



education

Department:

Education

PROVINCE OF KWAZULU-NATAL

## Foundation phase

**Just-in-Time Training Workshop  
2019: No. 3**

# Participants' Handout

## Mathematics



**Jika iMfundo**  
what I do matters

Endorsed by:



Jika iMfundo: Foundation Phase JIT Workshop 3 of 2019  
 Mathematics  
 Workshop guide for participants

In this workshop you will be given the opportunity to think deeply about the concepts covered in the Space and Shape curriculum in the Foundation Phase. There is some content input which is given, since a deeper understanding of the content will enable more effective teaching of the topics. Links to the Jika iMfundo lesson plans on the topic of Space and Shape are also made. You will also find out more about language across the curriculum 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.

<b>Time (Length of session)</b>	<b>Activity</b>	<b>Resources</b>
30 min	<b>Session 1:</b> Arrival and distribution of materials for the workshop  <i>Pre-workshop activity</i>	Facilitator's guide (leader) Participants guides (participants)  <i>Pre-workshop activity</i>
90 min	<b>Session 2:</b> Space and Shape	Participants' handout. <i>Resources Handout)</i>
120 min	<b>Session 3:</b> Language across the curriculum	Participants' handout. <i>Resources Handout)</i>
60 min	<b>Session 4:</b> Dry run – preparation for training	Facilitator's guide and participants' handouts (participants)
30 min	<b>Session 5:</b> <i>Post-workshop activity</i>	<i>Post-workshop activity</i>
	END - Lunch	

### Session 1: Materials distribution and pre-workshop activity.

You have 30 min. to complete this activity.

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

### Session 2: Space and shape

In this session the following lesson plans from the Term 3 Jika iMfundo FP Maths materials are relevant:

- *Grade 1 Term 3 lessons 33 to 38.*
- *Grade 2 Term 3 lessons 15 to 17.*
- *Grade 3 Term 3 lessons 28 and 29 and 38 to 40.*

This activity involves sets of questions to guide the discussion for about 90 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

*Let's get physical*

- Use your hands, arms and other objects to show examples of as many different shapes as you can.
- Why is this a good activity in an FP mathematics class?
- Talk about the shapes your group has made.
- Why do you think it is appropriate (as prescribed by CAPS) for young learners to study space shapes like balls, cones and boxes before they study circles, triangles and rectangles?

In this session we will look at shapes analytically. This means that we will look carefully at what makes up shapes, and what makes one shape the same as or different from another. Children look closely at shapes and don't always assume the things that we do when we look at abstract drawings. That is why it is good for teachers to think quite deeply about the make-up of geometric shapes. This session will **deepen** your knowledge of shapes **beyond** the FP curriculum requirements for learners. As teachers, you need to know the bigger picture in order to teach the "small stuff" first.

We study many different shapes whose names we need to learn and whose characteristics we need to know about. The table below is taken from the FP CAPS (p. 9). It gives the overview of the Geometry content coverage for the year for FP.

Table 2.1 Foundation Phase Mathematics Content Focus

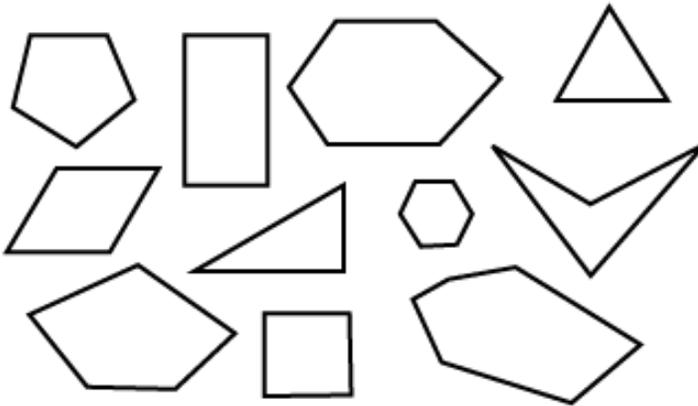
MATHEMATICS CONTENT KNOWLEDGE		
Content Area	General Content Focus	Foundation Phase Specific Content Focus
Space and Shape (Geometry)	<p>The study of Space and Shape improves understanding and appreciation of the pattern, precision, achievement and beauty in natural and cultural forms. It focuses on the</p> <ul style="list-style-type: none"><li>• properties, relationships;</li><li>• orientations, positions; and</li><li>• transformations of two-dimensional shapes and three-dimensional objects.</li></ul>	<p>In this phase learners focus on three-dimensional (3-D) objects, two-dimensional (2-D) shapes, position and directions.</p> <ul style="list-style-type: none"><li>• Learners explore properties of 3-D objects and 2-D shapes by sorting, classifying, describing and naming them.</li><li>• Learners draw shapes and build with objects.</li><li>• Learners recognise and describe shapes and objects in their environment that resemble mathematical objects and shapes.</li><li>• Learners describe the position of objects, themselves and others using the appropriate vocabulary.</li><li>• Learners follow and give directions.</li></ul>



c. Triangles

d. Octagons

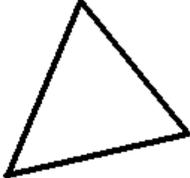
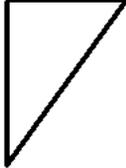
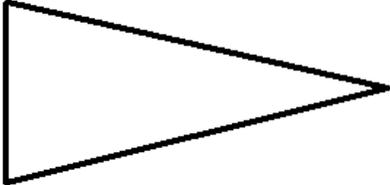
2. Look at the drawings of shapes below and circle all of the regular polygons.



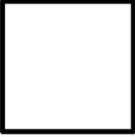
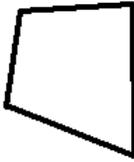
At school the triangles and quadrilaterals are studied in greater depth than other polygons. You therefore need to know all of their more specialised names and characteristics. FP learners only need to know the basic 2-D shape names (triangle, square, rectangle, circle). You might want to know more! (They do also learn about basic 3-D shapes, such as spheres, prisms, cylinders, pyramids and cones – these are discussed later.)

### Types of triangles

*NOTE: Some learners get confused when triangles are shown in unusual orientations. You need to guard against this by showing them triangles in different orientations as a matter of habit. This will enable learners to develop a more **generalised** understanding of the shapes.*

Acute angled triangle (has three acute angles)	Obtuse angled triangle (has one acute angle)	Right angled triangle (has one right angle)
		
Equilateral triangle (three angles equal 60 and three sides of equal length)	Isosceles triangle (has two equal sized angles and two sides of equal length)	
		

### Types of quadrilaterals

Square (regular quadrilateral) (four sides of equal length and four right angles)	Rectangle (two pairs of opposite sides equal in length and four right angles)	Parallelogram (two pairs of opposite sides parallel and equal in length)	Rhombus (all four sides equal in length)
			
Kite (two adjacent pairs of sides equal in length)	Trapezium (at least one pair of sides parallel)	Irregular quadrilateral (all sides different lengths)	
			

You do not just need to be able to name the shapes but you should be aware of the inter-relationships between the shapes.

### Activity 2

1. What is useful about an activity like this for FP learners:  
*Draw a house/person/animal using only geometric shapes. You should use at least 3 different kinds of shapes in your drawing.*

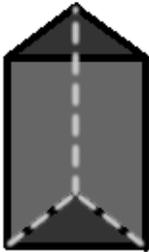
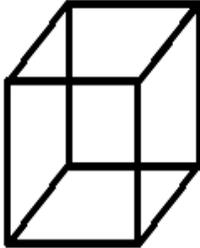
2. ENRICHMENT: Refer to the information given above to answer these questions. Most people know and agree that a rectangle can also be a parallelogram, but what about other relationships between shapes? Answer **SOMETIMES** or **ALWAYS** or **NEVER** to the following questions.

- a. When is a parallelogram a kite?
- b. When is a square a trapezium?
- c. When is a kite a square?
- d. When is a rectangle a parallelogram?
- e. When is a parallelogram a rhombus?
- f. When is a rectangle a trapezium?
- g. When is a rhombus a square?

3. Why is it a useful activity for learners to think about the relationships between shapes?

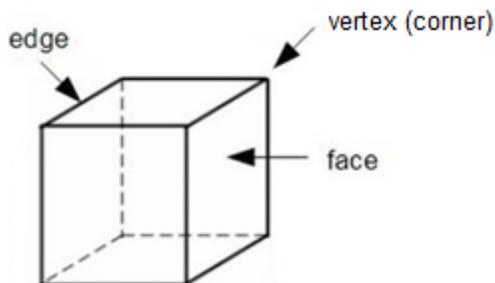
### Space figures

A figure that is not a plane figure is called a space figure. Space figures take up space; they do not lie flat in a plane. Space shapes are three dimensional (3-D). They have height which makes them protrude up above the plane in which they lie. *Dotted edges can be used to show edges that cannot be seen at the 'back' of an object, or these edges are just not shown in a drawing at all.*

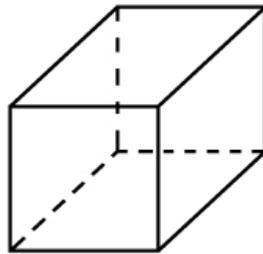
			
SOLID (shaded) e.g. wooden block (cannot see back edges)	HOLLOW (lines and dashes) e.g. cardboard (cannot see back edges)	FRAMEWORK (lines) e.g. wire frame (see through– all edges visible)	DISCRETE POINTS (dots) e.g. dust cloud

The closed space figures that are made entirely of plane surfaces (such as cardboard or paper) are called **polyhedra**. (Sometimes they are called **polyhedrons**). Polyhedra are made entirely of **faces** (the flat surfaces which are all polygonal regions), **edges** (where the faces meet, they are all line-segments), and **vertices** (where the edges meet, they are all points). We can **name** polyhedra according to the **number of faces** they have. You need to apply the terminology about polyhedra in next activity.

*In FP learners have to be able to identify the 2-D faces of 3-D shapes (edges and vertices given as enrichment). The diagram below shows the faces, edges and vertices of a cube.*



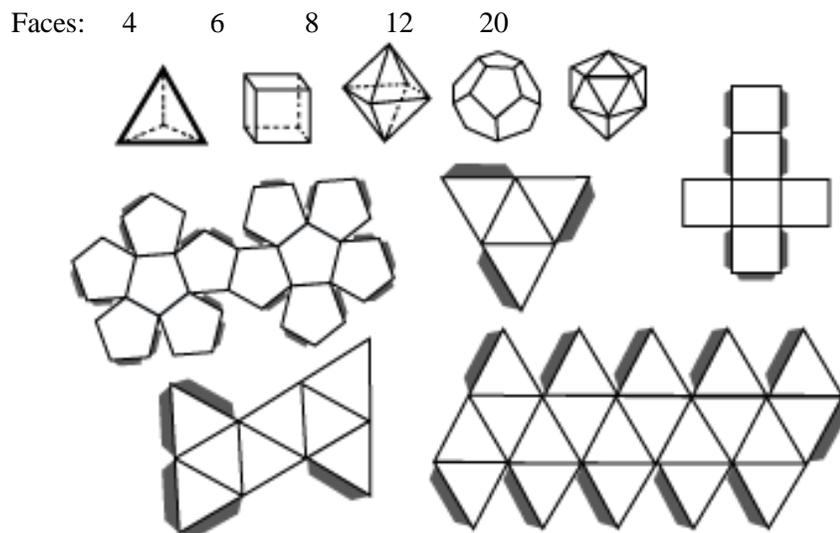
### Activity 3



1. How many faces, edges and vertices does the shape have?
2. How would you name the shape? Give two possible names.
3. What dimension is the shape?

### *FOR INTEREST: Regular polyhedral*

A **regular polyhedron** is any polyhedron with all of its faces the same size and interior angles the same size. Both conditions (**faces and interior angles**) need to be satisfied for a polyhedron to be regular. There are sketches of the five regular polyhedra and their nets below.

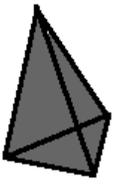


There are several polyhedra, but if we look more closely at them, we can identify two special groups of polyhedra that can be more specifically classified: pyramids and prisms. These are shapes commonly spoken about in schools and so we take a closer look at them too.

### *Pyramids*

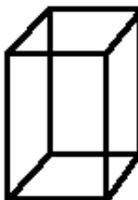
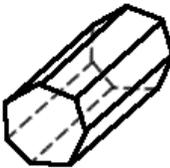
A pyramid is a polyhedron in which one face is called the base, and all of the other faces are triangular regions having a common vertex called the apex. The triangular faces are called lateral (side) faces. The **BASE** determines the kind of pyramid. We can name pyramids according to their base, or according to how many faces they have. For example, a pyramid with five faces is called a pentahedron, its base could be a square and so we

can also call it a square pyramid. Here are a few examples of pyramids: they have been named according to their bases.

			
Triangular pyramid (solid)	Square pyramid (framework - see through)	Pentagonal pyramid (surfaces)	Octagonal pyramid (surfaces)

**Prisms**

Prisms are the set of polyhedra with two faces called bases, which are congruent polygonal regions in parallel planes, and whose other faces, called lateral faces, are rectangular regions. As with pyramids, the BASES determine the kind of prism. We can also name prisms according to how many faces they have, and according to their bases. For example, a hexagonal prism has a hexagon (six-sided polygon) as its base. It has eight faces altogether and so is called an octahedron.

			
Triangular prism (solid)	Square prism (framework- see through)	Pentagonal prism (surfaces)	Heptagonal prism (surfaces)

A **net** is a cut out (flat, 2-dimensional) shape that can be folded up into a space shape. We can make nets for all of the polyhedra. (There are also nets for some other space shapes which are not polyhedra.)

**Activity 4**

1. Name each of the pyramids and prisms drawn above in the following way:
  - a. Name it according to the shape of base
  
  - b. Name it according to the number of faces it has
  
2. To sketch a pyramid, it is usually the easiest to draw the base, set the position of the apex, and drop down the edges where necessary. Draw each of the pyramids shown above yourself.

3. To sketch a prism, it is usually the easiest to draw the bases which are the same (called *congruent*), and then draw in the edges where necessary. Draw each of the pyramids shown above yourself.

### **Activity 5**

Refer to the resources handout for the extracts from the Term 3 lessons on space and shape in the Jika iMfundo FP Mathematics materials:

- *Grade 1 Term 3 lesson 37.*
- *Grade 2 Term 3 lessons 16.*
- *Grade 3 Term 3 lessons 28 and 39.*

Analyse the activities and think about ways in which you would use these activities. How would you apply the knowledge gained in the content input in the teaching of these lessons?

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?

### **Session 3: Language across the curriculum – maths vocabulary in *Number Patterns***

In this session the following lesson plans from the Term 3 Jika iMfundo FP Maths materials are relevant:

- *Grade 1 Term 3 lessons 27, 28, and 29.*
- *Grade 2 Term 3 lessons 22 and 23.*
- *Grade 3 Term 3 lessons 20 and 21.*

This activity involves sets of questions to guide the discussion for about 120 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

Mathematics teaching needs to *keep the focus on the mathematics*, but language is used to communicate ideas in maths, together with real objects, gestures and drawings, written words and symbols. So mathematics teaching cannot be separated from language – both spoken and written. In the Foundation Phase learners are introduced to many basic mathematical concepts and at the same time to the language which they will use to express these ideas. They will be learning many of the same words in their language lessons at the same time as they learn about them in their mathematics lessons. These two learning encounters should complement each other.

The toolkit has a dictionary that was developed using the mathematical lesson vocabulary. The dictionary is bilingual. *Refer to the extract from the dictionary in the resources handout for the following activities.*

**Activity 1**

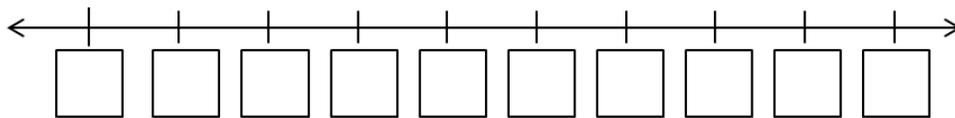
Discuss the following questions in your group. Use the dictionary extract to help you.

1. Think about the words “between” and “extend”. How would you use the following methods to explain the meanings of these words to your learners?
  - a. A gesture.
  - b. Real object(s).
  - c. A drawing.
  - d. A verbal explanation.
  - e. A written explanation.
2. Compare your ideas, thinking about the following:
  - a. Did you find it easier to explain the word “between” or “extend”? If so, why?
  - b. In what way do gestures/objects/drawings/verbal/written explanations differ? How do the different methods complement each other?
3. Are the words ‘between’ and ‘extend’ used only in mathematics or are they also used more generally? Where and how?

In the CAPS there are separate content focus times for Mathematics and Language but in fact there is an overlap between the two areas. The *words* we use cut across all “topics”. Many topics may be isolated for convenience, but, in reality, they intersect. In this session we will use the topic of **Number Patterns** to look more closely at the language used and the way in which it is presented in the lesson plan activities and the learner activities. We will think of ways in which this vocabulary can be consolidated and used across the curriculum. We will also look at the way in which the toolkit is designed to help you develop the mathematical vocabulary of the learners while you teach them the daily CAPS content.

**Activity 2**

1. Use the number line below to mark up the 2s number pattern, starting at zero. Explain to your group how to count along the number line.



2. Use a 200 number board to circle all of the multiples of 2. (*See the resources handout for a copy of a 200 number board.*) Discuss the pattern(s) that you notice in the numbers you have circled.
3. Look at these numbers. *They may not be in order and all the numbers in the sequence might not be there. Which one does not belong to the pattern? Why do you say that?*
  - 210, 220, 203, 240, 250, 260
  - 365, 375, 385, 397, 405

### Activity 3

1. Go through the activities from the Grade 1, 2 and 3 lesson plans in the resources handout and circle all of the vocabulary which has a particular meaning as a mathematical term in the context of the planned topic, *Number Patterns*. The Lesson Vocabulary list has also been given. Circle the number patterns terms.
2. Look over the terms you have circled. These are words that may have a special meaning in the context of maths.
  - a. Are the same words used in all three grades? What is the same/what is different?
  - b. Compare the activities across the three grades. How do they show progression?

### Activity 4

1. How many of the terms that you identified are included in the dictionary list?
  - a. Which words are not there and would you like to see them there?
  - b. Read the given explanations (with diagrams/etc.). Are they helpful/not? Discuss.
2. If you did bring your dictionary with you, look through it and see if other words you identified are given and check the explanations.
3. The dictionary provides bilingual terminology explanations.
  - a. Are both languages useful and if so how?
  - b. How could a teacher use the dictionary in lesson planning and preparation?
  - c. Is there a use for the dictionary in a classroom and if so in what way?

The CAPS gives information on curriculum coverage. This curriculum is dense with mathematical terminology. In the next activity we refer to the CAPS Term 3 overview of the topic *Number Patterns* in FP.

### Activity 5

1. Go through the CAPS extracts (from the overview for Term 3) in the resources handout.
  - a. **Circle** all of the vocabulary relating to the topic, *Number Patterns*.
  - b. How does the curriculum show progression in for content area?
2. Compare the use of the terms across the three grades in the CAPS, Lesson Plans and Dictionaries.
  - a. How are they the same?
  - b. How are they different?

#### **Session 4: Discussion and dry run – preparation for training**

In this session you should wrap up the discussions you have had in this workshop. In your groups, discuss the following questions.

1. What is the most important idea you learnt about teaching Space and Shape and using the Jika iMfundo lesson plans to teach this topic in Session 2?
2. What is the most important idea you learnt about using language across the curriculum in Session 3?

The next set of questions you think about the work going forwards based on the training at this workshop.

3. How will you manage Session 2 in your district? Do you have questions about the content of Session 2? If so, what are they?
4. How will you manage Session 3 in your district? Do you have questions about the content of Session 3? If so, what are they?

Remember that you should work together and support each other in your schools and districts.

Please make notes of things that work well and difficulties you have over the next term and bring them to the next training session for discussion.

#### **Session 5: Post-workshop activity.**

You have 30 min. 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.