education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Foundation phase

Just-in-Time Training Workshop 2020: No. 1

Participants' Handout

Mathematics

Jika iMfundo
what I do matters

Endorsed by:

SADTU
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iMfundo: Foundation Phase JIT Workshop 1 of 2020
Mathematics
Workshop guide for participants

In this workshop you will be given the opportunity to think deeply about the development of number sense in the Foundation Phase. This primarily relates to learning about place value. Learners need a sound number sense before they can progress to Grade 4 and to be able to use this number sense to work efficiently and confidently when operating on numbers. Links to the lesson plans on the topics of number concept development and place value are made to prepare you for the teaching of these topics in the coming term. You will also continue to think about language across the curriculum in the Foundation Phase since this is also critical to enable a successful transition from the phase.

Work in groups on all of the activity questions. Time guidelines are given and your facilitator will interact with you while you work. You will have many group discussions in which you can share what you have found. Suggested times are given below. If you have more time and want to continue the discussions for longer you are free to do so.

Time (Length of session)	**Activity**	**Resources**
30 min	**Session 1:** Arrival and distribution of materials for the workshop *Pre-workshop activity*	Facilitator's guide (leader) Participants guides (participants) *Pre-workshop activity*
40 min	**Session 2:** Transitioning to Grade 4	Participants' handout. *Resources Handout*
140 min	**Session 3:** Number sense, place value and operations	Participants' handout. *Resources Handout*
30 min	**Session 4:** *Post-workshop activity*	*Post-workshop activity*

Session 1: Materials distribution and pre-workshop activity.

You have 30 minutes to complete this activity.

Your facilitator will hand out the workshop materials quietly while you are busy on the activity.

Session 2: Transitioning to Grade 4

In this session you will consider the progression from Grade 3 to Grade 4 according to the CAPS and think about ways in which teachers in the FP and IP could work together to ensure that the learners transition smoothly between the phases.

This activity involves sets of questions to guide the discussion for about 40 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

The foundations of mathematics learning are laid in the Foundation Phase. The overview of the Intermediate Phase Mathematics curriculum describes the progression in the topic of Numbers, Operations and Relationships in the following way.

Numbers, Operations and Relationships (Summary descriptor Intermediate Phase)

• The main progression in Numbers, Operations and Relationships happens in three ways:
-- the number range increases
-- different kinds of numbers are introduced
-- the calculation techniques change.
• The number range for doing calculations is different from the number range for ordering numbers and for finding multiples and factors.
• As the number range for doing calculations increases up to Grade 6, learners should develop more efficient techniques for calculations, including using columns and learning how to use the calculator. These techniques however should only be introduced and encouraged once learners have an adequate sense of place value and an understanding of the properties of numbers and operations.

Activity 1

Read the overview above and go over the curriculum descriptors of the content covered in Grades 1 to 3 and Grade 4 (in the CAPS extracts – see Resources handout) in order to think about the importance of this foundation.

1. Number symbols and number names
    a. What is learned in FP?
    b. What is learned/assumed already in place in IP?

2. Describe, compare and order numbers
    a. What is learned in FP?
    b. What is learned/assumed already in place in IP?

3. Place value and operations
    a. What is learned in FP?
    b. What is learned/assumed already in place in IP?

The way in which mathematics is taught could enhance future learning or inhibit it. Think about the following questions.

Activity 2

1. What kinds of activities would enable powerful learning?

2. What kind of questions would develop independent thinking in mathematics activities?

3. What teaching methodologies could inhibit learners' ability to apply their learning as they progress to the Intermediate phase?

Assessment could enhance or inhibit future learning. Read the following extract from Wikipedia.

Assessment for learning

- comprises two phases—initial or diagnostic assessment and formative assessment
- assessment can be based on a variety of information sources (e.g., portfolios, works in progress, teacher observation, conversation)
- verbal or written feedback to the student is primarily descriptive and emphasizes strengths, identifies challenges, and points to the next steps
- as teachers check on the understanding they adjust their instruction to keep students on track
- no grades or scores are given - record-keeping is primarily anecdotal and descriptive
- occurs throughout the learning process, from the outset of the course of study to the time of summative assessment

Assessment for learning and assessment as learning will enable you to teach more meaningfully for understanding. The next activity calls on you to make questions that would develop understanding through promoting mathematical reasoning.

Activity 3

1. Design an assessment question that calls on reasoning with numbers at a Foundation Phase level that could prepare learners to work meaningfully with numbers in the Intermediate phase.

2. Design an assessment question that calls on reasoning about operations at a Foundation Phase level that could prepare learners to work meaningfully with numbers in the Intermediate phase.

Session 3a: Number sense, place value and operations

In this session you will do hands-on activities related to the teaching of place value in the FP. These will give you experience on how to work with the lesson plan activities relating to the teaching of place value.

You will make some of your own manipulatives using the cut-outs in the attached hand-out.

- The large ten frames are used with to work with smaller numbers and move between ones and tens. (You can use bottle tops, beans or other items as counters in the ten frame.)
- One full ten frame can be exchanged for one printed ten, when learners start to work with bigger numbers (Grade 2 and 3).
- The printed tens and hundreds that are for work with bigger numbers (working in tens and hundreds).

This activity involves sets of questions to guide the discussion for about 70 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

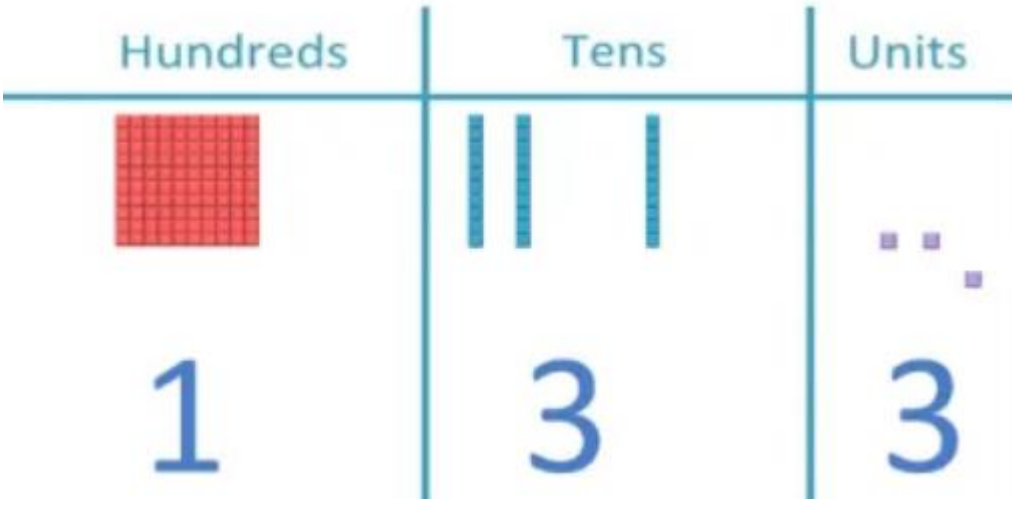
Teaching place value in FP

FP number work gives teachers the opportunity to teach a thorough understanding of the way in which our numeration system works. This can be expanded to higher number ranges very easily, once the basics are in places.

To use place value properly learners need to know about grouping into tens (because we use a base 10 number system) and they need our ten symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. They need to know the names of the places for recoding ever increasing numbers.

Establishing basic number concept – place value in the number range 0-30

Once basic counting from one to nine is established, we move on to the need for an understanding of place value to write the numerals for the numbers we are talking about. Reading numbers involves recognition of **face value** and **total value** using **place value**. Concrete aids can help learners to develop their understanding of this. For example:



*We see **face value** in the number of items in each place. (1 hundred, 3 tens, 3 units)*

*We see **place value** because of the different sizes and shapes of the ones, tens and hundreds. (block size)*
*We see and can work out **total value** because of the blocks and bottle tops displayed.*

We will now discuss the use of various apparatus to aid the teaching of an understanding of base ten numeration.

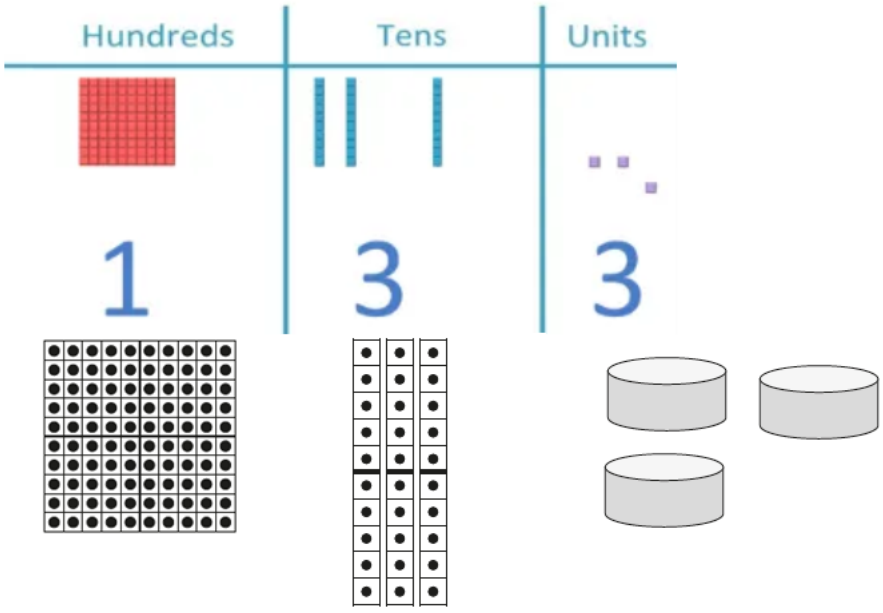
Activity 1

1. Why might a learner think that 12 sweets are less than 8 sweets?

2. What could we do to rectify the error in his/her understanding?

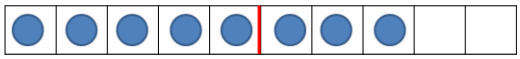
The idea of grouping according to a **base of ten** needs to be explained. Sucker sticks (or toothpicks) and elastic bands can be used as aids. Dienes blocks are referred to in the Jika iMfundo lesson plans. These are a very useful place value manipulative but they are expensive. Flard cards are used once learners have some number knowledge.

In these activities an alternative to Dienes blocks is presented. It is called a base ten kit (it is made up of ten frames, bottle tops, printed tens and printed hundreds) and is currently being trailed in the TMU pilot in 3 provinces. In the drawing below the base ten kit items are placed to show them in relation to the Dienes block equivalents. You will work with the base ten kits and familiarise yourselves with them in the activities that follow.

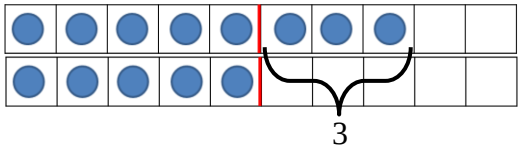


Ten frames can make working with numbers more meaningful and enable learners to develop their number sense and knowledge of place value. Ten frames and bottle tops can be used for all of the CAPS number work activities shown below.

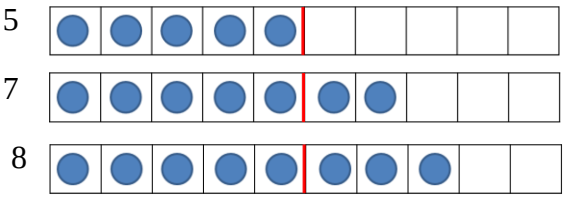
- Matching (one-to-one correspondence)
- Sorting



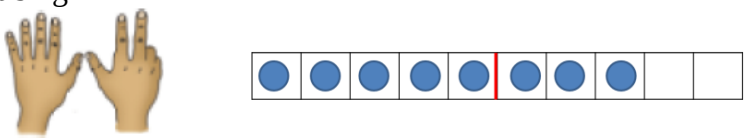
- Comparing



- Ordering



- Subitising



Subitising is 'an instant cognition of the number of objects'. This is one of the most important skills that learners should acquire in the Foundation Phase. A ten frame is a useful tool to help learners to subitise objects. If learners start to subitise numbers rather than count in ones all the time, they will be well prepared for the Intermediate Phase.

Activity 2

1. Cut out the base ten kit and flard cards (see Resources handout).

2. How would you expect a learner to group the sucker sticks below to reveal the number of sucker sticks as a base ten numeral?

3. How could they represent the same number using the base ten kit?

4. Set out 19 sucker sticks. Group them in base ten. Add 1 sucker stick. Regroup. What property of our number system is illustrated by working with sucker sticks in this way?

5. Use the base ten kit to show the same exchange, from 19 to 20, in a concrete display. How are the base ten kits more effective in showing the displays?

6. Draw displays of 17 and 27 using the base ten kit. Which represents the bigger number? How do you know?

Consolidating basic number concept and moving on – place value in the number range 0-999

Once grouping into tens is established, we need to extend learners' understanding of place value into the hundreds.

Activity 3

1. Is it still reasonable to expect learners to use unit counting to work with numbers in the range 0-99 or 0-999?

2. How could learners represent the number 68 using the base ten kit? How does this compare to doing the same display using sucker sticks?

3. How could learners represent the number 154 using the base ten kit? How does this compare to doing the same display using sucker sticks?

4. Set out 79 using the base ten kit. Add 1. Regroup. What property of our number system is illustrated by working with bottle tops in this way?

5. To represent bigger numbers we can draw simplified pictorials of the base ten kit.
    a. How could we represent the bottle tops?

    b. How could we represent the printed tens?

    c. How could we represent the printed hundreds?

6. Draw displays of 257 and 275 using the base ten kit. Which represents the bigger number? How do you know? Choose other pairs of numbers to compare using the base ten kit or simplified pictorials.

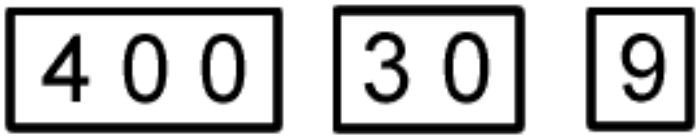
Work with base ten kits as you work through the following type of activity. This will enable you to demonstrate the relationship between units in different places.

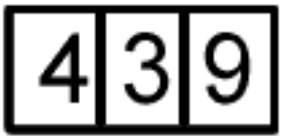
Activity 4

Complete the following:

1. 60 bottle tops can be exchanged for __ printed tens, so 60 ones = __ tens.
2. 480 bottle tops can be exchanged for __ printed tens, so 480 ones = __ tens.
3. 40 printed tens can be exchanged for __ printed hundreds, so 40 tens = __ hundreds.
4. 50 printed tens can be exchanged for __ printed hundreds, so 50 tens = __ hundreds.
5. 33 printed tens can be exchanged for __ bottle tops, so 33 tens = __ ones.
6. 42 printed tens can be exchanged for __ bottle tops, so 42 tens = __ ones.
7. 8 printed hundreds can be exchanged for __ bottle tops, so 8 hundreds = __ ones.
8. 7 printed hundreds can be exchanged for __ printed tens, so 7 hundreds = __ tens.
9. 9 printed hundreds can be exchanged for __ printed tens, so 9 hundreds = __ tens.
10. 765 bottle tops can be exchanged for __ bottle tops, __ printed tens, and __ printed hundreds, so 765 ones = __ ones, __ tens, and __ hundreds.
11. 299 bottle tops can be exchanged for __ bottle tops, __ printed tens, and __ printed hundreds, so 299 ones = __ ones, __ tens, and __ hundreds.
12. In what way do the base ten kits clarify the ideas of face value, place value and total value of the digits that make up a number?

We may think of the number 439 as written on three separate cards, which could be placed one behind the other to look like this (these are known as place value cards or Flard cards).





Using these cards we can say that 400 is the total value of the first digit in the numeral that has a face value of 4 in the 100s place.

Activity 5

Use Flard cards to display the following numbers. In each case talk about the face value, place value and total value of the digits that make up the number.

1. 24

2. 60

3. 97

4. 202

5. 499

6. 870

7. 919

Our apparatus is limited, and our time and patience would also be limited in the working with large numbers using concrete material. However, learners need to be able to read and work with large numbers and so it is worth every minute spent working with the apparatus if good place value concept is established through this activity. Learners need to learn how to read and write number names, and how our number system is used to do this.

Your learners ultimately need to be able to answer questions relating to the understanding of the relative positioning of numerals, involving whole numbers up to 999 (in term 4 Grade 3). Expanded notation is a notation that reveals what is hidden behind the numerals that we see. It is thus a useful exercise for learners to write out numbers in expanded notation to show their understanding of the total values of the digits that make up a number.

Remember the use of Flard cards (and base ten kits) to assist learners to write numbers in expanded notation and to compare numbers.

Activity 6

1. Write out the following numbers in expanded notation in three different ways:

    a. 27

    b. 90

    c. 456

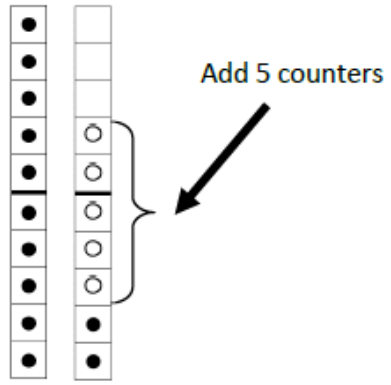
    d. 305

2. In the number 566 the 6 on the left is __ times the 6 on the right.
3. In the number 202 the 2 on the left is __ times the 2 on the right.
4. In the number 111 the 1 in the middle is __ times the 1 on the far right.
5. In the number 387, the face values of the digits are _ , _ and _; the place value of the digits (from left to right) are _ , _ and _; and the total values represented by the digits (from left to right) are __ , __ and _.

We can also use the base ten kit to support the teaching of operations with understanding. The kit is supportive because it can be used to give a concrete display that shows what is happening when numbers are added or subtracted. Teachers can use the displays to make meaningful connections with the numeric calculations to help learners understand the number work involved in the calculation.
Here are some illustrations that show how the base ten kit can be used to bridge ten. This bridging can be used in single digit calculations and also in calculations with two- and three digit numbers.

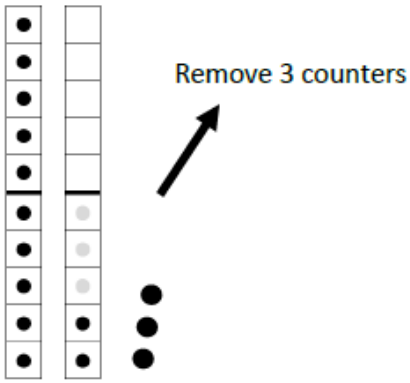
Addition without carrying and subtraction without borrowing – no bridging ten. There is no change in the tens place.

1) 12 + 5



10 and 7 make 17.

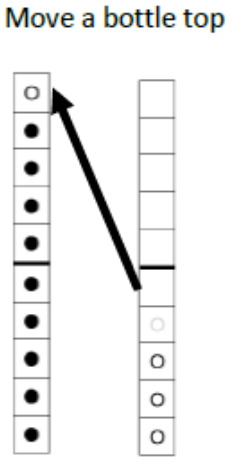
2) 15 – 3



10 and 2 make 12.

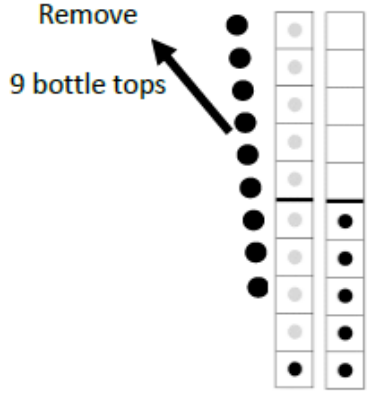
Addition with carrying and subtraction with borrowing (bridging ten). Look at how the bottle tops are moved.

3) 9 + 4

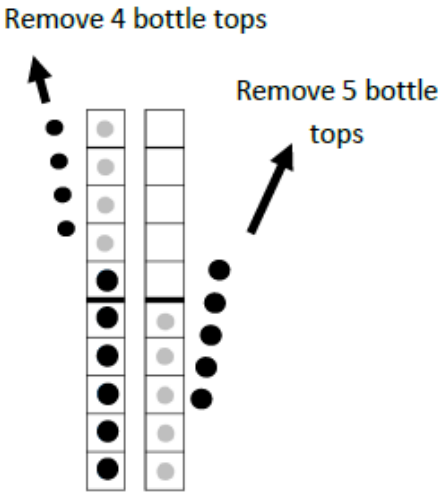


10 and 3 make 13.

4) 15 – 9



1 and 5 make 6.



5 and 1 is 6.

You need to do the physical work with the base ten kits and not just draw them. The next activity gives you many opportunities to do so, across a range of different example types.

Activity 7

a. Use the base ten kit to show the following calculations.

1. 3 + 4 = ___
2. 7 + 2 = ___
3. 4 – 3 = ___
4. 9 – 5 = ___
5. What is the same and what is different about the four calculations above?

6. 6 + 9 =___
7. 8 + 7 =___
8. 12 – 6 = ___
9. 16 – 9 = ___
10. What is the same and what is different about the four calculations above?

11. 34 + 25 = ___
12. 46 + 78 = ___
13. 78 – 25 = ___
14. 81 – 54 = ___
15. What is the same and what is different about the four calculations above?

16. 102 + 342 = ___
17. 485 + 239 = ___
18. 845 – 724 = ___
19. 536 – 269 = ___
20. What is the same and what is different about the four calculations above?

b. After you have done this, discuss how the base ten kit supports the working out of the calculations.

c. How can you make connections between the displays with the kits and the numeric calculations?

A calculator (or mental maths) ***game*** *that can be used to consolidate place value is called "ZAP".*

One player calls out a number for the other players to enter onto their calculator displays (e.g. 789). The player then says "ZAP the 8", which means that the other players must replace the 8 with the digit 0, using one operation (i.e. to change it into 709. To zap the 8 you need to subtract 80. The call is 'subtract 80'.). The player who is the quickest to decide on how to ZAP the given digit is the winner of the first round and could call out the next number.

The winner chooses a new number to call, for example calls 324 and says "ZAP the 3". (The correct call is subtract 300).

And so the game continues, with learners calling out numbers and indicating which digit should be ZAPPED. Learners could play the game for 10 minutes (or so).

Learners draw on and develop their understanding of place value while they play this game.

Place value is taught over the 3 years of the Foundation Phase in a sequenced and progressive manner. In the Jika iMfundo lesson plans, this teaching unfolds according to the CAPS pacing so that learners are exposed to content in the appropriate order and at the right time.

Session 3b: Number sense and Place value in the Jika iMfundo lesson plans

In this session you will work with the Term 1 Jika iMfundo FP Maths materials (see lesson plans extracts in the resources handout) to think about ways in which you can teach place value (and operations) in a meaningful way using the base ten kit to prepare learners for Grade 4 number and operation work.

Activity 8

First peruse the **contents pages extracts** of each of the grades (see Resources handout).

- *Grade 1, 2 and 3 Term 1 lesson plan contents pages extracts*

a. Discuss if the base ten kit could be used in any of these lessons. Which ones and how?

Next refer to the **lesson plan extracts** from each of the grades (see Resources handout).

- *Grade 1 Term 1 lesson 11 – all activities*
- *Grade 2 Term 1 lesson 4 – all activities*
- *Grade 3 Term 1 lesson 2 – all activities*

b. Analyse the activities and think about ways in which you would use these activities. For each of the activities, discuss:

1. What content is covered and how it is presented.
2. How does it relate to the CAPS content specifications?
3. How would you use the activity?
4. Would you add to/change the activity in any way and if so, how and why?

Activity 9

In the Foundation Phase hands-on work and language across the curriculum are always a priority. Look at the lesson plan extracts from the previous activity and think about the vocabulary that is used in those lessons.

1. What vocabulary is developed in the lessons that relates to place value? How could the Jika iMfundo dictionary help you to build the understanding of the mathematics terminology?

2. In what way is the development of language in the Foundation Phase important for enabling the bridge to the Intermediate phase and how can teachers support this language development?

Session 5: Post-workshop activity.

You have 30 minutes to complete this activity.

Acknowledgement: The following resource was used in the preparation of this workshop. Sapire, I. (2010). *Mathematics for Primary School Teachers*. Saide and the Wits School of Education, University of the Witwatersrand, Johannesburg.