Work Program for B2FMaths@Home Week 3 Year 3

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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

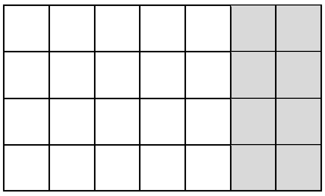
This week we are teaching the concept arrays and counting patterns. We will particularly be focusing on arrays of objects arranged into a grid-like pattern (e.g. tiles or the top of Lego blocks). This model for multiplication and division has links with many other concepts in later years, such as area, volume, fractions and helps develop a firm foundation for understanding algebra.

Students need to work out:

- How to draw arrays (grid-structures) and groups to represent multiplication (e.g. 4 fives as 4 rows of 5).
- Connections between addition and multiplication
- How to easily calculate multiplication for 1, 2, 3, 4, 5 and 10 facts, and be able to efficiently work out 6, 7, 8 and 9 facts (see Distributive Property below).

We are also hoping that students will learn:

- Arrays can be easily split to show other facts. In later years we will call this the **Distributive Property**

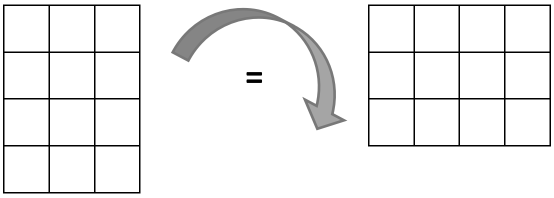


4 sevens is the same as

4 fives *and* 4 twos

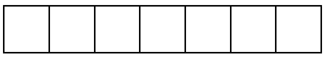
4x7 = 4x5 + 4x2

- Arrays can be rotated to demonstrate that 4x3 = 3x4. In later years we will call this the **Commutative Property**

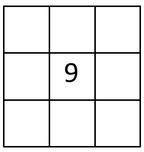


4 threes = 3 fours

- **Prime numbers**, like 7, can only be made by multiplying 1 by itself. That means that they only have 2 factors: themselves and 1. When we arrange prime numbers into arrays, they make lines.



- **Composite numbers** have more than 2 factors. They make arrays other than in one line.
- **Even numbers** can all make arrays with 2 on one side (as one factor). **Odd numbers** can't.
- **Square numbers** can make square arrays.

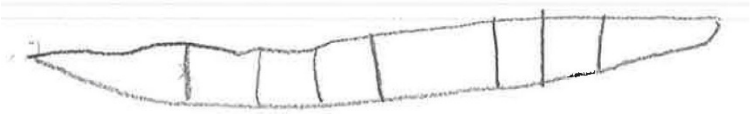


Structural stages

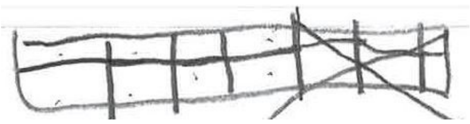
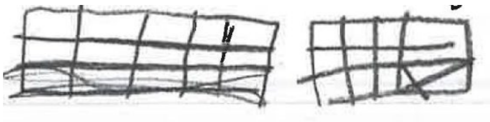
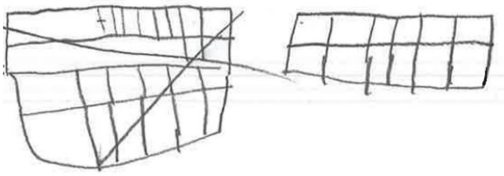
Look at your child's drawings to determine what structural level they are at. Emphasise moving to the next structural stage rather than drawing larger amounts. For teachers: Joanne Mulligan has more information on developing structural thinking in the PASMAP research available online.

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.

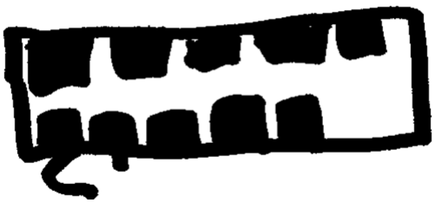
Prestructural: does not have 10 squares, not arranged in to correct number of rows or columns



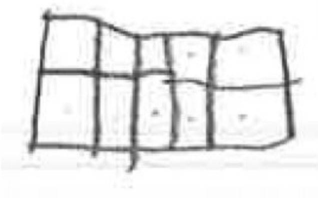
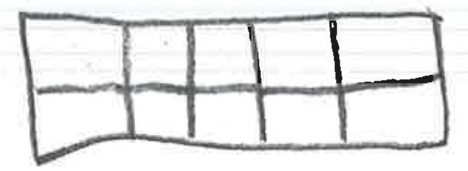

Emergent: correct number of rows or columns, but not both, or just 10 in one line but without 2 rows

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

Monday: At-Home Investigation

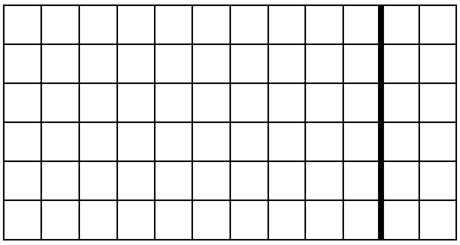
You will need:

- Grid paper that is provided
- Coloured pencils
- If you have some large Lego pieces then feel free to use those instead of the image provided

Steps:

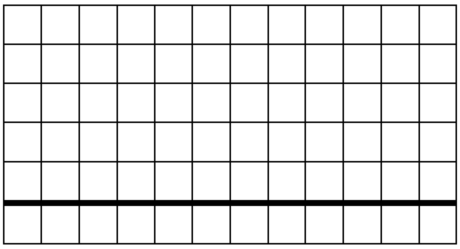
1. Make sure you have read "What you need to know this week" so that you know what to emphasise with your child.
2. Read the sheet to your child. When your child draws the rectangle of 6 x 12, they do not need to draw on all the dots. One square can stand for one dot. Just draw around the outside of a rectangle 6 x 12.
3. Ask for your child's ideas on how to solve the problem but cutting up either the 12 or the 6 to make it easier. Hopefully they will work out that cutting the 12 into a 10 and a 2 is much easier than cutting it into 2 sixes. Once they have tried their own way first, feel free to suggest using a 10 and a 2.
4. Try to encourage your child to use any multiplication facts that they already know rather than counting all the dots. For example, "Do you know your 10x facts? How about we look at this big part then? What would 6 x 10 be?"
5. 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 explain how they have solved the problem and focus on using that strategy for breaking up other tricky multiplication situations.

Below are a few ideas for how your child could solve the problem. They all work. Some are easier.



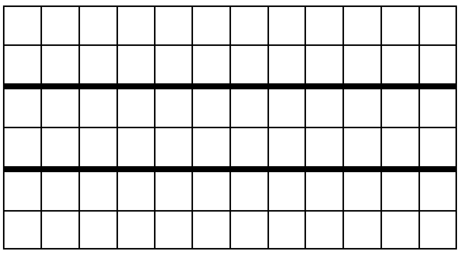
Split the 12 into 10 and 2

6x10 = 60, 6x2 = 12
60 + 12 = 72



Split the 6 into 5 and 1

5x12 = 60, 1x12 = 12
60 + 12 = 72



Split the 6 into 2, 2, 2

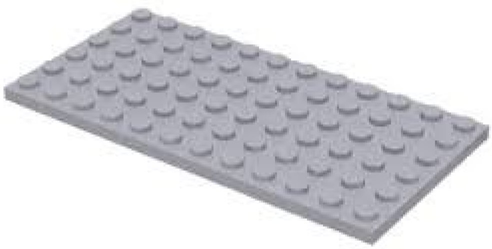
2x12 = 24
24 + 24 + 24 = 72

At-Home Investigation

Sometimes arrays are quite large and need to be broken into smaller amounts to make the multiplication easier.

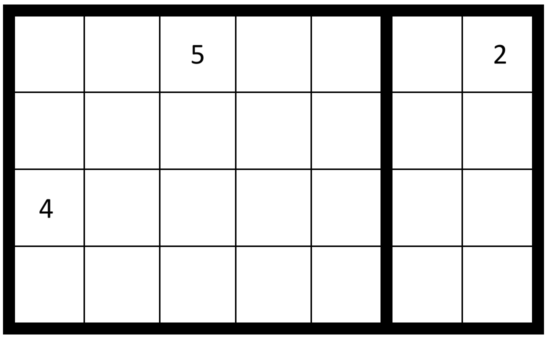
Examine a large Lego piece

The Lego piece below has lots of dots on it. It is 6 dots wide and 12 dots long. Draw a rectangle on your grid paper to represent the Lego piece. How long is it? How wide is it?



Think it through

Multiplying 6 x 12 is tricky. Perhaps there is a way that we can break up the 12 or the 6 to make it easier? Write down at least 2 ideas about how you could break your rectangle up to make it easier to work out the total number of squares. Here is an example of how we could break up 4 x 7 into a 4 x 5 part and a 4 x 2 part.



Try out at least 2 of your ideas on your grid paper. Sketch what you did here and write on the numbers. What did you find that worked?

Generalise your findings:

Do you think you could come up with a similar idea for other tricky numbers too? What might you do if one side of the rectangle was 4 and the other side was:

- 6
- 7
- 9
- 8

Tuesday: Connecting Lesson

Number task for 10-15 minutes: *Finding a total* **<u>This task is the same as last week</u>**

Choose a composite number between 10 and 50.

Roll a dice 4 times to get 4 numbers, or just pick any 4 numbers between 1 and 8.

Try to use those numbers to get as close as possible to your target number.

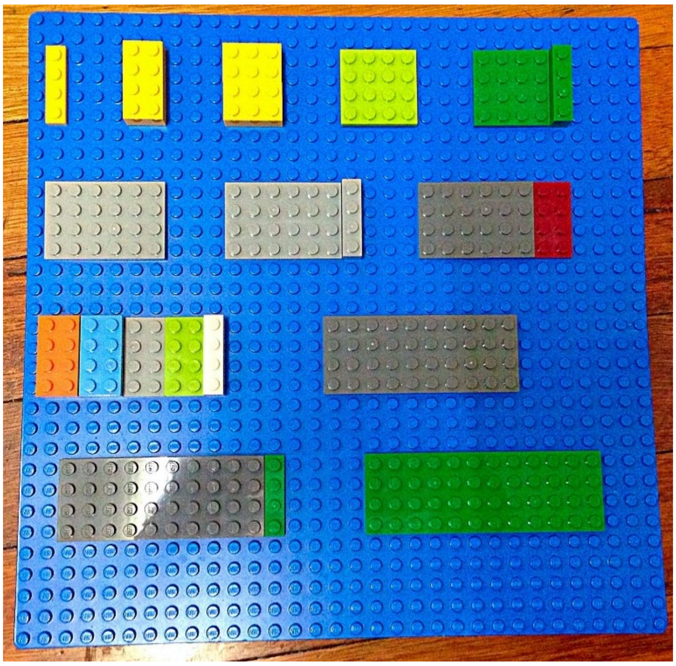
Rules:

- Not all 4 numbers have to be used
- A number can only be used once
- Use any operation you like (+ - x ÷) and any others that you know (e.g. powers or square roots, ! etc.)

Try at least 3 numbers.

Worksheet task: 15-20 minutes
This lesson is a review of the connection between addition and multiplication. It shouldn't be too hard to do. It focuses heavily on counting patterns using 2s, 3s, 5s and 10s as knowing these facts is required for students to achieve the "C" standard.

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.



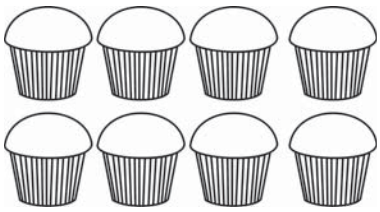
Your child also has to be able to work out multiplying any single digit number to achieve a B standard. This doesn't mean knowing all the multiplication facts yet, just being able to work them out.

D16. Arrays and skip counting

TR p78

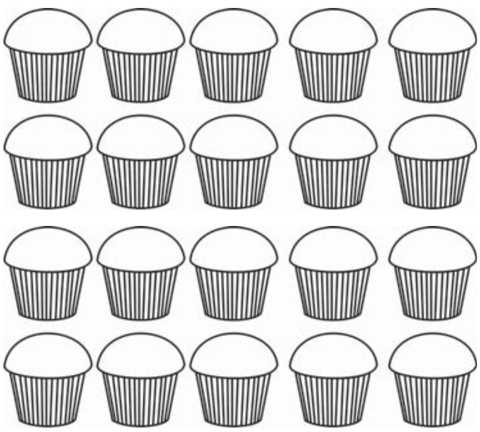
The following pictures show arrays. Your job is to work out how to count arrays without having to count every single object.

1. One way that I could count the following muffins is like this: 2, 4, 6, 8.



2. What is another way that I could count them?

3. How could I count the muffins below?



4. How else could I count these muffins?

5. How could I count these jerseys?

6. How else could I count these jerseys?

7. Soldiers were lined up in rows of five. There were four rows of five.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- **Colour in red** one of the sets of **counting numbers** that would help you work out how many soldiers there were. Write them here:

- **Colour in blue** the other set of that would help you work out how many soldiers there were. Write them here:

Which number is coloured in red and blue? Explain why it is coloured in both colours:

8. Muffins were lined up in rows of four. There were six rows of four.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- **Colour in red** one of the sets of **counting numbers** that would help you work out how many muffins there were. Write them here:

- **Colour in blue** the other set of that would help you work out how many muffins there were. Write them here:

Which number is coloured in red and blue? Explain why it is coloured in both colours:

BACKWARDS QUESTION:

What is missing from this counting pattern? ____, ____, 6, ____, 12, ____

How did you know?

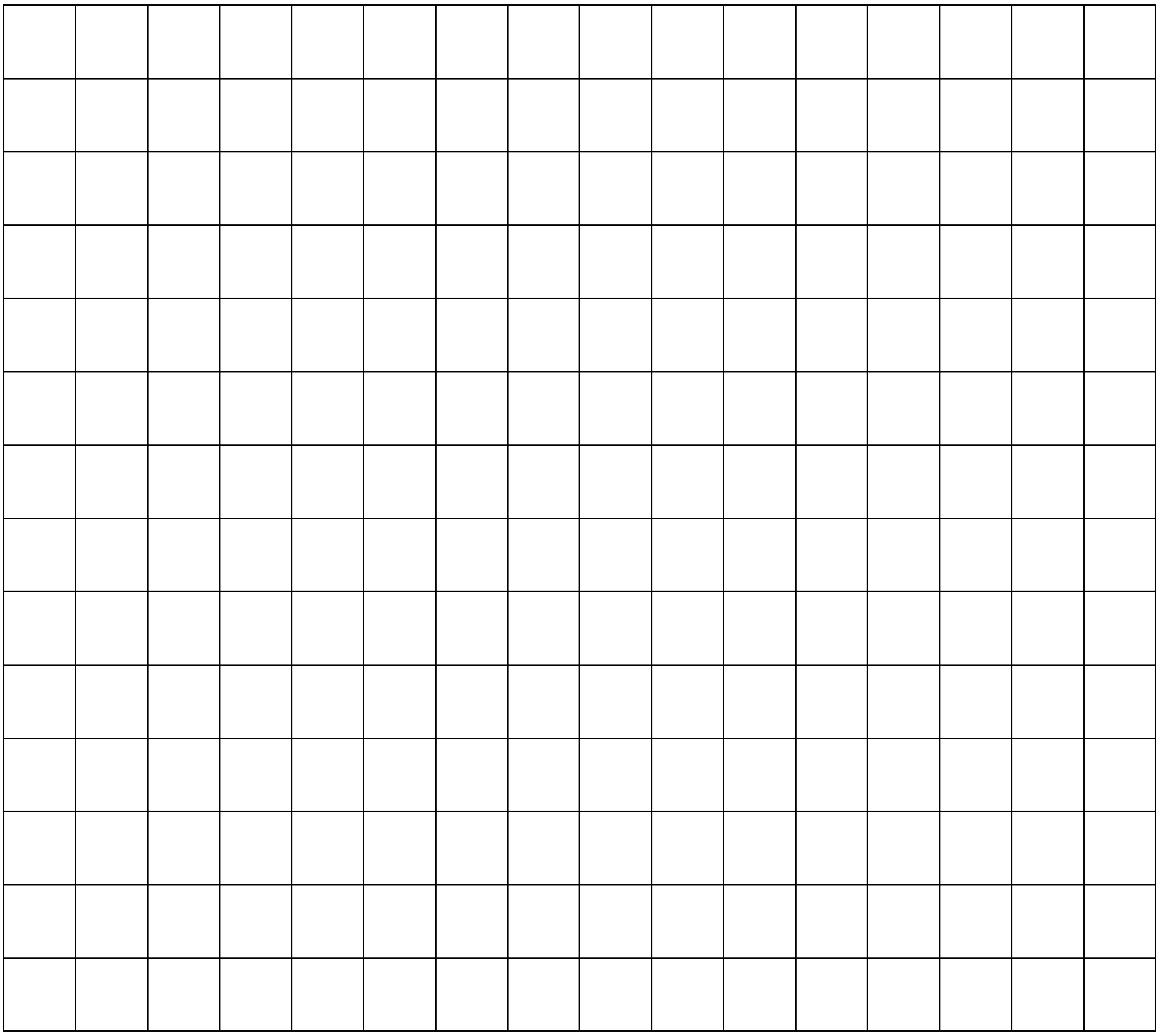
Wednesday: Application Lesson

This lesson allows your child to practise what they have learned over the past two days and focus on the connection between addition and multiplication.

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 both addition and multiplication. For each array, have your child describe the number of rows, the number in each row, and explain the connection out loud.



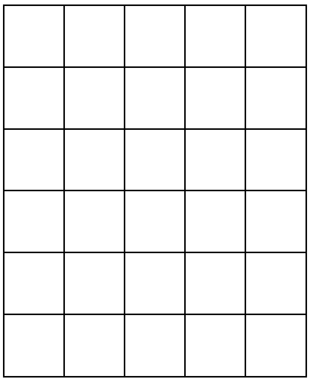
Connecting adding and multiplying

Both adding and multiplying number sentences can be used to describe arrays. Your job is to use the questions below to work out how they are connected.

Matthew collects stickers. He puts them in rows of five on his sticker chart. He makes six rows of stickers. How many does he have? Draw his sticker collection below:

1. How could you count the stickers in collections? Write the counting numbers that you could use at the end of each row and column.
2. Using the counting numbers, write two different Addition number sentences that you could use to work out how many stickers there are altogether. Use this space:
3. Now write two different Multiplication number sentences that you could use to work out how many stickers there are altogether. Check them with your calculator. Use this space:

The number sentences that you wrote are connected. Use the questions below to work out how they are connected.



Add sentence: 5 + 5 + 5 + 5 + 5 + 5 =

Multiply sentence: 5 x 6 =

Write any others that are related here:

1. Look at the Multiplication sentence.
    - What does the five mean?
    - Where is the five in the drawing?
    - Where is the five in the Addition sentence?
2. Look at the Multiplication sentence.
    - What does the six mean?
    - Where is the six in the drawing?
    - Where is the six in the Addition sentence?
3. If Matthew had seven rows instead of six, how would your number sentences change? Write new number sentences below and adjust your picture above.

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 4 257, count in 100s until you get to 5 257.

2. 342 - ____ = 127

3. What number is 1 more than 5 099? Now write the number that is 10 more and the number that is 100 more than 5 099.

4. Read this number and say it: 1 708. Write it in words. How many thousands, hundreds, tens and ones does it have?

5. Share 30 counters to show halves. Then show thirds and fifths.

Measurement/Geometry:

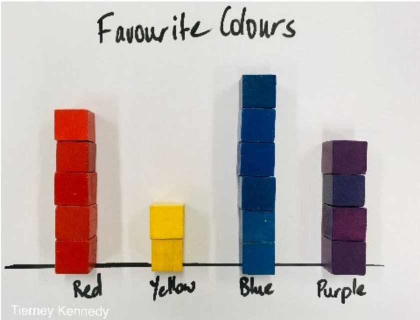
6. Find and draw a container that has a 1 litre capacity. Write down the name of one container that holds less than a litre and one that holds more than a litre.

7. How long is it until lunch time?

8. Draw a simple map to show how to get from your bedroom to the kitchen. Include how many steps are needed and the turns you need to make.

Chance/Data:

9. What can you tell from the information in the graph?
Write 3 **true** statements.
What is one thing that the graph **does not** tell you?



Friday: Connecting Lesson

Working out multiplication facts
In the previous lessons this week we have been working hard to connect addition and multiplication. We have also introduced the idea of cutting larger arrays into parts to make it easier to calculate. In this work sheet your child will use all of the strategies that they have learned to calculate all the multiplication facts to 10x10.

Please note: the facts do not need to be solved in any particular order. Try starting by asking your child which facts they already know. Fill those in first. Once the easier facts are done, ask your child to think about which strategies they could use to calculate the remaining facts.

By the end of this year, your child needs to recall easily the facts for at least 2, 3, 5 and 10s (this includes questions such as 8x3 as one of the numbers is in the list). They do not need to recall 4, 6, 7, 8 or 9s, but they do need to have efficient strategies to be able to work them out. Games are one of the best ways to improve recall of number facts, so feel free to play the games from this week often to build your child's fluency.

D20. Work out x facts

TR p80

You need to be able to work out how to multiply numbers and remember the answers quickly. In this activity you will work out each of the multiplication questions and fill the results into the table.

Strategies to use:

1. Skip counting (3, 6, 9)
2. Doubles (2, 4, 6, 8)
3. Counting on from what you know (I know 3 x 2 is 6, so 3 x 3 must be 3 more than 6)
4. Turn arounds (I know 4 x 5 is 20, so 5 x 4 is 20 too)

Choose a blank square. Line up the row it is in with the column it is in. There will be a number at the start of the row and at the start of the column. Multiply the two numbers and put the answer in that square. (E.g. see below: 4 x 5 = 20)

x	1	2	3	4	5	6	7	8	9	10
1			3							
2			6							
3			9							
4					20					
5				20						
6										
7										
8										
9										
10										

Backwards Question:

If my answer was 12, what numbers could I have multiplied to get it? Give as many answers as you can.