education

Department:
Education
**PROVINCE OF KWAZULU-NATAL**

# Foundation phase

# Just-in-Time Training Workshop 2019: No. 1

# Participants' Handout

## Mathematics

Jika iMfundo
what I do matters

**Endorsed by:**

SADTU

NAPTOSA

NATU
Educating Our Nation

Jika iMfundo: Foundation Phase JIT Workshop
Mathematics
January 2019
Workshop guide for participants

In this workshop you will look more closely at general preparation and the use of resources with the Jika iMfundo FP Maths materials. You will also find out more about how to teach fractions in the Foundation 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 | Activity | Resources |
|---|---|---|
| 8.00 – 8.30 | Arrival and distribution of materials for the workshop<br>*Pre-workshop activity* | Facilitator's guide (leader)<br>Participants guides (participants)<br>*Pre-workshop activity* |
| 8.30 – 9.30 | Planning and Resources (1 hour = 60 min) | Participants guide.<br>Extracts from the Jika IMfundo tracker, lesson plans and learner material (see *Resources Handout*)<br>Response sheet (see *Resources Handout*) |
| 9.30 – 10.30 | Fractions in FP (1 hour = 60 min) | Participants guide.<br>**Material for fractions activities.**<br>• Scrap paper (several pieces),<br>• Counters (e.g. beans/bottle tops – about 30),<br>• Scissors (to cut circular discs. (see *Resources Handout*)<br>• Extracts from Jika IMfundo lesson plans (see *Resources Handout*) |
| 10.30-11.00 | TEA BREAK | |
| 11.00-13.30 | Fractions in FP (2 ½ hours = 150 min)<br>*Post-workshop activity* | The same as for Fractions Session 2a.<br>*Post-workshop activity* |
| 13.30-14.30 | END - Lunch | |

## Session 1: Jika IMfundo Toolkit – what's in the package and how to use it?

In this discussion you will refer extracts from the *Tracker*, the *Lesson Plans* and the *Learner Activity Book*. (see *Resources Handout*)

This activity involves sets of questions to guide the discussion for about 60 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

**At the back of this hand-out there is a sheet with some of the activity questions.** You should use this to record your group's responses to these questions. You will hand in the response sheet as feedback.

***Toolkit reflection (30 min)***

Take a few minutes to page through the excerpts from the Jika IMfundo lesson plans and related material (*Tracker*, *Lesson Plans* and *Learner Activity Book*) (see *Resources Handout*).

What is contained in the material? [Make a list.] (5 min)

***Answer these questions using the sheet at the back of this hand-out.***

1. How have you been able to use the Jika iMfundo toolkit in your classroom so far?

2. In what way has the material supported you? (10 min)

3. What difficulties have you experienced? (10 min)

**Resources in FP Mathematics (30 min)**

Page through the resource lists and printable resources in the *Lesson Plans*. [Make a list of these resources to remind yourself what is available as printable resources in the guide.]

***Answer these question using the sheet at the back of this hand-out.***

4. What resources do you have in your mathematics storeroom that you could use when teaching FP Mathematics? Do you regularly use those resources? Why/why not? (10 min)

5. Maths in FP cannot be taught without support of concrete resources. Discuss this comment. (10 min)

6. What is the best way to be prepared for well-resourced teaching? (10 min)

7. Officials/HOD/Lead teachers: Discuss how will YOU help the teachers to be well prepared? (10 min)

## Session 2: Teaching fractions in the Foundation Phase

In this discussion you will do hands-on activities related to the teaching of fractions in the FP. You will also refer to some extracts from the Jika IMfundo *Lesson Plans* (see *Resources Handout*). This will give you experience on how to work with the lesson plan activities relating to the teaching of fractions.

This activity involves sets of questions to guide the discussion in one 1 hour session and one 2 ½ hour session. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

## Session 2a (60 min): Fraction concept

Fraction concept is a part of number concept, since fractions are the numerals (symbols) for a group of numbers.

Fractions can be used to express all rational numbers. Rational number concept involves an understanding of fractions which involves more than just the finding of parts of a whole. Learners need to be exposed to a range of activities and conceptual teaching on fractions as parts of wholes, ratios, decimals and percentages in order to develop fully their understanding of multiplicative reasoning and rational numbers.

Fraction numerals are written as a numerator over a denominator.

**Reflection**

**10 min**

What is the difference between a number and a numeral?

How does this difference start to speak to you about the difference between knowing how to write a fraction numeral and knowing the numeric value of that numeral?

**Fractions and wholes: introductory concepts and activities**

Fractions can be used to represent numbers which are not whole numbers. As such, they are slightly more difficult to come to terms with than whole numbers and are taught once basic number concept has been established. The first part of this activity will look in a detailed manner at sound methods for the teaching of fractions to young learners. You should be able to follow these ideas and ensure that all of this information given is part of your own knowledge. It is vital that all teachers of mathematics have a good concept of fractions themselves.

We need to ensure that learners are given adequate **exposure to a great enough variety of examples** of fractions in concrete demonstrations so that they are able to form their own abstract concept of what number the fraction numeral represents. We begin by looking at fractions as parts of concrete wholes and progress from there to more abstract working with fractions.

**Types of wholes**

The first important thing we should stress is that we can find fractions of **continuous** and **discontinuous** wholes. These two types of wholes are not always given equal representation. We should not emphasise one more than the other or we risk giving an unbalanced idea of concrete wholes.

A **continuous whole** is a single item which is cut/folded/broken/divided up into parts of equal size in one way or another in order to find its fraction parts. Continuous wholes can also be called unit wholes since they are made of a single item. Examples of continuous wholes are: an orange, a piece of paper, a slab of chocolate, a circular disc, a loaf of bread etc.

A **discontinuous whole** is a group of items that together make up the whole. To find a fraction part of such a whole, we can divide it up into groups, each with the same number of items. We call such groups "equal-sized groups" or "groups of equal size". It is important that we always mention that the groups are equal in size to emphasise this aspect of the fraction parts of a whole. Examples of discontinuous wholes are: 15 oranges, 6 biscuits, 27 counters, 4 new pencils, etc.

**Reflection**

**15 min**

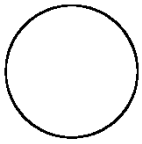
List five more of your own examples of continuous wholes.

List five more of your own examples of discontinuous wholes.

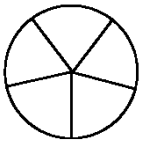
To assist learners establish their fraction concept, we must use good language patterns consistently. It is thought that our language is linked to our thinking, and so by encouraging learners to talk about what they see, we help learners to transfer what they see in the concrete demonstrations into their abstract thought. The language patterns that we are talking about are recorded below.

**Language patterns (talking about) continuous wholes**

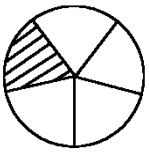
*Demonstrate using this example: participants must cut out the circular discs and do this.*



Whole



Whole divided up into
5 parts of equal size



$\frac{1}{5}$ of the whole shaded

To find $\frac{1}{5}$ of my circular disc, I first divide the whole circular disc into 5 parts of equal size. Each part is $\frac{1}{5}$ of the whole, and if I shade one of these parts, I have shaded $\frac{1}{5}$ of the whole.

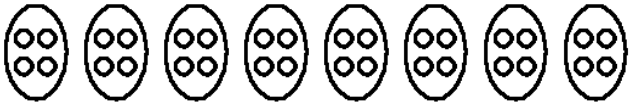
**Language patterns (talking about): discontinuous wholes**

*Demonstrate using this example: participants must do this using beans (or other counters)*

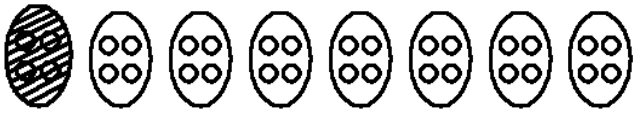
**Example**

Find $\frac{1}{8}$ of 32 counters

32 counters (shown above) represent the whole



I put my counters into 8 groups of equal size. There are four counters in each group.



One of the groups of equal size is $\frac{1}{8}$ of the whole.

To find $\frac{1}{8}$ of 32 counters, I first divide the counters into 8 groups of equal size. I find eight groups with four counters in each group. Each group is $\frac{1}{8}$ of the whole, and so 4 counters is $\frac{1}{8}$ of 32 counters.

When you introduce fractions to learners, you will **begin by finding unit fractions** (as we have done above). A unit fraction is a fraction of the form $\frac{1}{n}$. The numerator is one and the denominator can be any number except zero. You must allow the learners to experiment with finding unit fractions of a broad variety of wholes. At the beginning you will restrict your discontinuous wholes according to the denominator.

For example, if the denominator is 6, you will only ask the learners to find fraction parts of 6 counters, or 12, 18, 24, etc. counters (multiples of 6). You must also remember to set tasks involving continuous wholes as well as discontinuous wholes.

Vary your apparatus as widely as you can. Use pieces of paper, string, sand, water, beads, counters, strips of paper, bottle tops – whatever is easily available.

**Activity**

**30 min**

**Activity 1**

Illustrate and record your solutions to the following questions:

1. Find $\frac{1}{3}$ of the rectangle given below:

Record your language pattern.

2. Find $\frac{1}{3}$ of 27 beads, as given below.

Record your language pattern.

Discuss these additional exercises. (If you use these with learners, they should illustrate and give the language pattern each time):

a. Find $\frac{1}{3}$ of 30 biscuits.

b. Shade $\frac{1}{4}$ of a circular disc.

c. Illustrate and explain how to find $\frac{1}{6}$ of a circular cake.

d. Find $\frac{1}{4}$ of 20 beads.

## Session 2b: Further activities in the teaching of fractions (150 min)

You could turn some of your fraction finding into games or activities. In this way, you could keep the learners busy for slightly longer periods of time, while they are learning and discovering ideas in an interesting and enjoyable way.

**Example of a game to teach fractions**

**"Full House"**

In this example, learners are given 20 counters. They must then try to find all the possible fraction parts that they can, of 20 counters. They could work in groups of two to four members (not more, as they would not have enough of a chance to express themselves). The discussion of the different fraction parts, could go on in the whole group. Once the group thinks that they have found all the possible fraction parts they can put up their hands and say "Full House!", to call you to come and check up on them. As a follow up, ask each learner to record in full and good language one of the fraction parts which they found. Try this activity out yourself!

Once you are satisfied that your learners have established the general result: $\frac{1}{n}$ of $m = m \div \boldsymbol{n}$, you can move on to finding non-unit fractions (these will be discussed later in the session).

**Activity**

**10 min**

**Activity 2**

Give two examples to show that $\frac{1}{n}$ of $m = m \div \boldsymbol{n}$, one of a continuous whole and one of a discontinuous whole.

***Continuous whole example.***

***Discontinuous whole example.***

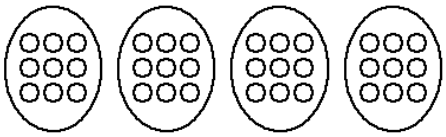
You will now set tasks for your learners to find fraction parts of wholes, where the fraction is of the type $\frac{m}{n}$ where $n \neq 0$. This is purely an extension of the previous activities, where you found $\frac{1}{n}$ of a whole. These fractions are called **non-unitary fractions**. Learners should not experience too many difficulties finding non-unitary fractions if unit fractions have been grasped well.

**Example**

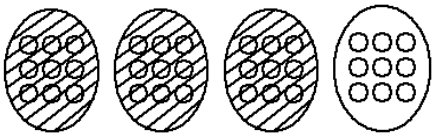
**Discontinuous whole: Find $\frac{3}{4}$ of 36 beads**

The whole

The whole divided into quarters



Three of the four groups (representing $\frac{3}{4}$ of 36) have been shaded



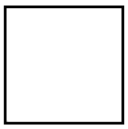
*Language pattern*

The whole is 36 beads. I divide the whole up into four groups of equal size in order to find quarters. There are 9 beads in each group. One group of 9 is $\frac{1}{4}$ of 36, and so 3 groups of 9 are $\frac{3}{4}$ of 36, i.e. 27 is $\frac{3}{4}$ of 36.

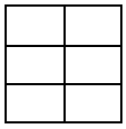
**Example**

**Continuous whole: Find $\frac{5}{6}$ of the square sheet of paper below.**

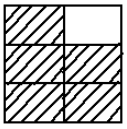
The whole



The whole divided up into 6 parts of equal size



5 of the 6 parts of equal size have been shaded. i.e. $\frac{5}{6}$ of the whole has been shaded



*Language pattern*

The whole is a square sheet of paper. I fold the whole up into six parts of equal size in order to find sixths. Each part is $\frac{1}{6}$ of the whole, so 5 of the six equal sized parts is $\frac{5}{6}$ of the whole.

**Activity**

**30 min**

**Activity 3**

Try these examples on your own. Write out the full language pattern you would use in each case, so that you can check your own ability to talk fluently about the fraction parts you are finding.

1. Illustrate $\frac{2}{3}$ of a pizza.

2. Show how you find $\frac{2}{5}$ of 20 bricks.

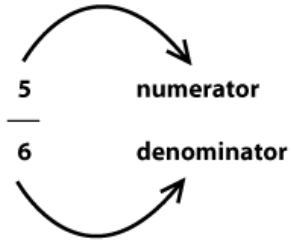
3. Shade $\frac{3}{5}$ of a rectangular sheet of paper.

4. What is $\frac{3}{4}$ of 20 liquorice strips?

We have covered the finding of fractions of many different wholes. We will begin to hope that our learners are starting to think of fractions also as numerals for numbers, and have started to recognise certain fractions which look different but which actually represent the same number (such as $\frac{1}{2}$ and $\frac{2}{4}$). The last thing we need to cover in this introductory section is a little more terminology, relating to types of fractions. Some of this terminology is not specifically used in CAPS but it should be used so that learners begin to become familiar the correct terminology right from the start.

**Fraction numerals**

Show learners how to write a fraction numeral and tell them the terminology. Make sure they know which of the numerals is the numerator and which is the denominator.




You must learn these names if you do not already know them. This is important terminology in the section of fractions. Make sure that learners use the terminology repeatedly, to help them build the words into their regular speech.

**Like and unlike fractions**

We call fractions which have the same denominators **like fractions**. Fractions whose denominators are not the same are called **unlike fractions**.

For example $\frac{3}{7}$, $\frac{6}{7}$, have 7 as their denominator.

**Activity**

**10 min**

**Activity 4**

1. Is $\frac{5}{3}$ like to $\frac{2}{3}$ ? _____
2. Give 5 other fractions which are like to each of the given fractions below:
   a. $\frac{1}{2}$ _____
   b. $\frac{2}{3}$ _____
   c. $\frac{4}{5}$ _____

**Proper and improper fractions**

When the numerator of a fraction is smaller than the denominator of a fraction, the fraction is called a **proper fraction**. When the numerator of a fraction is bigger than the denominator of a fraction, the fraction is called an **improper fraction**.

**Example**

$\frac{4}{7}, \frac{5}{6}, \frac{2}{9}, \frac{3}{8}$ are proper fractions

$\frac{14}{5}, \frac{15}{4}, \frac{22}{3}, \frac{3}{2}$ are improper fractions

**Activity**

**10 min**

**Activity 5**

1. Give your own 6 examples of proper fractions.
2. Give your own 6 examples of improper fractions.
3. Are like fractions equal in number (value)? _____
4. Are the fractions such as $\frac{2}{2}, \frac{4}{4}, \frac{5}{5}$ and $\frac{8}{8}$ proper or improper fractions? _____

You should now be able to do all of the exercises that follow. You can use them with learners where appropriate. Remember to try them out yourself before using them in your classroom. The exercises can be photocopied. They are at grade 2/3 level (basic and challenging). You should adapt the exercises to use with grade 2 according to CAPS fraction requirements.

**Activity**

**30 min**

**Activity 6**

1. Work through the following four fractions exercises (see *Resources Handout*).
2. You have learnt about fractions and fraction terminology. Reflect on the exercises bearing in mind the following things:
    a. Variation in types of whole.

b. Variation in fractions being used.

c. Variation in number of parts in discontinuous wholes.

d. Variations in the denominators.

e. Variations in the numerators.

3. Why is variation good for learning?

4. What prior knowledge is built on when you teach fractions?

5. In Exercise 4, what kinds of things result in examples that do NOT show the fraction parts? Why might this confuse learners?

## CAPS – Fractions requirements

The activities described in the first session cover the first part of the fractions content for the foundation phase. In FP, the curriculum does not require learners to write fraction numerals, but it might be useful to teach them how to read and write fraction numerals right away, as this reinforces that we are teaching them number concept.

**Activity**

**20 min**

**Activity 7**

Refer to the CAPS extracts (see *Resources Handout*) and the ANA diagnostic report (2014) extracts (see *Resources Handout*) when you do this activity.

1. Read the curriculum extract and talk about the differences between the Grade 1, 2 and 3 curriculum requirements related to fractions.

2. In Grade 1 there is no fractions teaching. Grouping and sharing is indicated, which leads into fractions. In what way is the topic of grouping and sharing related to fractions?

3. In Grades 2 and 3 teaching on fractions begins. Compare the content stipulated under 1.10 (Sharing leading to fractions) and 1.17 (Fractions) for the two grades.

4. What concrete apparatus/activities could be used to teach fractions according to CAPS in FP?

5. How do the remediation strategies suggested in the ANA report link to the strategies you have used in the workshop today?

6. How could you apply the work done in the session today to assist in remediation of the errors diagnosed in the ANA 2014?

**Activity 8 (If time allows, otherwise do this on your own or with your colleagues at school.)**

**Activity**

**15 min**

Refer to the *Lesson Plans extracts* when you do this activity.

1. Look through the lesson plan sets to find lessons on fractions.
2. What concrete resources are suggested for use in the lesson plans?

3. Choose one fractions lesson. Look closely at the scaffolded activities and think of how you might add to this lesson based on some of the activities you have worked through today.

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.