 times 8, I need you to write 8 times 3 and show how you would solve this on the number line.
	Ask each student or groups to present back each of the 3 examples. With each solution ask:
	- When you look at this solution on the number line, what is the answer to 1 times or 1 group?
	- What is the answer to 2 times or 2 groups?
	- What is the answer to 3 times or 3 groups?
	Continue the process up to 6,7 and 8 times for each example.
	Wrap this activity up by asking the student/group:
	- Do you feel you can now visualize what a times table question looks like with blocks?
	- Do you think that drawing blocks is an efficient way to work out the answers to a multiplication problem?
	- What do you feel would be a quicker way to multiply?
20 mins	**<u>Creative Activity</u>** (1) Hand out the carboard to each group and ask them to create a colourful number line poster. Some ideas for what to include on it are: - A number of blocks each with the same number of dots or objects within them - Show where the groups are - Show where the objects within the groups are

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	- A real-life word question for the same times tables example - Mike the Monkey - Dylan the Dragon - Anything else that could add to the creativity (2) If done in groups, have someone from each group talk through their completed poster.