FACILITATOR'S GUIDE

2020 TRAINING WORKSHOP NO.1

MATHEMATICS

FOUNDATION PHASE

PILO
IMPROVING LEARNER PERFORMANCE

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

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

Falicitator's Guide

MATHEMATICS

Endorsed by:

Jika iMfundo
what I do matters

Jika iMfundo: Foundation Phase JIT Workshop 1 of 2020
Mathematics
Workshop guide for facilitators

In this workshop participants 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. Participants 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.

Participants should work in groups on all of the activity questions. Time guidelines are given and you should facilitate the group discussions. 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 order to think about the importance of this foundation.

1. Number symbols and number names
    a. What is learned in FP?
    Refer to the CAPS for this. Not repeated here.
    b. What is learned/assumed already in place in IP?
    Learners are able to read and write numbers up to 999.

2. Describe, compare and order numbers
    a. What is learned in FP?
    Refer to the CAPS for this. Not repeated here.
    b. What is learned/assumed already in place in IP?
    Learners are able to describe (speak about), compare and order numbers up to 999 using place value.

3. Place value and operations
    a. What is learned in FP?
    Refer to the CAPS for this. Not repeated here.
    b. What is learned/assumed already in place in IP?
    The ability to work with place value in numbers up to 1 000.
    Understanding of the meaning of the four operations (addition, subtraction, multiplication and division) and ability to perform these operations with up to 3 digit numbers.

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?
Activities that involve reasoning and the use of alternative strategies. Activities that are well grounding on concrete activities that are linked to more abstract calculations. Learner and learning centred activities.

2. What kind of questions would develop independent thinking in mathematics activities?
Questions that do not simply require rote recall. Questions that are open ended and lead to discussion rather than closed and with simple numeric answers only. Problem solving questions in contexts.

3. What teaching methodologies could inhibit learners' ability to apply their learning as they progress to the Intermediate phase?
Rote activities, too much teacher talk and not enough interaction and learner talk, too much chanting and not enough individual learner responses.

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

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.
Comparison of numbers requires reasoning – e.g. Is 51 bigger than 42? How do you know?

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.
Drawing on basic facts to do other calculations requires reasoning using operations – e.g. If you know that 305 + 48 = 353, how much is 353 – 48 = ?

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.

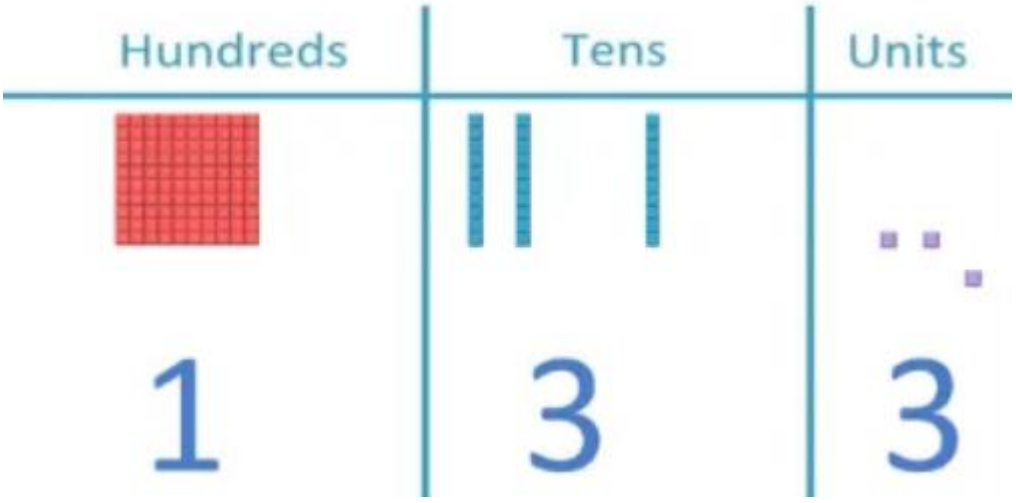
Teaching place value in FP

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?
   The face value of the digits in the number 12 might confuse them – they are "smaller" than the face value of 8.

2. What could we do to rectify the error in his/her understanding?
   Use concrete apparatus to demonstrate the amounts and count out how many there are. Show how the grouping works using place value to make the number 12.

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.

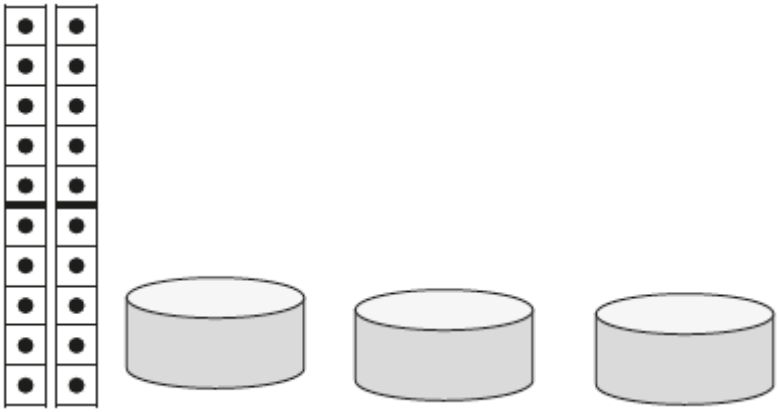
Activity 2

1. Cut out the base ten kit and flard cards.
   You need to make yourself the flard cards and the base ten kit using the hand-outs for the activities that follow.

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?

Group them in to groups of ten. They will get 2 tens and 3 loose ones will remain. The number of sticks is 23.

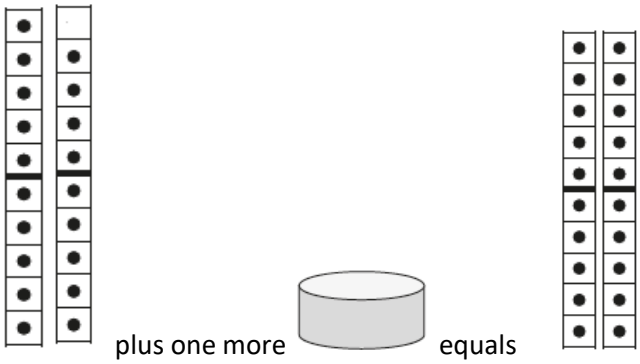
3. How could they represent the same number using the base ten kit?
   Use two full ten frames and three bottle tops (Grade 1, early in Grade 2) OR two printed tens and 3 bottle tops (Grade 2 and 3).



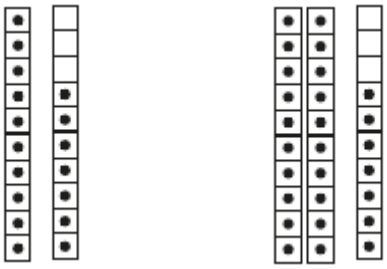
4. Set out 19 sucker sticks. Group them in base ten. Add 1 sucker stick. Regroup. What property of our number system is illustrated by working with sucker sticks in this way?

When you add 1 sucker stick you make a new ten so you need to group the sucker sticks into a ten. The number is now 20 – or 2 tens.
Regrouping according to the base (of ten) is the property that is illustrated 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?



27 represents the biggest number. There are more blocks in the display (2 printed (or full ten frames) tens and 7 bottle tops). The number has two tens and 7 ones which is more than 1 ten and 7 ones.

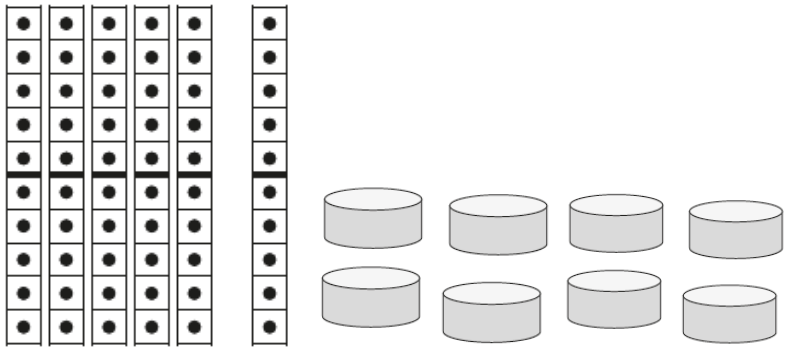
Consolidating basic number concept and moving on – place value in the number range 0-999

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

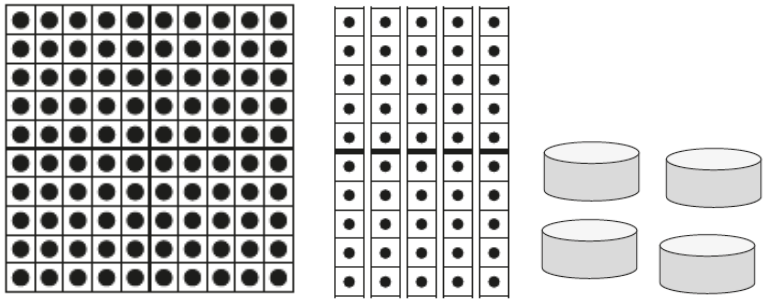
Activity 3

1. Is it still reasonable to expect learners to use unit counting to work with numbers in the range 0-99 or 0-999?
   NO. They need to start working with the groups (tens and hundreds) using place value.

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?

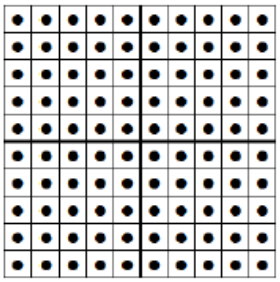


3. How could learners represent the number 154 using the base ten kit? How does this compare to doing the same display using sucker sticks?

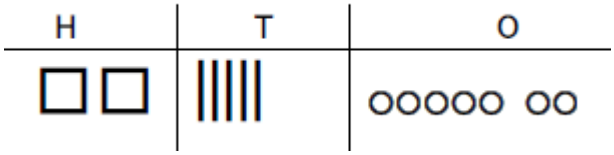


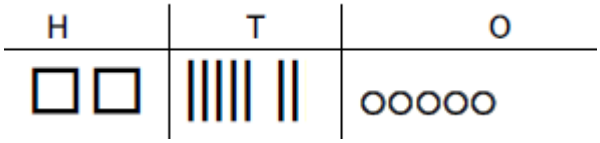
4. Set out 79 using the base ten kit. Add 1. Regroup. What property of our number system is illustrated by working with bottle tops in this way?
   Show using the base ten kit that the only change is that the one extra bottle tops fills a ten frame.
   So we can see that 79 + 1 = 80 (discuss this example using the language of tens and ones)

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?

Number symbols	100	10	1
Number names	hundred	ten	one
Base ten kit (manipulatives)			
Simplified pictorials (drawing)			

6. Draw displays of 257 and 275 using the base ten kit. Which represents the bigger number? How do you know?
   Both numbers have the same number of hundreds. 275 is the biggest number. It has more tens. (The ones are not needed to compare these two numbers, because the tens have already determined the difference in size. Discuss how the base ten kits and displays help you to visualise the comparison.)





Choose other pairs of numbers to compare using the base ten kit or simplified pictorials.
Do this if there is time using the approach shown above or using base ten kits.

Base ten kit exchange activity

Activity 4

Complete the following:

1. 60 bottle tops can be exchanged for _6_ printed tens, so 60 ones = _6_ tens.
2. 480 bottle tops can be exchanged for 48__ printed tens, so 480 ones = _48_ tens.
3. 40 printed tens can be exchanged for _4_ printed hundreds, so 40 tens = _4_ hundreds.
4. 50 printed tens can be exchanged for _5_ printed hundreds, so 50 tens = _5_ hundreds.
5. 33 printed tens can be exchanged for _330_ bottle tops, so 33 tens = _330_ ones.
6. 42 printed tens can be exchanged for _420_ bottle tops, so 42 tens = _420_ ones.
7. 8 printed hundreds can be exchanged for _800_ bottle tops, so 8 hundreds = _800_ ones.

8. 7 printed hundreds can be exchanged for _70_ printed tens, so 7 hundreds = _70_ tens.

9. 9 printed hundreds can be exchanged for _90_ printed tens, so 9 hundreds = _90_ tens.

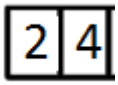
10. 765 bottle tops can be exchanged for _5_ bottle tops, _6_ printed tens, and _7_ printed hundreds, so 765 ones = _5_ ones, _6_ tens, and _7_ hundreds.

11. 299 bottle tops can be exchanged for _9_ bottle tops, _9_ printed tens, and _2_ printed hundreds, so 299 ones = _9_ ones, _9_ tens, and _2_ hundreds.

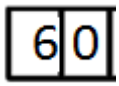
12. In what way do the base ten kits clarify the ideas of face value, place value and total value of the digits that make up a number?
They make it possible to visualise the numbers because the different elements of the kit have different sizes and shapes.
*We see **face value** in the number of items in each place.*
*We see **place value** because of the different sizes and shapes of the ones, tens and hundreds.*
*We see and can work out **total value** because of the blocks and bottle tops displayed.*

Activity 5

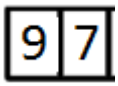
1. 24



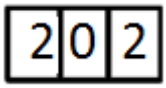
2. 60



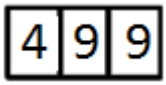
3. 97



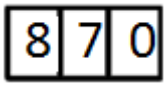
4. 202



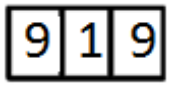
5. 499



6. 870



7. 919



Expanded notation and number work

Activity 6

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

a. 27
= 2 x 10 + 7 x 1
= 2 tens plus 7 ones
= 20 + 7

b. 90
= 9 x 10 + 0 x 1
= 9 tens plus 0 ones
= 90 + 0

c. 456
= 4 x 100 + 5 x 10 + 6 x 1
= 4 hundreds plus 5 tens plus 6 ones
= 400 + 50 + 6

d. 305
= 3 x 100 + 0 x 10 + 5 x 1
= 3 hundreds plus 0 tens plus 5 ones
= 300 + 0 + 5

2. In the number 566 the 6 on the left is _10_ times the 6 on the right.
3. In the number 202 the 2 on the left is _100_ times the 2 on the right.
4. In the number 111 the 1 in the middle is _10_ times the 1 on the far right.
5. In the number 387, the face values of the digits are _3 , _8 and _7; the place value of the digits (from left to right) are _hundreds , _tens and _ones; and the total values represented by the digits (from left to right) are _300 , 80_ and _7.

Operations using the base ten kit.

Activity 7
THIS IS A PRACTICAL ACTIVITY. DISPLAYS ARE NOT SHOWN HERE.

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

1. 3 + 4 = __7_
2. 7 + 2 = _9__
3. 4 – 3 = _1__
4. 9 – 5 = __4_
5. What differences do you see in the four calculations above?
   These calculations are all single digit calculations which do not involve regrouping (bridging ten) at all. Early Grade 1 level.

6. 6 + 9 =___
7. 8 + 7 =___
8. 12 – 6 = ___
9. 16 – 9 = ___
10. What differences do you see in the four calculations above?
    These calculations are calculations that involve single and double digit numbers. They do require regrouping (bridging ten). Later Grade 1 and early Grade 2 level.
    Bridging ten requires learners to see that we 'make a ten' (we get one full ten frame) and then have some loose ones (if the number is bigger than ten). Learner need lots of practice making tens and working with numbers that go beyond ten.

11. 34 + 25 = ___
12. 46 + 78 = ___
13. 78 – 25 = ___
14. 81 – 54 = ___
15. What differences do you see in the four calculations above?
    *These calculations are calculations with double digit numbers. The first one (for addition and for subtraction) does **not** require regrouping (bridging ten) the second one (for each operation) does require regrouping (bridging ten). Grade 2 level.*

16. 102 + 342 = ___
17. 485 + 239 = ___
18. 845 – 724 = ___
19. 536 – 269 = ___
20. What differences do you see in the four calculations above?
    *These calculations are calculations with three digit numbers. The first one (for addition and for subtraction) does **not** require regrouping (bridging ten) the second one (for each operation) does require regrouping (bridging ten). Grade 3 level.*

b. After you have done this, discuss how the base ten kit supports the working out of the calculations.
The base ten kits helps learners to bridge ten when doing calculations. This is because with the base ten kit, we can 'make a ten'. The 'Make-a-ten' method assists learners in shifting methods from counting to using the base-ten number system. The idea of number bonds 2 to 9 and subitising are critical for using the make-a-ten method. 'Make-a-ten' helps learners to develop and deepen their concept of place value while they are working on number operations.

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

Talk about the links between the numbers in the number sentences that express the calculation and the visual displays of the base ten kit.

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?

Discussion – facilitate group discussions and share good ideas from individual groups with the whole group. Facilitate the discussion and ensure all participants are actively involved. Allow report back to the bigger groups where good ideas can be shared more widely.

Discuss the way in which the Jika iMfundo lesson plans use Dienes blocks, uinfix and flard cards and think about how you could use the base ten kit effectively in these lessons as well.

Activity 9

In the Foundation Phase hands-on work and language across the curriculum is 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?
   Remember to always refer to the dictionary and use it to build your won and your learners' knowledge of mathematical vocabulary in English and the mother tongue. Look at the lesson vocabulary for each lesson and think about the meanings of each of these words and how you would express them in IsiZulu.

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?
   The language issue is often given as one of the main reasons why learners struggle with the bridge to Grade 4 from the FP. Discuss what your school does to address this issue. Discuss the way in which the lesson plans help you with this issue (bilingual material).

Session 4: Post-workshop activity.

You have 30 minutes to complete this activity.