Contents – click on the link below

How to use this work program

Accessing the online resources

To access the online resources, please go to: https://www.backtofrontmaths.com.au/b2fmathshome

Running the program each week

Each week is designed with five maths lessons so that you can do it each day. Different days have different types of lessons to make sure that students experience the kind of thinking that they need to continue growing in maths. The types of lessons include:

- **At-home investigation:** This is a hands-on task where students explore a new idea before they are taught that skill. They need to come up with an idea to try to solve the problem, try out their idea, decide if it worked or not, try again if needed, and explain what they did.
  If your child has time with your teacher with a webcam, the teacher will generally be doing this lesson with your child. This is the lesson that will require the heaviest input from you to help your child think through an idea and generally requires the use of some hands-on materials that are listed in the information page.
- **Connecting lesson:** This type of lesson has questions that lead students to develop their ideas and learn a new skill. It should be fairly easy for a student to do, but you will need to be available to read the question to your child as needed, encourage them to think further, and make sure that they complete the work. Most of these lessons will include 10 minutes of practising number operations or concepts through activities or games.
- **Interleaved practise lesson:** This type of lesson provides 8-10 questions from different areas of maths so that students practise remembering what they have previously been taught. Some of the questions may not be easy for your child, so feel free to help whenever you see them struggling.
- **Generalising lesson:** This lesson contains some extension material for use if your child found the week's lessons too easy. *If you would prefer*, you can spend this lesson playing more of the number games that are included in the connecting lesson or giving your child time to complete any of the lessons that they have not yet done.

Getting help

The website above will have answers to frequently asked questions as well as videos to help you successfully teach your child at home. If you have further questions or need support, please contact your child's teacher directly using the contact details that they have provided to you. If they can't answer your questions, they will contact the B2FMaths@Home team directly to get an answer within 3 days.

What you need to know this week

Week overview
This week we are teaching the concept arrays and counting patterns. In early primary, this means looking for examples of objects being arranged into a grid-like pattern (e.g. tiles or the top of Lego blocks).

Students need to work out:
- When we line objects up, or group them, we can count them more easily (e.g. counting shoes in twos instead of individually).
- How to draw arrays (grid-structures) and groups to represent multiplication (e.g. 4 fives as 4 rows of 5).
- How to count in 2s, 3s and 5s.
- What "multiply" means.

### You will need the following objects:
- Lego if you have any, or similar bricks that have dots arranged across the top
- An egg carton if you have one, and small objects to fit in each of the slots (coins, buttons, small toys, counters from a board game, bottle caps)
- Print out of the squares, or if you have small cubes (like dice) then use those instead
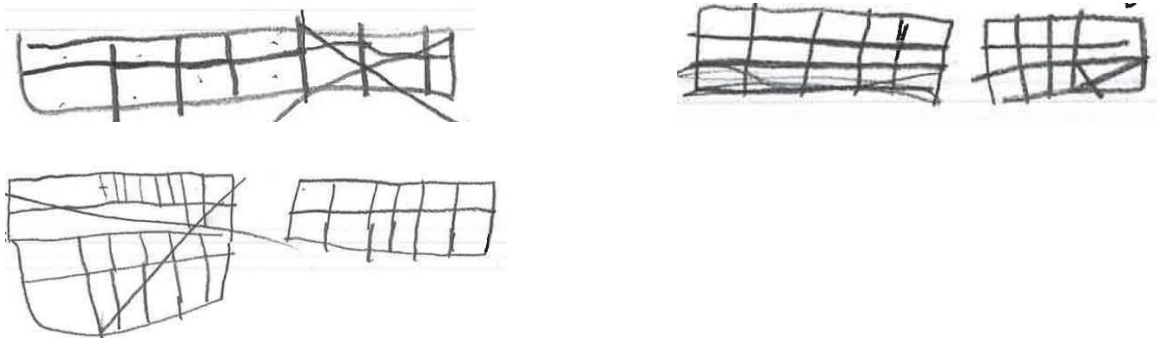
Structural stages

Look at your child's drawings to determine what structural level they are at. Emphasise moving to the next structural stage rather than drawing larger amounts. For teachers: Joanne Mulligan has more information on developing structural thinking in the PASMAP research available online.

Each of the drawings below is of a tens frame (rectangle with 2 rows of 5), drawn by a child who is familiar with tens frames but can't see one. Each drawing was completed by a child aged between 5 and 8.
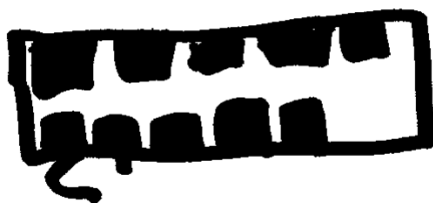
**Prestructural**: does not have 10 squares, not arranged in to correct number of rows or columns
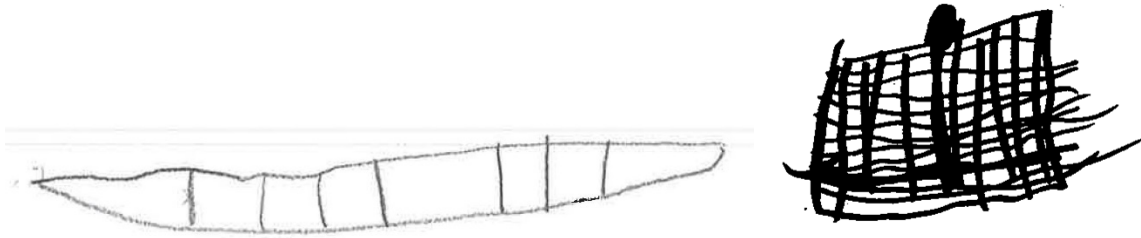
Emergent: correct number of rows or columns, but not both, or just 10 in one line but without 2 rows

Partial structural: can draw 10, but not also keep the structure of rows and columns, often this means 2 rows of 5 but not having the squares touching

Structural: both drawings show structural thinking, however the dots on the images show that the child needed to check that there really were 10
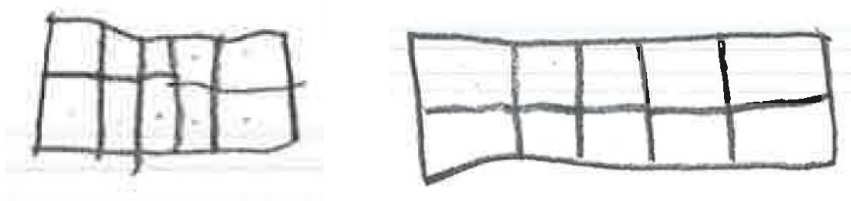
Teacher Overview

Students will be thinking about arrays to develop multiplicative thinking. They will also be focusing heavily on structural drawing of amounts (e.g. drawing a tens frame instead of 10 individual squares).

Students need experience in creating, counting and drawing objects arranged into structures in order to develop strong mental objects for numbers. The term "mental objects" refers to being able to move things around like real objects in your mind. You have to be able to manipulate them, not just picture them. This will help students later with place value, algebraic thinking, multiplicative thinking, understanding fractions and lots more.

- Students need to develop an appropriate vocabulary to describe what they see. Use words such as: rows, lines, columns, 3 twos or 3 groups of two, lined up, arranged, "counting in 2s" etc
- Construction and deconstruction of models provides experiences that help young students to build perceptive understanding of multiplicative relationships.
- Drawing the models helps students develop a stronger understanding. Have them collect a certain number of blocks and then line them up, cover the blocks, then draw from memory.
- Skip counting collections is faster than counting individually. Using an array allows us to see the relationship between addition and multiplication.
- While both arrays and groups can be used to represent multiplication and division, arrays are much more powerful. They show both factors and the multiple at the same time. They connect "counting in" (e.g. number in each row), with multiplying. They can be used later to show properties of numbers such as "square", "prime", "composite" and to also demonstrate the commutative and distributive laws. They are incredibly important for algebra and are also linked with an understanding of fractions and probability. **Please don't skip arrays**.

What to emphasise

If you have time online with a webcam
Work on having students make arrays, cover them, then draw them. Try to emphasise sticking the squares together, drawing the whole rectangle, then cutting, rather than drawing the squares individually. Check that the parents understand how the number games for the week work and make sure that you ask the student if they have played them yet.

If you have only email or phone contact
Check that parents have read the "What you need to know this week" section. Check that they understand the importance of using the number tasks and interleaving sheet so that students retain what they have learned and think regularly about number.

Tracking student achievement
Has the student represented multiplication using a "groups of" or "array" model?
- If so, tick **N2C** on the tracking sheet.
- Have they created these for any single digit number? Tick **N2B**.

Has the student recognised increasing and decreasing sequences with 2s, 3s and 5s?
- If so, tick **N1C**. Can they also include 4s and 10s? Tick **N1B**.

For free use in 2020 during the virus pandemic   www.backtofrontmaths.com.au

Monday: At-Home Investigation

You will need:
- 24 small cubes, or cut out the squares below to use instead
- A tea towel or piece of paper to cover the cubes or squares
- Lego blocks if you have them

Steps:
1. Make sure you have read "What you need to know this week" so that you know what to emphasise with your child.
2. Read the sheet to your child. Ask for their ideas on how to solve the problems. Encourage them to move the squares or cubes around to form a rectangle. Ask them, "Is this a rectangle? Is everything lined up?"
3. Your child should come up with multiple different rectangles: 1x24, 2x12, 3x8, 4x6. These can be horizontal or vertical – it won't matter. The important part is using each different arrangement for the same quantity. If they get stuck try asking, "How about if we have 2 rows? How about if we put them all in 1 row?"
4. Make sure that your child tries drawing the array when it is covered. This means they have to think far more about the 24 objects, such as thinking about the 3 lines of eight squares. Be aware that many children need multiple attempts at this question. If your child is wrong, uncover the squares and look at them again with your child. Help your child think about what worked and what didn't, then come up with a new plan if needed. Have them count the number in each row and look at how the squares/blocks are aligned. Re-cover the objects and try again.
5. If your child is still wrong after multiple attempts, reduce the number of blocks/squares to 12 and try again.
6. Encourage your child to find and draw an array with more than 20 objects from somewhere in the house. Scribe for them if you need to, but please don't do the drawings as they help the child to develop a stronger understanding.
7. Discuss what your child found out with them. Keep in mind the ideas from the "What you need to know this week" section so that you can ask questions that are appropriate to the issues identified. Try to encourage your child to count in 2s, 3s or 4s rather than 1s.

At-Home Investigation

Here is an array of 12 muffins. They are lined up in rows. Use the squares to make some arrays of 24 and draw them.

Make as many arrays as you can find from your 24 squares. Cover your arrays with a tea towel or piece of paper and draw what you can remember:

How are your arrays similar? How are they different? Write number sentences to show how you could count them.

How might your answer change if you had one more square? Draw it or explain your thinking.

Arrays in your house:

Find an array in your house with more than 20 objects in it. Draw it here.

Teacher Overview

This is a *Problem Solving and Reasoning* task.

The emphasis is *modelling* arrays and discussing the *similarities*, *differences* and *patterns* or *characteristics*. We want students to explore arrays and develop structural thinking. There is also an emphasis on *generalising* – such as realising that the orientation of an array does not change how many objects are in the array.

Finding arrays at home is something that you can do via a webcam. Children can also hold up their drawings of arrays if they do them in pen. If needed, children can also cut out and glue the squares into an array before drawing.

Watch out for:
- Needing to see the array to be able to draw it
- Not having equal numbers in each row/column (this is not an array)
- Adults drawing for the children
- Levels of structural thinking
- Not connecting "counting in" with the number of rows/columns

Good questions to prompt thinking:
- Show me an array. It has to be all lined up into rows. What can you find that is an array?
- Is this an array? (NB you would draw 12 not arranged in an array)
- How could you make sure it was an array?

Students requiring support:
- Reduce the number of squares to 12
- Glue the squares into an array
- Use your finger/pen to trace the outside lines for each square then try drawing them
- Check drawing of a tens frame.

Extension:
- Change the numbers. Introduce the multiplication symbol.
- Emphasise the need to move from partial structural to structural thinking
- Talk about fractions in relation to your 24, e.g. a quarter or a third of 24.

Tuesday: Connecting Lesson

Number game for 10-15 minutes: *Target partitioning*
You will need: a piece of paper, or tea towel to act as the "target", and 18 objects to throw at it.

1. Show your child the items and ask them how many there are.
   a. If you child cannot work out that there are 18 objects, reduce the number to 12 and try again.
2. Ask your child to try throwing the objects to land on the target. Once all 18 have been thrown, record how many hits and how many misses as shown in the table below.

Hits	Misses	Number sentence
5	13	5+13=18

3. Focus on counting only one of the numbers, then guess the other number, and count to confirm (whether right or wrong). Have your child read the number sentence out before trying again.

Worksheet task: 15-20 minutes
This lesson is following on from what your child learned yesterday about **arrays**. The purpose of the lesson is to discuss **aligning** objects into rows, then **counting them in groups**.

Lego fours task: 15 minutes
Use Lego bricks to represent rows/columns of 4. Make each one and encourage your child to work out how many dots there are. Please note: being able to work out increasing and decreasing sequences with 4s is a requirement for a B standard (e.g. counting in 4s). This task is great for developing that understanding.

Your child also has to be able to work out multiplying any single digit number to achieve a B standard. This doesn't mean knowing all the multiplication facts yet, just being able to work them out.
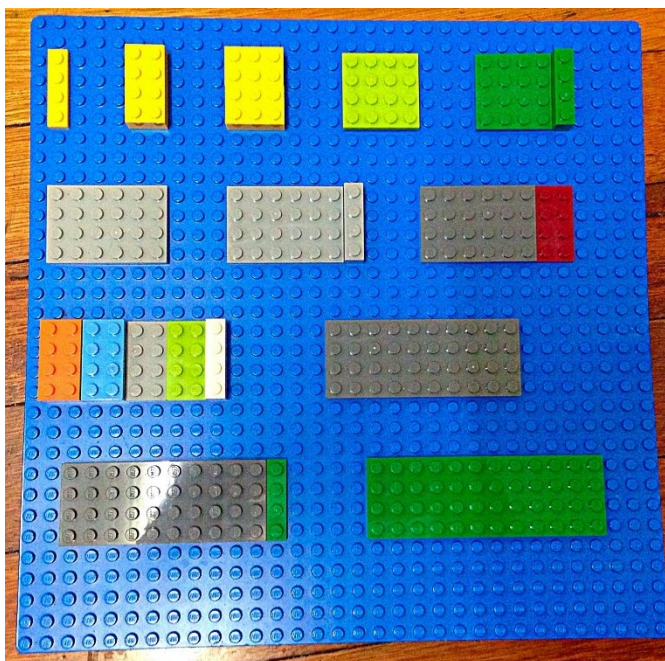
2A made a vegetable garden near their classroom.
They planted lettuces in 5 rows of 3 plants.
How many lettuce plants did they have? Draw the garden.

🖊 or 🖐   Draw the garden and work out how many plants there were.

How many lettuce plants would there have been if 2A had made 3 rows of 5?

🖊 or 🖐   Show how you worked it out.

🗣   What is the same about these two arrays?

2A had 6 tomato plants. They grew so well that 2A decided to double the number of plants they had.
How many would they have then?

🖊 or 🖐   Show how you worked it out.

🗣   Tell a friend how you solved the problem.

Problem solving:
Teacher initials: Date:
Student solved the problem with: ○ Minimal help ○ Some prompting ○ Solved after explanation ○ Did not work out a   solution by themself ○ N/A – not a novel problem

Peer Assessment

Name:

Teacher Overview

This is a **Reasoning** task.

The purpose of this lesson is to *discuss,* the *similarities* and *differences* between arrays and make *connections*. This activity emphasises partial structural models for arrays, so feel free to work on structural models instead. Make sure children try drawing each array.

To help students retain the information, make sure that they have *explained their reasons* for drawing to their parents. If you have time online with students, emphasise counting in 3s and 4s, lining objects up, and positional language.

The Lego task is an optional extra but is great for helping families to see the connection between "counting in" and the array structure. It also useful for building confidence in adults and enjoyment for children.

Wednesday: Application Lesson

This lesson allows your child to practise what they have learned over the past two days.

Number game for 10-15 minutes: *Array fun*
You will need: a print out of the grid at the bottom of this page, 2 colours of pencil, one or two dice.

1. Player one rolls the two dice (or one dice two times). The numbers rolled are the length and width of your array to colour! (e.g. a 4 and a 3 would need a 4 x 3 array) You can turn it sideways to fit. Colour your array on the grid, then it is the other player's turn.
2. The player who wins is the last player who can draw their array.

Worksheet task: 15-20 minutes
This lesson is following on from what your child learned yesterday about **arrays**. The purpose of the lesson is to **connect** the arrays with multiplication. For each array, have your child describe the number of rows, the number in each row, and count the muffins (by the number of rows or columns).
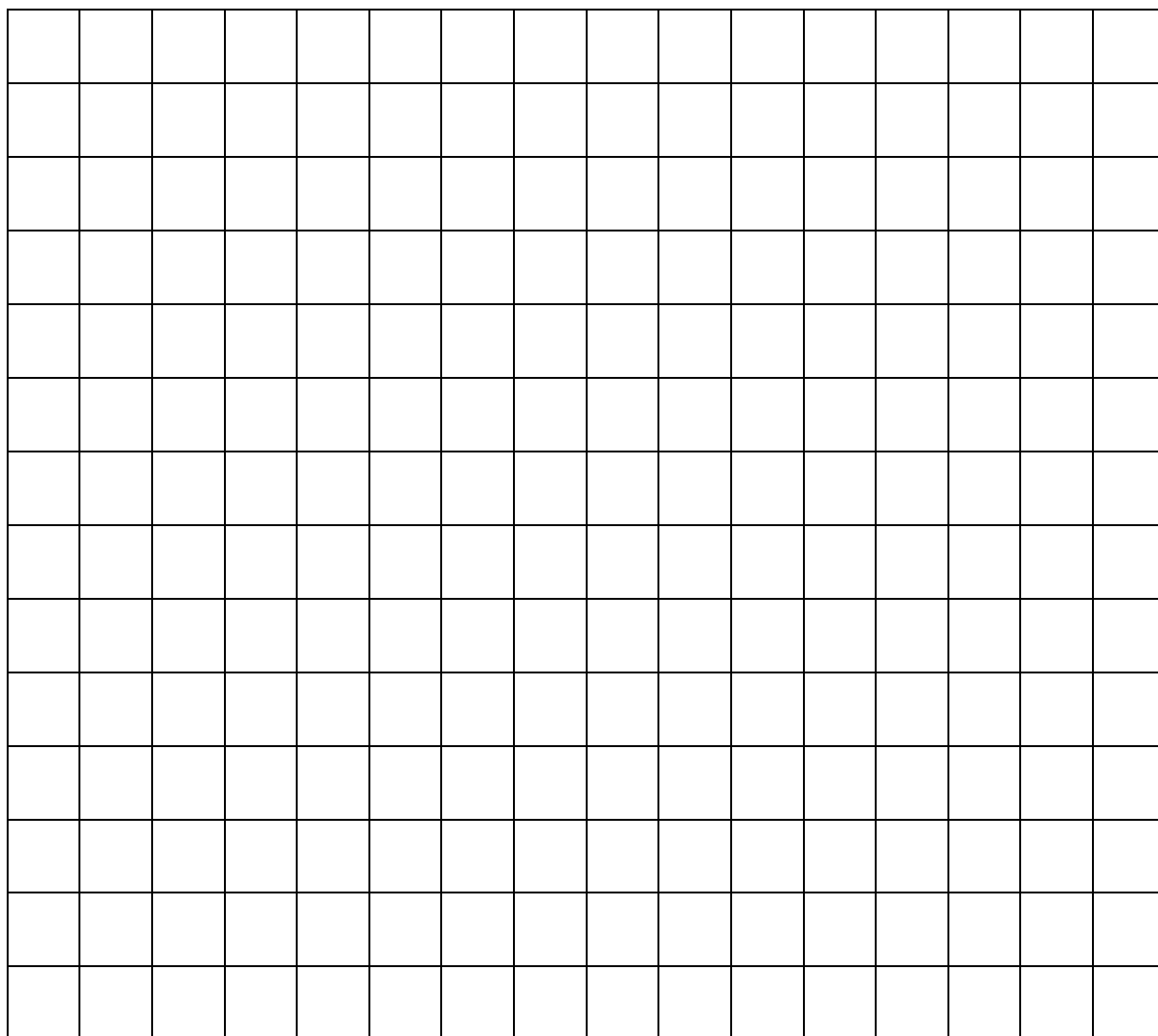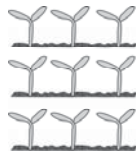
Application questions

1. 2A's vegetable garden has 12 carrot plants. Draw the different ways that these plants could be planted in rows.
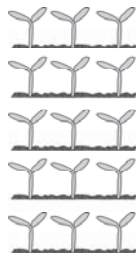
    ✏️ or ✍️ Show the rows of plants that could be made.

2. These are some of the ways that the vegetable plants in the garden have been arranged. Fill in the boxes to describe the rows and numbers of plants.
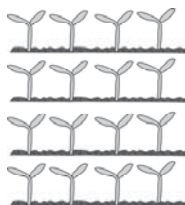
    ☐ rows with ☐ plants in each row.
    How many altogether?

    ☐ rows with ☐ plants in each row.
    How many altogether?

    ☐ rows with ☐ plants in each row.
    How many altogether?

    ☐ rows with ☐ plants in each row.
    How many altogether?

Teacher Overview

This is an *Application* lesson. It gives students another chance to develop an understanding of arrays. At the end of this lesson students need to be able to describe multiplication as groups or arrays, and count in at least 3s and 4s to meet the Achievement Standard.

Other considerations:
- Check that the student has played the number games and remind parents that it is important if they haven't played it with their child.
- If the student can describe the arrays with 3s and 4s, and connect those to multiplication, that is the C standard. For a B standard the child has to be able to work out multiplication for any single digit number (not know by rote).

Thursday: Interleaved Practice Questions

Why we are using mixed up questions:
In this lesson your child will be reviewing a range of skills that they have learned previously. Each question is unrelated to the previous question, because we want your child to have to *think hard* about what to do. Mixing up questions like this, rather than just practising related questions, has been shown in research to improve student retention of concepts by 60% over a 4 month period.

What to expect:
Your child will probably have forgotten how to complete quite a few of the questions. If needed, change the numbers in each question to make them easier because this will still require your child to think hard and remember a process. If they still can't work it out, feel free to show them, but try using different numbers rather than the exact same question. There are answers to each question on the website in case you get stuck.

Interleaved practice

Number:

1. Starting at 121, count in 10s until you get to 201.

2. 42 - _____ = 17

3. What number is 10 more than 99?

4. Write the number 318 in words.

5. Share 16 counters to show quarters. Then show eighths.

Measurement/Geometry:

6. How many coffee cups fill up your big mixing bowl with water?

7. How long is it until lunch time?

8. Describe how to get from your bedroom to the kitchen. How many steps are needed? How do you have to turn?

Chance/Data:

9. What can you tell from the information in the graph? Write 3 true statements.
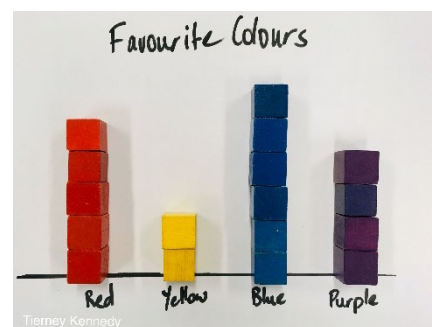
Teacher Overview

The questions on this worksheet are drawn from the "C standard" of the Achievement Standard. See your tracking sheet for more detail. Each week the interleaved questions will get a little harder, and more concepts will be reviewed throughout the program as we teach that concept. We have included answers to these questions on the B2FMaths@Home so that parents can find them if needed.

Support for struggling students:
You might like to try the Interleaved questions from a lower year level, or simply reduce the numbers in the questions. You might also give the student the answer then ask them to work out how the answer was obtained.

Friday: Connecting Lesson

Array Hunt
Go on an array hunt! Take photos or draw arrays that you can find in your house that have at least 25 objects in them. Count the number of items in your arrays and write down the numbers. Explain how you counted them.

How many squares would there be on this fabric? How do you know?

If we plant one seedling in each pot, how many seedlings in that?
You have to work it out without counting them all!
Write down your number sentences to show your thinking.

Teacher Overview

This is a *Conceptual Understanding* and *Reasoning* lesson. It is designed to extend student understanding further and promote generalising.

The purpose of the lesson is to give students an opportunity to start looking for arrays in the real world and draw their attention to the structures present in everyday objects. It also gives students the opportunity to solve a complex and challenging problem and to think about the logic involved.

To extend student thinking further:
- Ask students to count all the shoes in their house. They could line the pairs of shoes up down the hallway to take a photo and count them.
- Create arrays of any single digit number and explore breaking them into parts.
- Cover parts of arrays (as illustrated in the fabric picture).