Zimbabwe
Ministry of Primary and Secondary Education

NUMERACY

IGATE
Module 1
What is a number?

Improving Gender Attitudes, Transition and Education Outcomes

care

World Vision

The Open University

Girls' Education Challenge

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Revised Module 1 (MoPSE)

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Foundational numeracy

Module 1: What is a number?

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About these modules

This is the first of six Teacher Professional Development (TPD) modules for all teachers working with learners whose attainment in numeracy is below their Grade or Form level. The modules are also appropriate for Initial Teacher Education (ITE) – particularly during school placements or practicum.

Module 1: What is a number?

Module 2: Early addition and subtraction

Module 3: Addition and subtraction of bigger numbers

Module 4: Multiplication and division – part 1

Module 5: Multiplication and division – part 2

Module 6: Fractions and decimals

The modules were collaboratively developed for the Ministry of Primary and Secondary Education (MoPSE) by the Open University, World Vision and CARE International. The modules have been tried and tested in hundreds of primary and secondary schools across Zimbabwe, strengthening the teaching of foundation skills and improving learning outcomes. Our thanks to everyone who contributed – especially teachers, school heads and schools' inspectors.

MoPSE's highest priority is to empower ALL learners through strong foundations in literacy and numeracy.

Whatever their Grade or Form, all learners need strong foundations in literacy and numeracy to succeed in other learning areas. Learners must **learn to read and use number** so they can **read and use number to learn**.

Using the modules

Teachers will benefit most by using the modules within reflective-practice cycles in their schools, as shown below.

Read an activity.
Plan how you will use the activity.
Do the activity with your learners.
Reflect on what learners learned from doing the activity.

- What worked well?
- What would you change next time?

Share your experiences with your colleagues.

- The modules can be used by:
  - individual teachers
  - pairs or groups of teachers
  - whole schools
  - cluster meetings or district workshops.
- The modules provide classroom activities and guidance for effective use.

Learner attainment

We describe learners who can do an activity confidently and successfully as 'higher attaining' and learners who cannot do an activity well as 'lower attaining'.

No one knows what a learner will be able to do given the chance. Every learner has the potential for growth. Teachers have often been surprised when they found a learner who was 'higher attaining' for one activity was then 'lower attaining' for another – and vice versa. So, we don't label learners with words like 'fast' or 'slow'.

A learner may have different levels of attainment in different learning areas, or in different aspects of one learning area. That's why assessment is a big part of the activities. It is important to find out, as often as possible, what learners know and can or can't do. Then they can be given activities at a level that will help them progress.

Working in groups

Learning takes place as a result of **doing** an activity, **thinking** about it, and **understanding** the ideas it contains.

In order to make sure that all learners are **doing**, activities are designed so learners work together in pairs or small groups for most of the lesson. Pairs, or groups of four to six learners, work best because everyone can take part. Sometimes the teacher will need to demonstrate the activity first.

There are several ways in which learners can be put into groups. Teachers should choose the one that works best for their learners.

- **Learners choose their own groups:** Sometimes this can result in friends working (or not working!) together, while other learners are left out.
- **Learners at a similar level of attainment work together:** This can work well, as learners are working at their preferred pace, but learners who need help have to find it from outside the group.
- **Learners at mixed levels of attainment work together:** This type of grouping has the advantage that higher-attaining learners can help lower-attaining ones. This gives lower-attaining learners personal and prompt support, and higher-attaining learners a chance to talk about what they have learned, which helps to deepen their understanding.

Collecting and storing resources

Many of the activities in these modules rely on learners using physical resources. Some activities need large quantities of resources so that learners can work through the activities in small groups. How can you make sure you have enough?

Here are some suggestions from teachers who trialled these materials.

Sticks

- Ask each learner to bring in at least ten small sticks the length of their middle finger.
- Ask learners to hunt for small sticks in the school grounds during break times. (This worked well in rural communities, but not so well in city schools.)
- As an alternative to sticks, ask learners to bring in at least ten toothpicks or drinking straws.
- Bundle up the sticks into 'tens' using elastic bands (if you have them, as these work better for subtraction) or short lengths of wool or string.

Counters

- Ask each learner to bring in a collection of counters. In rural communities, learners usually brought in small stones, beans or seeds. In city schools, learners often brought in plastic beads or bottle tops.

Place value counters

- Ask local bottle stores, lodges and hotels to collect tops from drink bottles. Write the value of the counter on the top with a permanent marker.
- Cut up manila or paper into 2-cm squares and write the value of the counter on each piece.

Making resources together

- Some teachers organised a weekly after-school resource-making meeting to make sure all classes had the equipment they needed. This was especially helpful when making number cards or arrow cards!

Sharing resources

- Share a set of resources between two classes. So, for example, while one class has a literacy lesson, the other class does numeracy, and vice versa. The teachers quickly swop resources between lessons!
- Split the class into two halves. Work with one half of the class on activities that use resources, while the other half work in their books.

Storing resources

Teachers often reused the same resources many times, for lots of different activities. They realised that they would save a lot of time by storing resources carefully, either in their classroom or a common store-cupboard.

Unit 1: Counting

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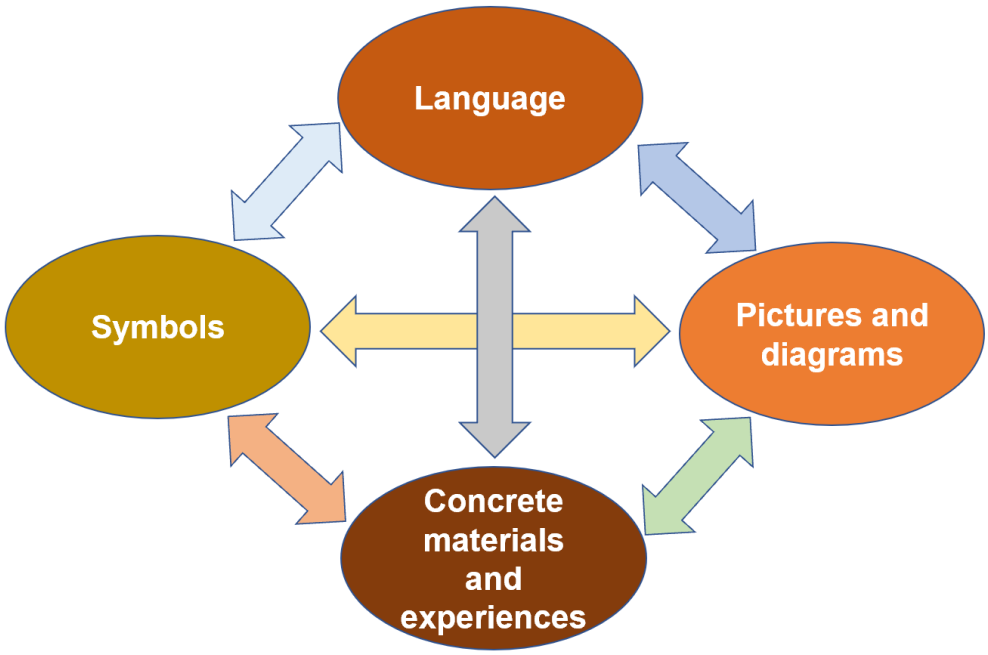
Introduction

Learners need to understand the nature and properties of numbers before using numbers to calculate. This means that they:

- understand that numbers have a fixed order
- know that each number represents a different quantity
- can compare the sizes of numbers
- can count accurately backwards and forwards
- recognise that numbers can be represented in several different ways
- know that, when counting objects, the last number is the number of objects in the set.



Researchers have noticed that introducing learners to different ways of 'seeing' numbers and making connections between them helps learners develop a good understanding of number. The connections between concrete materials and experiences, spoken and written language, symbols (including numerals) and pictorial representations (such as diagrams, number lines and number squares), can be summarised in the diagram above.[1]

This unit will explore how teachers can find out what their learners know – and what they still need to learn – about the number system. It offers opportunities to address any gaps in learners' understanding of counting.

Key words and phrases

- **concrete experiences –** real-life examples of mathematical ideas
- **concrete materials** – objects (for example counters) or diagrams (for example number lines)

[1] Haylock, D. and Cockburn, A. (2017:13) *Understanding Mathematics for Young Children* (5th edition). London: Sage

1.1: Counting out loud and reading numbers

Aim

To check that all learners can:

- say numbers in order to ten, and back from any number less than ten
- read numbers 0–10.

What the learners will do

Learners sit in groups of 4-6 and practise counting forwards and backwards out loud, first from zero or one, then from any number less than ten. Finally, they read and order written numbers 0–10.

Resources

You will need:

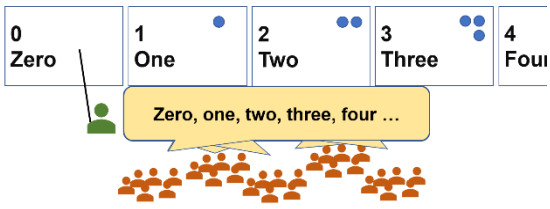
- a 0–10 number card display (**Resource A Number card display**, page 30) – put it where everyone can see it
- a set of large 0–10 number cards (similar to **Resource B Number cards**, page 31, but large enough for all learners to see when you hold them up).

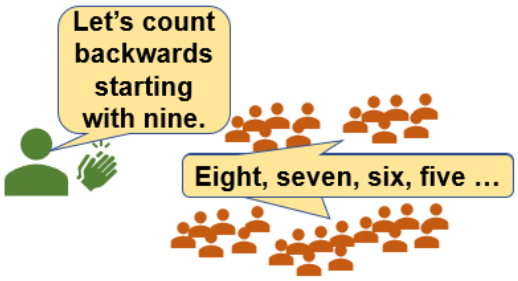
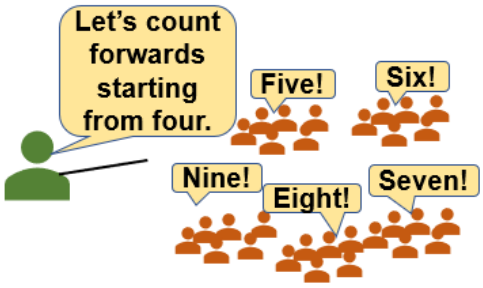
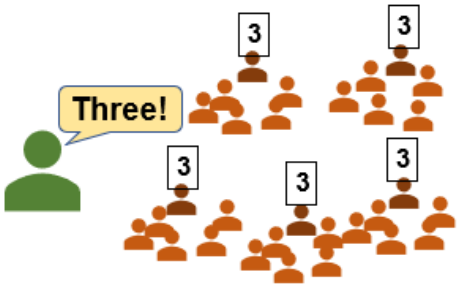
Each group of six to eight learners will need:

- a set of small 0–10 number cards (**Resource B Number cards**, page 31).

Activity

This fast-moving whole-class session will help you to see which aspects of spoken and written numbers your learners know well, and where some learners may need more support. Learners should be seated in groups of 4-6.

1. Stand by the number card display. As you point to the numbers, ask learners to count forwards and backwards from zero to ten. Next, point to different numbers and ask learners to call out each number you point to.	

2. Come away from the display. Ask the whole class to count together by rote from zero to ten as you clap. 3. Now start counting from other numbers, for example, five or seven, asking the class to continue counting forwards or backwards from that number.	
4. This time ask the learners from just one group to say the next number in the count when you point to them.	
5. Ask learners to spread out their number cards, face up, so all the group can see them. When you say a number between zero and ten, one person from each group stands up and holds the correct card above their head. That person can only stand up again when everyone in the group has had a go.	
6. Give one of each of your large set of number cards, in random order, to volunteers. Ask them to arrange themselves into order from the smallest to the biggest number. Ask the rest of the class to give 'thumbs up' if they agree with the order, or 'thumbs down' if they disagree.	
7. Repeat step 5, but this time leave out one card. Groups decide which number is missing and hold up the correct card.	

Assessment

- Step 1. Ask a learner who can count confidently to point to the numbers as the class counts. This gives you the chance to make a note of any learners who are either counting slightly slower than others, or not able to count at all. You will need to give these learners extra practice with counting out loud.
- Steps 2 & 3. Watch learners as they count. Some may be able to count forward from zero or one, but not from other numbers; or back from ten, but not from any other number. These learners will need extra practice counting out loud from any number.
- Step 4. You can say the numbers from anywhere in the classroom. Stand by different groups as you say the numbers to see which learners know what card to pick up and which ones need help with reading numbers.
- Steps 5 & 6. Are all learners sure the order is correct? Some learners may need more practice reading and ordering numbers.
- If you find that everyone in your class is confident with these activities, try working with them on **Module 2 Activity 2.1 Switch**.

In practice

Mr Shumba was asked to try out this activity by his colleagues. He did so reluctantly, because he thought it was too easy for his class. He was surprised to find the activity very helpful in showing him exactly how much his class knew.

During the activity, he **noticed** that a few learners were slow to respond or copied from others. He thought they might need more help with counting. He **noted** down their names and suggested that they attend the after-school club.

When learners were arranging their number cards in order, he was surprised how much they talked about the size of their numbers. He realised that they were learning from each other. He decided that he wanted to do more activities like this, where learners helped each other – the more 'teachers' there are in the classroom, the more learning will take place!

1.2: How many?

Aim

To check that all your learners can:

- count up to ten objects
- read numbers 1–10.

What the learners will do

Learners take turns to turn over a number card. They take a handful of counters from the bag that they think might match the number on the card, then count them to check.

Resources

Each group of four to six learners will need:

- two sets of 1–10 number cards (**Resource B Number cards**, page 31) mixed together
- 12–15 counters (see 'Collecting and storing resources, page 3) in a bag.

Activity

1. Learners work in groups of four to six, with their two sets of 1–10 number cards face down between them.
2. Learners take turns to:
   a) Take a card and read the number that is written on it.
   b) Put their hand in the bag and try to take out a handful of counters to match the number on the card without counting out loud.
   c) Count the counters to check if they were right. (The rest of the group must watch carefully to make sure they don't make a mistake!)
   d) Return the counters to the bag, and the card to the bottom of the pile.

Assessment

As learners do the activity, move around the room watching different groups.

Notice and note learners who:

- find their number difficult to read – the number card display that you put on the wall may help them
- do not count accurately – they may need more practice in everyday situations (for example counting cups for drinks)
- 'just know' quantities up to six without counting. These learners are developing a good sense of number and are ready to move on. Do not make them count in ones if they have already developed the skill of recognising small quantities.

In practice

Mrs Banda liked the idea of learners having to imagine a number of counters and take them out of the bag without being able to see them. She was worried that it would take her a long time to collect all the bags and counters she needed, so she asked the learners to bring in what they could from home. She soon had everything she needed and has put everything away carefully for use the next time she does this activity.

Her learners enjoyed the game and were soon able to pick smaller numbers of counters from the bag correctly. It took a bit longer to choose larger numbers of counters correctly without being able to see them!

1.3: Skittles

Aim

To check that all your learners can:

- count up to ten objects
- write numbers 0–10.

What the learners will do

Learners take turns to try to knock as many skittles over as they can with one roll of the ball. They count how many skittles have fallen and write their score next to their name.

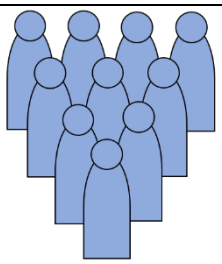
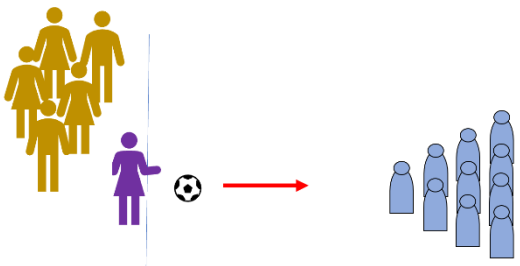
Resources

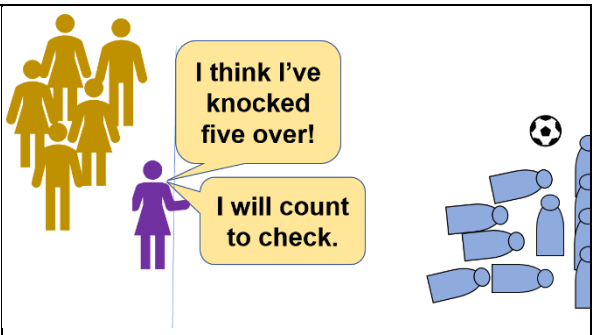
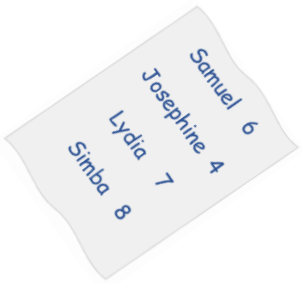
Each group of six learners will need:

- ten plastic bottles, partly filled with a small amount of sand or dirt (the 'skittles')
- a small ball, or one made from screwed-up paper
- somewhere to write scores. This could be on the ground with a stick, or on the classroom floor with chalk, or on paper.

Activity

If you have difficulty gathering lots of bottles to use as skittles, one or two small groups can do this activity while the rest of the class work on another activity, such as **Activity 1.2 How many?** If the skittles are left out in the school yard after the session, learners can continue the game during breaktimes.

1. Arrange the skittles in the shape of a triangle. Draw a line 4–5 metres from the bottles behind which learners will stand. (Adapt distance as necessary for the type of ball you are using.)	
2. Learners take turns to stand behind the line and roll the ball towards the skittles, trying to knock over as many as possible. (Tell them to aim for the point of the triangle.)	

3. After each throw, the learner has to say out loud how many bottles they think they have knocked over and then count the number of bottles.	
4. They write their score next to their name. 5. The winner is the learner who knocks over the most skittles.	

Assessment

This is another activity where you can move around the groups noticing and noting how learners are progressing with their learning.

Look for learners who:

- often estimate the number of skittles they knock over correctly – they have a good sense of number and are ready to move on
- find it difficult to write their score. This may be because they need more practice building the muscles in their hands used for writing, or it may be because they do not know what the numbers look like. Try letting them copy from number cards if this is the case.

In practice

Miss Maphosa knew that her learners needed lots of practice in counting, but she found it difficult to think of interesting ways to do this. She knew her class liked playing games, so she was very pleased to read about the skittles activity. She found that:

- learners enjoyed the activity because it was a game
- they corrected each other if a mistake was made
- they wanted to play the game over and over again
- they played the game at home and at breaktime, as well as in lessons
- all learners had to take part and so everyone was learning.

I arranged for one of the older classes to write the number cards for me, which gave them handwriting practice and saved me time. One or two said that they were going to make sets of cards to take home for their siblings to play with, which made me feel happy that the families would become involved in numeracy learning.

Unit 2: Comparing

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Introduction

This unit focuses on comparing the size of numbers and learning the language of comparison.

There are many words that can be used to compare numbers and measurements. The words used in these activities are restricted to **equal to**, **more than** and **less than**, so that learners become familiar and confident with them.

The best way to learn new language is to use it often, so the activities in the unit focus on learners working together and discussing what they are doing. This will improve learners' reasoning skills and should also lead to improvements in attainment.

Key words and phrases

- **grid** – horizontal and vertical lines drawn to form a set of squares
- **quantity** – how many (linked to counting)
- **size** – how big (linked to measurement)

2.1: Using mathematical language

Aim

This activity introduces learners to mathematical words used for comparing quantities and size. It is important as it helps them to understand and talk about the relationship between numbers.

What the learners will do

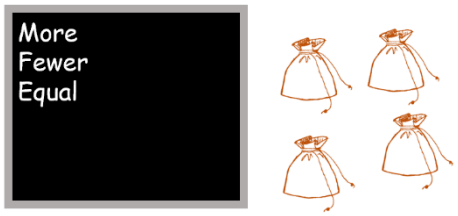
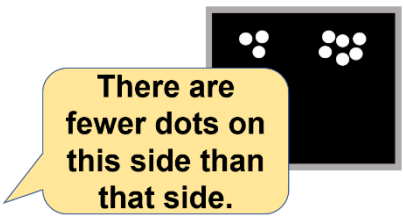
Learners work in groups of four to six. They first say sentences comparing two sets of counters, then repeat the activity using numbers.

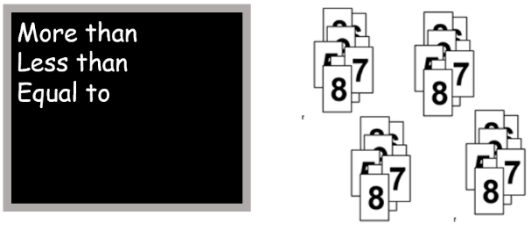
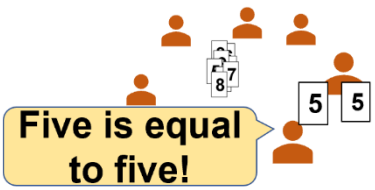
Resources

Each group of four to six learners will need:

- a bag containing 10–15 counters
- two sets of 0–10 number cards (**Resource B Number cards**, page 31).

Activity

1. Give each group a bag of counters. Write *more, fewer* and *equal* on the board.	
2. Spend a few minutes demonstrating the language you want learners to use. For example, *'There are fewer dots on this side'* (point to the group with fewer dots) *'than that side'* (point to the group of more dots) or *'Each side has an equal number of dots.'* Ask learners to repeat the sentences after you.	
3. One learner from each group takes some counters from the bag and puts them into two piles.	

4. A second learner says a sentence to describe the two piles of counters. For example, '*There are more stones in this pile'* (pointing to the pile that has more stones) *'than that pile'* (pointing to the pile that has fewer stones) or *'The two piles have an equal number of stones in them,'* or '*There are fewer stones in this pile than that pile.'*	
5. If all members of the group agree, the counters are returned to the bag. 6. Steps 2 and 3 are repeated until everyone in the group has had a turn taking counters from the bag and saying the sentence that describes the piles of counters.	
7. Collect the objects and give out the number cards. 8. Change the words written on the board to *more than*, *less than* and *equal to*.	
9. Demonstrate the language you want learners to use, holding up pairs of number cards. Ask learners to repeat the sentences after you. For example, *'Five is less than seven,'* or *'Eight is equal to eight.'*	
10. Learners repeat steps 3–5, but this time one learner picks two cards and a second learner says a sentence to describe them.	

Assessment

Tell learners that you are going to try to trick them. You are going to show them some objects or some numbers and say a sentence about them. It might be true, but it might not be true!

If they think the sentence matches the objects or numbers you show them, they should put both their thumbs up.

If they think the two do not match, they should put both thumbs down.

If they are not sure they should put their thumbs sideways.

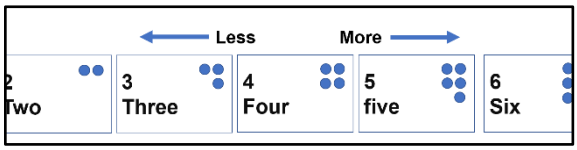
For example:

- Draw a set of four objects and a set of six objects on the board. Say, *'These two sets of objects are equal!'*
- Hold up cards showing 2 and 7. Say, *'Two is less than seven.'*

In order to see who understands and who does not, you will need at least five different sentences.

Make a note of learners who are clearly copying others or seem unsure. They may need a bit more practice before they move on to **Activity 2.2**.

In practice



Mrs Tembo still had the number card display on the classroom wall that she made for **Unit 1 Activity 1.1.** She realised that she could put 'more' and 'less' cards above the number card display, each with an arrow to show that that if a number is more than another number it is further along the line to the right, and vice versa.

2.2: More than, less than or equal to?

Aim

This activity helps learners to connect the language of comparison with the mathematical symbols **<**, **>** and **=**.

What the learners will do

Learners use the words 'more than', 'less than' and 'equal to' to compare numbers on their fingers to numbers on number cards. They write down the number sentences using **<**, **>** or **=** symbols.

Resources

You will need:

- a set of large **<**, **>** and **=** cards (**Resource C Comparing cards**, page 31).

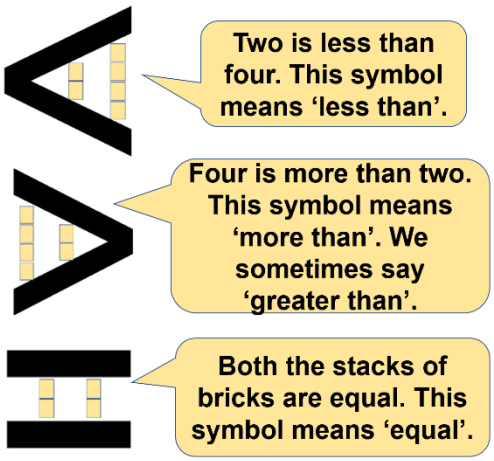
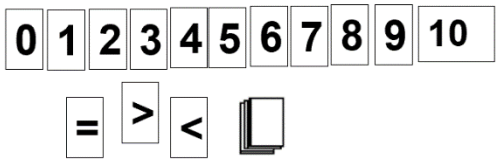
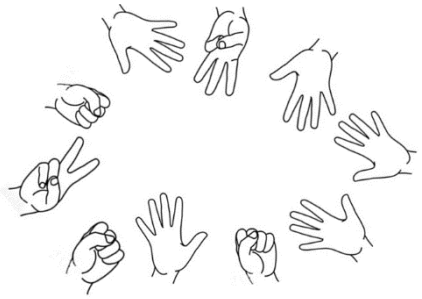
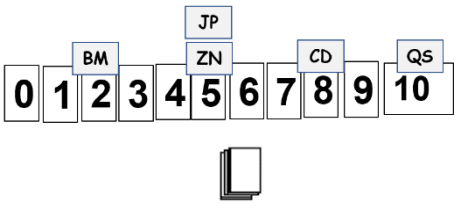
Each group of four or five learners will need:

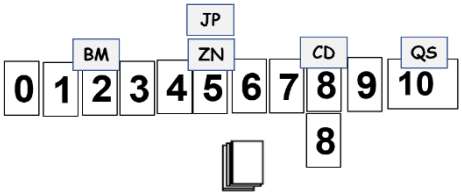
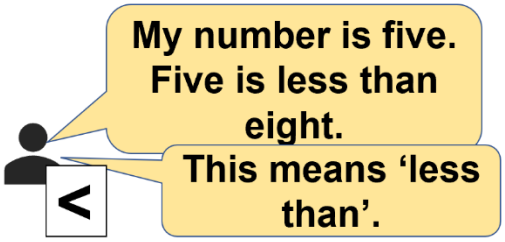
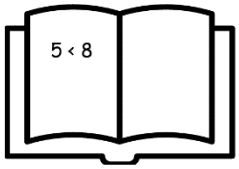
- two sets of 0–10 number cards (**Resource B Number cards**, page 31)
- a set of **<**, **>** and **=** symbol cards (**Resource C Comparing cards** page 31)
- exercise books and pens.

Each learner will also need:

- some kind of individual marker (such as a different-coloured stone or a small piece of paper with their initials on).

Activity

1. Draw the diagrams on the right on the board. (Do not draw the speech bubbles.) Ask learners, in their groups, to discuss the meaning of each diagram. Make sure learners understand the key points (see speech bubbles). Hold up your symbol cards one at a time and ask learners to call out their meaning.	
2. In their groups, learners lay out one set of number cards in order. The **<**, **>** and **=** are also placed on the table so everyone can see them. The other set of number cards are mixed and placed face down in a pile.	
3. Each learner takes a moment to think of a number between 0 and 10. The group counts, *'One, two, three,'* all together. On 'three', everyone places their hands on the table with their fingers showing the number they thought of.	
4. Each learner places their marker (see Resources list above) beside the number card to show the number they thought of.	

5. A number card from the pile is turned over and placed by the matching number in the line.	
6. Each learner in turn says a sentence about the relationship between their number and the number on the card using 'more than', 'less than' or 'equal to'. They pick a symbol card that matches their sentence.	
7. Everyone in the group writes their number sentence. Steps 3–6 are repeated as time allows.	

Assessment

Move around the room watching learners as they do the activity.

Look for learners who:

- count their fingers before putting them on the table – these learners need more practice connecting quantities with number names
- do not use the words 'equal to' when two numbers are the same
- muddle the < and > symbols. Remind them of the diagram on the board. Make a poster for the wall so learners have a reminder outside of this session.

Towards the end of the session, gather the class together.

- Ask two learners to each pick one of your large number cards and stand at the front.
- Ask another learner to pick one of your large symbol cards and stand between the two learners so the symbol is correct.
- If the rest of the class agree, they should put their hands on their shoulders. If they disagree, they should put their hands on their knees.
- Make a note of learners who do not seem to have understood. At another time, do this activity again with these learners.

Use what you have noticed, alongside grading of the books, to get a better picture of learners' understanding.

In practice

Even though he has been teaching for years, Mr Ngwenya still finds it difficult to remember the meanings of the **<** and **>** symbols. Putting the little blocks inside the symbol made it so easy, reminding him that the pointed bit of the symbol always points to the smaller number. His learners found this really helpful too.

3 > 2 means 'three is more than two'

2< 3 means 'two is less than three'

I watch my learners doing group work. If I notice learners having challenges, I ask those learners to answer questions during a whole-class assessment activity at the end of the session. This helps me to know what I need to do next to help those learners.

2.3: 'More than, less than' Bingo

Aim

This activity helps learners to think beyond 'more than' or 'less than'. They begin to use the phrases '*one* more/less' and '*two* more/less' to describe quantities and numbers.

What the learners will do

Learners work together in pairs. They decide whether the numbers they have written on their grid match the description given by the teacher. If a number matches, they cross it off. When all the numbers have been crossed off, they call *'BINGO!'*

Resources

You will need to prepare:

- about 20 'one more/less' and 'two more/less' phrases to call out – for example, 'the number that is two more than five' or 'one less than seven'.
- some 'equal to' phrases, for example, 'the number which is equal to three'.

Make sure no answer goes beyond 10 or below 0.

Each pair of learners will need:

- to draw a 3 x 2 grid. This can be in their books, on the ground with a stick, or on the classroom floor with chalk.

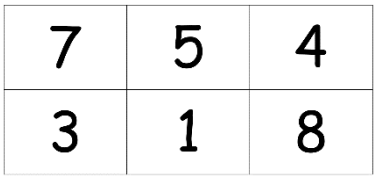
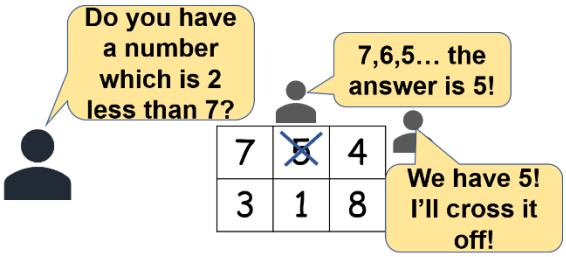
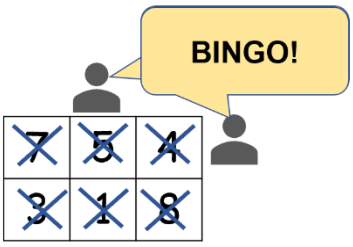
Activity

This is a teacher-led activity, with learners working in pairs. As they decide whether they can cross off a number, it is important to allow learners to talk to each other. Talking helps them to learn.

You might like to model the activity by asking for two volunteers to choose numbers to write in a grid on the board. As you read out phrases that fit the numbers they have written, they cross off the numbers.

Ask learners to think about different ways they could find the answer. These might include:

- using their fingers, putting more up or down as appropriate
- finding the number on the class number card display (**Resource A Number card display**, page 30), and counting forwards or backwards as appropriate
- counting forwards or backwards out loud or in their heads.

1. Ask learners, in pairs, to choose six numbers from 0 to 10 and to write each number in one of the boxes on their grid.	
2. Read one of the phrases you prepared. Learners decide the answer together and, if they have it on their grid, take turns to cross the number off. **Note:** Keep a record of which phrases you have read out, so you can check that learners have crossed off the correct numbers!	
3. When a pair of learners have crossed off all their numbers, they call *'BINGO!'* If they have crossed off the correct numbers, they are the winner. You may like to carry on the game until you have several 'winners'.	
Repeat the game as often as time allows or divide learners into groups of six to do the activity again. A higher-attaining learner could be the caller.	

Assessment

As they do the activities, notice the different ways that learners use to find the answer (see notes at the beginning of the activity). This will tell you how confident they are working with numbers within ten.

In practice

Miss Taderera's class enjoyed playing Bingo. The classroom was very noisy as each pair discussed whether they could cross a number off their card, but it was ‘good’ noise because they were talking about numbers and learning from each other. One group, having only one number left to cross off, was trying to work out what Miss Taderera could call in order for them to win. She thought this showed that these learners have a good understanding of how numbers work.

She decided to start a maths club after school, where learners just play maths games. She could see that Bingo could be used with all sorts of different sets of cards to match the needs of all the learners that come, from number recognition through fractions to multiplication and division!

She felt that teaching maths had become much more fun since she started using games.

Unit 3: Combining

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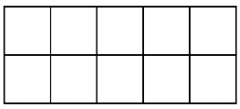
Introduction

Numeracy is full of patterns. Learners need to be encouraged to spot patterns themselves, rather than just having them pointed out in class. This will help them to reason and to solve number problems – something learners often find difficult.

The activities in this unit will help learners develop pattern-spotting skills.

Key words and phrases

- **pattern** – something that repeats, for example a sequence of numbers
- **ten frame** – an arrangement of ten squares (in a 2 x 5 grid) that helps learners to ‘see’ numbers



3.1: 'Seeing' numbers and spotting patterns

Aim

This activity helps learners understand that numbers can be made up from two or more smaller numbers.

It also reminds learners of the meaning of the **+** and **=** symbols.

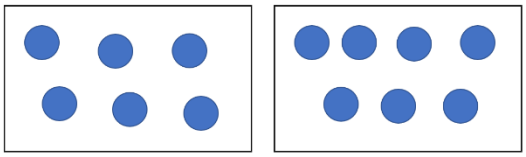
What the learners will do

In pairs, then in groups of four, learners discuss different ways that they can 'see' various groups of objects. They write down all the different ways they can think of to make numbers using **+** and **=**.

Resources

You will need to prepare:

- large cards exactly like the ones on the right (the arrangement of the spots is important).

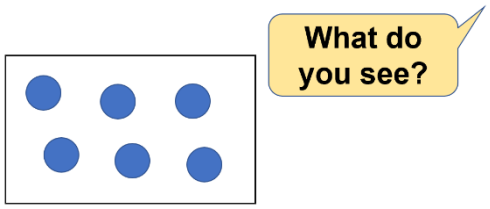
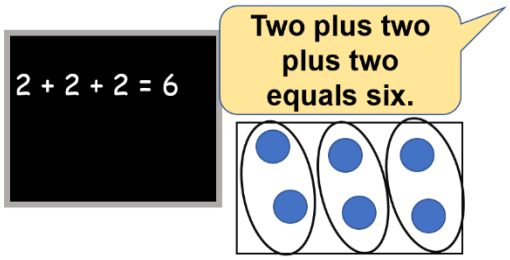


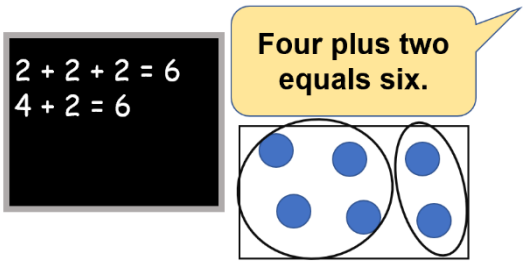
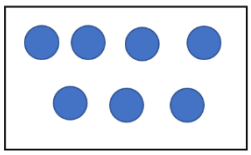
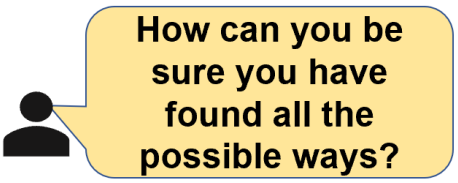
Each group of four learners will need:

- at least seven counters
- exercise books and pens.

Activity

This activity begins with a **short** whole-class task where learners work in pairs. For the rest of the activity, learners work in groups of four.

1. Show learners the card with six spots and ask them to tell each other what they see. Most learners will probably say something like *'a card with six spots'*. Write 6 on the board.	
2. Tell learners that you can also see three groups of two (show them as you say this). Write 2 + 2 + 2 = 6 on the board, saying, *'Two plus two plus two equals six,'* as you do so.	

3. Ask learners if they can see anything else. They might say they see three and three, or four and two, for example. Ask some pairs of learners to show the rest of the class what they see and to write a number sentence on the board.	
NOTE: Encourage learners to use the mathematical words 'plus' and 'equals' rather than 'and' and 'makes' as they read their number sentences.	
1. If there is time, show learners the other card, asking them to say what they see and to write the number sentences on the board. Otherwise, move straight on to step 5.	
2. Learners now work in groups of four. Starting with five counters, they discuss all the different ways they can 'see' the counters. Learners write all of their ideas in their books, using **+** and **=.**	
3. Ask learners how they can be sure they have found all the possible ways. Say that when they are confident that they have found all the ways to 'see' five, they should add another counter and find all the ways to 'see' six, then seven and eight, as time allows.	

Assessment

Step 1. Watch for learners who do not immediately see that there are six spots without counting them. By the time they are seven years old, most people can recognise small quantities, even in random arrangements. If any of your learners are struggling, it may be a sign that they need extra help.

Step 6. Look for learners who have a system for making sure they have found all the ways to make different numbers. These learners have a good sense of number and are developing very important reasoning skills. You might want to ask them to share their thinking with the rest of the class.

Towards the end of the session, gather learners together. Write 3 + 2 = 4 + 1 on the board. Ask learners to tell the person next to them whether they think this is right or wrong and explain their thinking. Listen as learners talk. This will tell you which learners have understood that '**=**' means that both sides are equal, not 'here comes the answer'!

Ask learners to tell each other one thing they have learned during the session. Listen in and make notes to help you know what learners are thinking.

In practice

Mrs Moyo found that, if she showed some of her learners a group of objects and asked, *'How many are there?'*, they always counted them one by one. She realised that they needed to be able to recognise straight away how many objects were in the group.

When she used this activity with her learners, she found that some were very surprised that you could split a group of counters in so many different ways. Learners quickly learned to recognise groups of counters and to write number sentences explaining what they had found out. She was very pleased to hear them using accurate mathematical language in their sentences. She realised that this activity has prepared her learners well for learning their number bonds to 10 in **Activity 3.2 Making 10**.

3.2: Making 10

Aim

This activity helps learners to learn about pairs of numbers that make 10. (These are often referred to as 'number bonds to 10'.) The activity also introduces learners to two important diagrams that will be used frequently in the modules.

What the learners will do

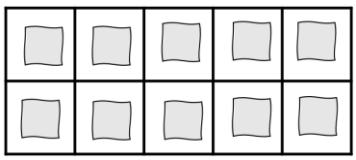
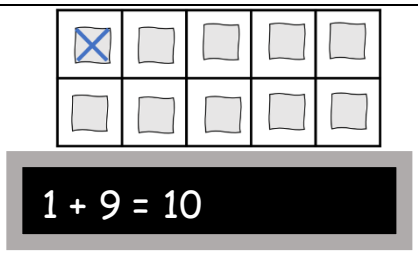
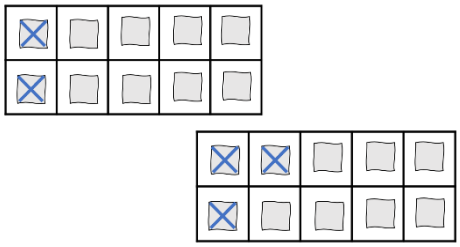
Learners use ten frames to help them find all the pairs of numbers which make ten.

Resources

Each group of four to six learners will need:

- ten small objects that are different on each side (double-sided counters), for example bottle tops or small pieces of paper with a mark on one side
- somewhere to draw a 2 x 5 grid (a ten frame) – see **Resource D Ten frame**, page 32. The individual squares need to be big enough for a double-sided counter.

Activity

1. Ask groups to draw a ten frame on paper, on the ground or on the classroom floor. Tell them to make sure each square is big enough to fit one counter. Ask them to put a counter in each square. All the counters should be the same way up.	
2. Ask a learner in each group to turn over one of their counters. What do they notice? (There are still ten counters, but now ten is split into one and nine.) Write 1 + 9 = 10 on the board.	
3. Learners take turns to turn over one more counter. After each counter has been turned over, all learners write down the number sentence that reflects the new arrangement of their counters. (For example, 2 + 8 = 10 etc.)	

Assessment

Gather the class back together. Ask learners if they think they have found all the pairs of numbers that make 10. How can they be sure? (By turning over just one counter at a time, they had a system to make sure they didn't miss any.)

Call out different numbers between one and nine, and ask groups – when you point to them – to call the other number that goes with it to make 10.

In practice

Miss Sizuba had been teaching numeracy for a number of years, but had never heard of ten frames. She usually just showed learners the pairs of numbers that added up to ten on the board and asked them, as she wrote them, to say the pairs of numbers several times after her. She found that not everyone remembered their number bonds this way. She realised that she needed to do something different.

She thought that she would give the **Making 10** activity a try, although she was worried that there might be a lot of mess with so many counters! She found learners understood and remembered their bonds to ten much better when they did the activity themselves, and the ten frames kept all the counters tidy.

She decided to try other practical activities with her learners. She found that her learners were very willing to put all the materials away neatly themselves!

3.3: Real-life maths

Aim

This activity helps learners to realise that mathematics is a practical subject and that they can use what they learn to help them with real-life problems. It builds on what they have learned in the previous activities.

What the learners will do

Learners will work in pairs to decide, if they are planting ten plots, how many different combinations of chomolia and onions there are. They will go on to see how many different possibilities there are for growth if five seeds are planted in each section of the plot.

Resources

Learners will need:

- exercise books and pens.

Activity

1. Ask learners to imagine that the school vegetable garden is divided into plots. Each class has two rows of five plots (ten plots altogether per class).
2. Draw a ten frame on the board to represent the two rows of five plots.
3. Tell learners that the school has chomolia and onions to plant in the plots.
4. Say that one class might plant six plots of chomolia and four plots of onions. Write ‘C’ in six boxes of the ten frame and ‘O’ in the other four boxes.

C	C	C	O	O
C	C	C	O	O

5. Challenge learners to find out, in pairs, how many different choices there are. Encourage them to use ten frames to help them.
6. Ask learners to show you how they know they have found all the possible choices.

NOTE: There may be a link here to other areas of the curriculum. Would you really want ten plots of onions, for example? What would be the best combination for maximum nutritional value?

7. Say that not all the seeds will grow, so five seeds will be planted in each plot. Ask learners to find out, in pairs, what possibilities there are for the number of seeds that grow in one plot. For example, four grow, one doesn’t; three grow, two don’t.

Assessment

This activity will show you which learners are beginning to know number bonds to 10 by heart.

Some learners will rely on counting the squares in the ten frame and will pick random numbers to start. These learners need more practice with pairs of numbers that make 10.

Some learners will use the system they used with the double-sided counters to make sure they have found all the possibilities. These learners are developing a good sense of number.

Some learners will complete the activity quickly because they have already understood the pattern and can therefore recall the pairs of numbers rapidly. Ask them to predict how many more possibilities for growth there would be if six seeds were planted in one plot, or seven. This will further develop their reasoning skills.

In practice

Mrs Ndlovu and her learners found this activity interesting because her school has a garden and agriculture is a big part of their lives.

She found that some learners had to be helped to make the link with ten frames by drawing a plan of the garden. Others quickly made the connection and were able to draw all the different arrangements of plots.

Some learners completed the first part of the activity quickly. They enjoyed the 'seeds' challenge, getting quite involved in predicting and testing how many options there might be for really big quantities of seeds. They spotted a relationship between the number of seeds and the number of possible combinations.

Ivin made a table like this:

Grow	Don't grow
5	0
4	1
3	2

Mrs Ndlovu was impressed with Ivin's systematic thinking. When she asked if Ivin had found all the possibilities, Ivin said, *'Yes, because then it just goes backwards, so it's the same.'*

Mrs Ndlovu asked him to draw some diagrams to show what he had found out. After he had drawn three diagrams, he looked at her and said, *'Oh! It's not the same, is it? Because the next two will be the ones that grow and the next three will be the ones that don't! There are two more possibilities!'*

Mrs Ndlovu resolved, each time she introduced a new concept, to give plenty of opportunity for connecting learning to daily life. She thought perhaps the test of understanding is whether learners can transfer their information to a real context and check that it makes sense.

Reflection

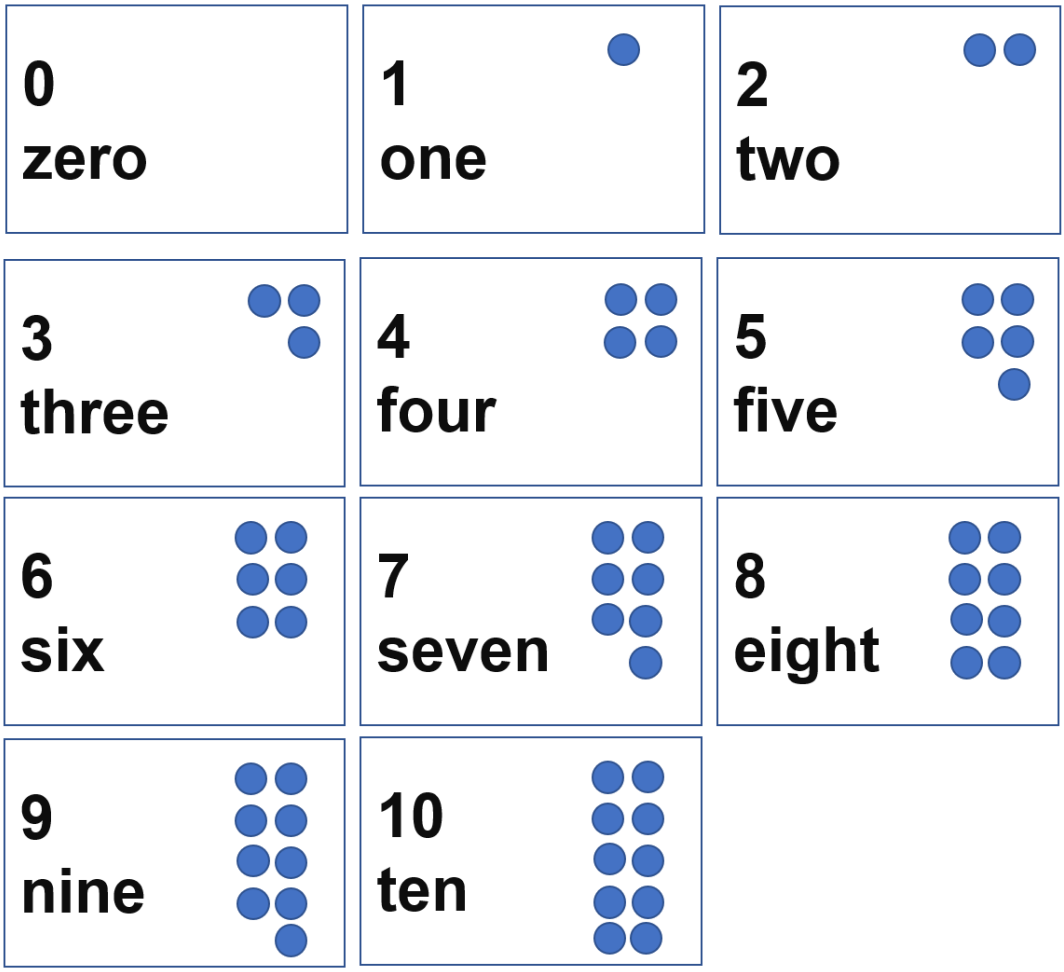
When you have completed this module, and tried out the activities in class, reflect on what you have learned from it. You can do this by yourself, but, if you have the opportunity, it is better to do so with other teachers in your school or cluster. Perhaps you can meet after school or set up a WhatsApp group to work with teachers some distance away?

- Which activity worked best with your learners? Why do you think it worked well?
- What will you do differently as a result of reading this module?
- Why do so many activities involve counters?
- Choose one activity from this module. Think about how it relates to each part of the connections diagram on page 4.

Resources

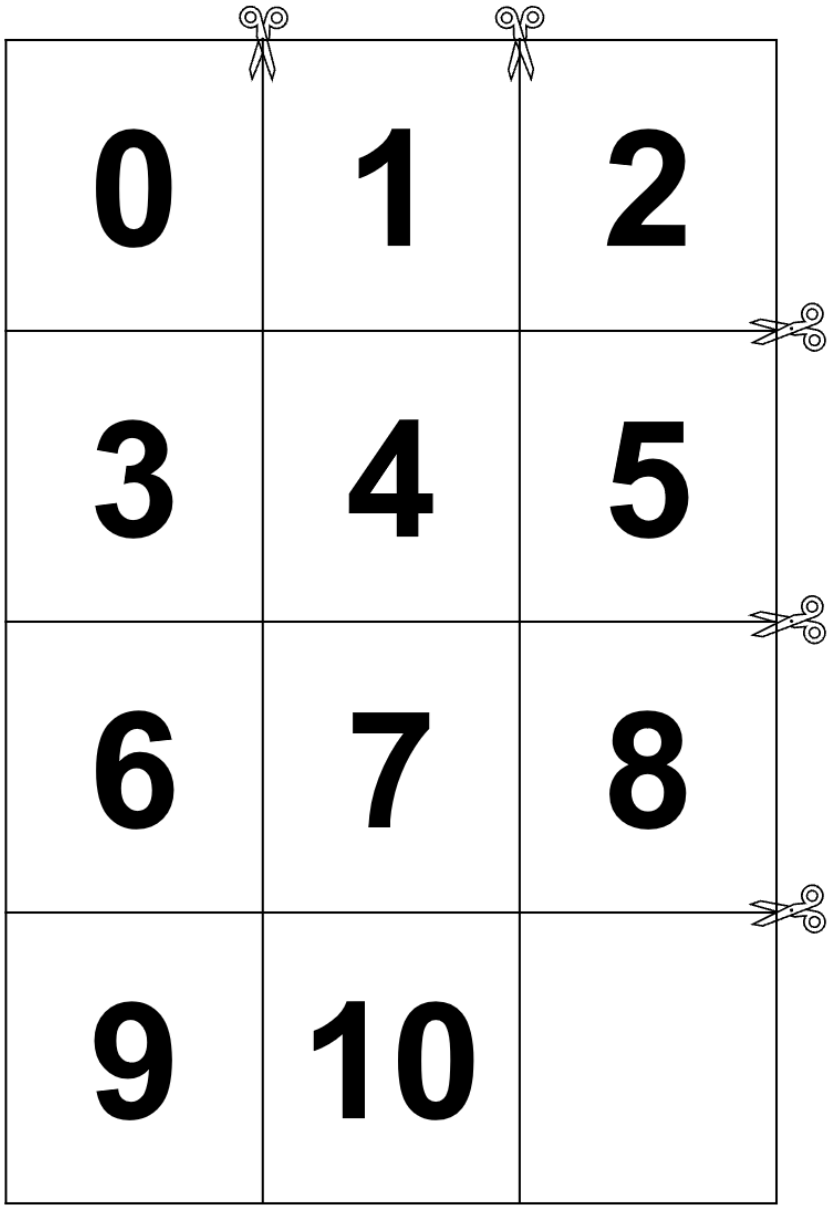
Resource A Number card display

Copy these cards out onto large sheets of paper or card. Stick the number cards on the wall of your classroom in a line from 0 to 10. You may want to draw other resources on the cards as they are introduced in future activities.

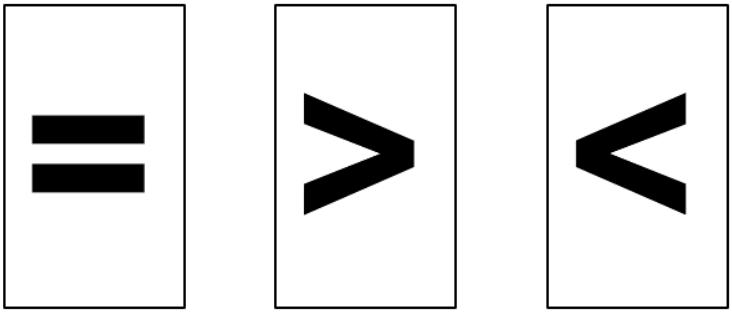


Resource B Number cards

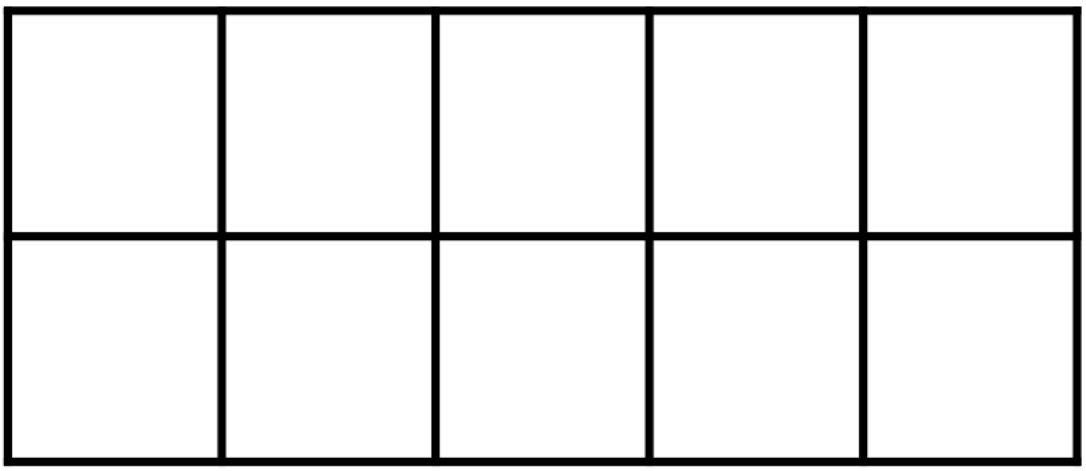
You can make these cards by cutting a sheet of paper as shown and writing the numbers in the pieces, or you can cut up old cardboard boxes and write the numbers on those. Each card should be about 6 cm x 4 cm.



Resource C Comparing cards



Resource D Ten frame



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