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English

# Grade R Mathematics Improvement Programme



## Workshop 3 Participant's Workbook

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The **Schools Development Unit (SDU)** at the **University of Cape Town (UCT)** is the mathematics technical partner to the Grade R Mathematics and Language Improvement Project. The SDU is a unit within UCT's School of Education that focuses on teachers' professional development in Mathematics, Science, Literacy/Language and Life Skills from Grade R to Grade 12. The SDU offers teacher qualifications and approved UCT short courses, school-based work, materials development and research to support teaching and learning in all South African contexts.

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# Overview

## Purpose

This is the third of twelve Grade R Mathematics Improvement Programme workshops, which form part of the Gauteng Department of Education (GDE) Grade R Mathematics and Language Improvement Project.

The purpose of this workshop is to assist teachers to implement the Maths Programme in their classrooms. Participants will strengthen their understanding of the CAPS Content Areas covered in Weeks 6–9 of Term 1 and practise skills in mediating maths learning.

References to the Grade R Mathematics Content Areas are taken from the *Curriculum and Assessment Policy Statement (CAPS): Grade R Mathematics (Final Draft)*, 2011, Department of Basic Education, South Africa.

## Learning outcomes

- ◆ To reflect on the implementation of Term 1 Weeks 3–5
- ◆ To apply the Maths Programme principles in weekly planning
- ◆ To explore strategies to support teaching maths in Grade R
- ◆ To engage with the Maths Programme content of Term 1 Weeks 6–9 (Patterns, Functions and Algebra; Space and Shape (Geometry); Measurement; Numbers, Operations and Relationships)
- ◆ To start to understand how learners' different interests and ability levels inform learning and teaching

## Workshop content

- ◆ Opening and reflection (1 hour)
- ◆ Session 1: Patterns, Functions and Algebra (1 hour)
- TEA
- ◆ Session 2: Space and Shape (Geometry) (1 hour)
- ◆ Session 3: Measurement (1 hour)
- LUNCH
- ◆ Session 4: Numbers, Operations and Relationships (1 hour)
- ◆ Session 5: Planning for teaching (1 hour)

# Opening and reflection

1 hour

Reflect on the implementation of the Maths Programme in your daily programme and complete the following activity in your group.



## Activity 1

1. Discuss your progress in implementing Weeks 3–5 and the *Take back to school* task from Workshop 2.
2. Share your photograph of the Space and Shape (Geometry) focus in the maths area.
3. How did you record your observations of each learner during the teacher-guided activity?
4. Which teaching principles are you more aware of in your classroom?



## Video 1

Watch the video of how the teacher uses a rhyme to practise counting and solving word problems.

Discuss how you managed this and other lessons that incorporated rhymes into counting activities.

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# Session 1: Patterns, Functions and Algebra

1 hour

This workshop focuses on teaching the following Maths Programme content: Term 1 Weeks 6–9. This session focuses on Term 1 Week 6: Patterns, Functions and Algebra.

## Term 1 Content overview: Patterns, Functions and Algebra

Refer to the Patterns, Functions and Algebra Content Area on page 62 of the *Concept Guide*.



### Activity 2

In your group, discuss:

1. What concepts are covered in Term 1?

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2. What are the differences between the content and the content from CAPS?

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## Understanding patterns

Developing an understanding of patterns is an important part of maths. Patterns are all around us and children encounter lots of patterns in their daily lives at home and at school.

Think about your own understanding of the Content Area: Patterns, Functions and Algebra and complete Activity 3 with your group.



### Activity 3

In your group, discuss:

1. What kinds of patterns might Grade R learners observe in their daily lives?

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2. Look at Poster 7 in the *Poster Book*.

- ◆ What patterns do you see?

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- ◆ What is the pattern?

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- ◆ Can you repeat the pattern? Explain.

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A **pattern** describes the regular sequence of objects, pictures, movements, actions or events that are repeated in a predictable way.

A **sequence** is the particular order in which objects, pictures, movements, actions or events follow each other.

### Identifying patterns

In a regular pattern, we can see how the elements in the sequence are repeated. We can also predict the order or sequence of the elements and how they will be repeated to create a pattern. In the pattern below we can see that the circle and square are repeated and we can predict what the next shape in the sequence will be.



#### Activity 4



1. Which shape is first?

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2. Which shape is next?

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3. What shape do you think will come after the last square?

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4. How would you extend the pattern?

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Repeating patterns are made up of a repeated sequence of elements, e.g. shapes, colours, sounds, objects, movements.

In the next activity, the facilitator will show you a sequence of shapes. You will use the attribute blocks on your table to copy this sequence and discuss how to extend this to create a pattern.



#### Activity 5

1. What is the pattern?

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2. What is the repeating part of the sequence?

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Introduce learners to patterns that start with only one attribute that differs, e.g. shape, and provide enough items in the sequence so that learners can work out what the pattern is (the repeating part in the sequence).

It is important for teachers to provide a range of opportunities for learners to identify, copy and create different kinds of patterns using sounds, actions, objects and pictures.



### Video 2

Watch the video of the teacher setting up activities that provide opportunities for learners to create and discuss patterns.

Notice how the teacher guides the learners through questions and prompts to create a pattern. Write down the vocabulary that she and the learners using during these activities.

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Refer to pages 80–86 of the *Concept Guide* to read more about teaching Patterns, Functions and Algebra in Grade R. You will also find a list of appropriate questions and vocabulary for this Content Area.

The **level principle** says that learners are at different starting points in Grade R. Each learner's prior knowledge is the starting point for what they will learn. They can use what they know already to learn new maths concepts and skills.

## Session 2: Space and Shape (Geometry)

1 hour

The focus of Term 1 Week 7 is Space and Shape (Geometry). In Workshop 2, we discussed 3-dimensional objects and 2-dimensional shapes and the content of Weeks 3–5 to be implemented in the classroom.

### Term 1 Content overview: Space and Shape (Geometry)



#### Activity 6

Refer to the Space and Shape (Geometry) Content Area on pages 63–65 of the *Concept Guide*. You will see that circles, squares and triangles are introduced in CAPS in Term 1 and rectangles are introduced in Term 4. The Maths Programme suggests that rectangles are introduced incidentally in Term 1.

1. When you taught squares did you find that learners confused squares and rectangles? Give reasons to support your answer.

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2. How were rectangles introduced in Week 3 of the Maths Programme?

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### Identifying 2-dimensional shapes (triangles)

In Grade R learners recognise, identify and name 2-dimensional shapes: circles, squares, triangles and rectangles. The Maths Programme also suggests that learners are encouraged to describe the properties of these shapes, e.g. straight or curved lines, number of lines and corners.

Learners apply their new knowledge of shapes and reinforce this learning in the independent small group activities.



### Video 3

Watch the video of the teacher introducing the learners to the triangle.

Notice how the teacher encourages the learners to describe the properties of the triangle.

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*Activity Guide: Term 1* provides many opportunities throughout the term for teachers to use open-ended questions. The *Poster Book* is used during whole class activities and small group teacher-guided activities to encourage learners to express their own ideas and solve problems.

In Activity 7, you will discuss a poster and talk about whether the questions posed are 'open-ended' or 'closed' questions.



### Activity 7

1. Look at Poster 8 and respond to the following questions.

◆ How many triangles can you see?

◆ How do you know it is a triangle?

◆ How many sides does it have?

◆ How many corners does it have?

◆ How many lines?

◆ Can you see any other triangles?

◆ What other shapes can you see?

◆ What is the same about these two shapes?

◆ What is different about these two shapes?

2. Which of the questions above are open-ended and which are closed questions?

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The **guidance principle** encourages teachers and learners to work together to solve problems using effective questioning.

- ◆ **Closed questions** are questions that have a limited ‘yes’ or ‘no’ response. Closed questions can be helpful in finding out what learners know, like ‘Which shape is a triangle?’, ‘What colour is it?’
- ◆ **Open-ended questions** have more than one possible answer, stimulate thinking and encourage learners to express their own ideas when solving problems.

Not all learners will grasp these concepts or learn the maths language at the same time (**level principle**).

### **Maths vocabulary**

When learners investigate, and describe shapes and objects, they use everyday language like ‘flat’, ‘smooth’ and ‘pointy’. Teachers can introduce maths vocabulary to replace everyday language, for example: straight lines, curved lines, corners, sides. We also talk about how long something is, how wide it is and refer to the height of something.

Refer to the pages 95–96 of the *Concept Guide* to read more about asking questions related to teaching and learning Space and Shape (Geometry) concepts. Also read page 96 for more about Space and Shape (Geometry) vocabulary in Grade R.

# Session 3: Measurement

1 hour

The focus of Term 1 Week 8 is Measurement: time and length.

## Term 1 Content overview: Measurement



### Activity 8

Refer to the Measurement Content Area on pages 66–67 of the *Concept Guide*.

In your group, review:

1. What concepts are covered in Term 1?

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2. What are the differences between this content and the content from CAPS?

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## What is measurement?

In Activity 9 we will discuss the question ‘What is measurement?’.



### Activity 9

Look at the picture below and answer the question.



Who is the biggest?

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Measurement is about finding ‘how much’ there is of a thing, e.g.:

- ◆ the length of something
- ◆ how much something holds
- ◆ the mass of something
- ◆ how long it takes to do something.

In order to measure, we need to decide on which attribute (feature/characteristic) we want to measure, e.g. length, mass, time. We use the following words to describe the measurements: taller, heavier, older.

We need to use units to measure. These can be non-standard units or standard units.

- ◆ **Non-standard measuring units** include hands, feet, crayons, pieces of string, sticks and blocks.
- ◆ **Standard measuring units** include litres, millilitres, kilograms, grams, metres, hours, minutes, etc.

In Grade R learners measure **informally** and use **non-standard measuring units** to measure time, length, mass, capacity and volume.

### Direct comparison

Measurement in Grade R includes comparing the attribute of something ‘directly’ with something else. For example, measuring the length of a crayon against another crayon or comparing the height of two learners standing back-to-back.

Observe the facilitator measuring a group of participants and then complete Activity 10 in your group.



#### Activity 10

Refer to pages 97–103 of the *Concept Guide* to read more about Measurement and pages 69–75 of *Activity Guide: Term 1* before you answer the questions below.

1. What non-standard unit of measurement was used to measure the height of the participants?
- 

2. What other non-standard units of measurement could be used to measure the height of the participants?
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## Time

Time is a difficult abstract concept for learners to understand. Learners need to understand how time passes in their own lives, so teachers need to relate time to the learner's daily experiences and events that are familiar to them.



### Activity 11

Refer back to Term 1 Week 8 in *Activity Guide: Term 1* and with a partner discuss how time is taught in these lessons. Share your ideas about the following.

1. How can Grade R teachers/practitioners help learners understand more about the concepts of:
  - ◆ day and night?
  - ◆ yesterday, today and tomorrow?
  - ◆ how long things take?
  - ◆ the sequence of time?

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2. How can you use your daily programme activities to teach learners about the concept of time?

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3. What vocabulary is important to understand the concept of time?

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Refer to pages 97–103 of the *Concept Guide* to read more about Measurement and time. Refer to the page 105 of the *Concept Guide* to read more about asking questions related to teaching and learning of Measurement in Grade R.

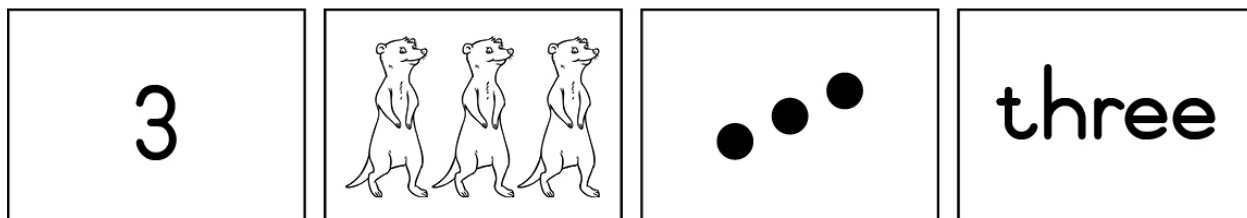
# Session 4: Numbers, Operations and Relationships

1 hour

In Workshop 2, you were introduced to the concepts of counting and representation of number. In this workshop we will see how the same ideas continue into Week 6 as the number 3 is introduced. The same routine is followed as with numbers 1 and 2, namely:

Tell the *Number 3 story* and dramatise as you build up the story with the different representations of the number using frieze cards from the *Resource Kit*:

- ◆ animal (picture)
- ◆ number symbol
- ◆ number word
- ◆ dots (representing the doorbells).



Look for objects and match the number symbol (3) and number word (three). In Week 6, learners are introduced to dot cards (from the *Resource Kit*). Learners match counters to the dot cards and discuss that 3 is made up of 1 and 2 dots.

## Term 1 Content overview: Numbers, Operations and Relationships

Week 7 focuses on Space and Shape (Geometry) while Week 8 focuses on Measurement.

The focus of Week 9 in Term 1 is once more on number concepts. In this session, you will investigate the relationship between numbers.



### Activity 12

Refer to the Numbers, Operations and Relationships content overview on pages 57–61 of the *Concept Guide*. In your group, discuss the following features of the content overview:

1. What is Topic 1.4?
2. What sub-topics are listed under this topic?
3. What are the differences between the blue and black text? Explain why you think this is so.



## Calculating

In Grade R learners do not do number operations like addition and subtraction, multiplication and division. These concepts are gradually built up through investigation and through problem solving. For example: *I have three apples. I eat one. How many apples do I have left?*

Learners need to understand the relationship between numbers. Activities that involve breaking down and building up numbers help learners to understand the relationships between numbers and the value of numbers. For example: *5 is made up of 2 and 3, 1 and 4.*

## Demonstration

Watch the demonstration of a 'shake-and-break' game and then discuss your observations in your group.



### Activity 13

Discuss the demonstration you have just watched.

1. What number concepts could the learners learn by playing this game?

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2. What questions did the facilitator use that highlighted addition and subtraction?

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Not all learners will demonstrate an understanding of these number concepts at the same time (**level principle**).

# Session 5: Planning for teaching

1 hour

## Term 1 Content Summary (Weeks 6–9)

Appendix A: Term 1 Weekly Content Summary (Weeks 6–9) outlines the main Content Area Focus for each week, the topics to be covered, the new knowledge and practise focus for each week, and suggested activities for whole class, teacher-guided and independent group work for the week.



### Activity 14

Look at Appendix A: Term 1 Weekly Content Summary (Weeks 6–9). Answer the questions.

Questions	Week 6	Week 7	Week 8	Week 9
What is the Content Area Focus for the week?				
What are the key concepts that learners will be learning?				
What new knowledge is introduced?				
What skills are being practised?				

## Activity Guide: Term 1: Weeks 6, 7, 8 and 9

Refer to Weeks 6, 7, 8 and 9 in *Activity Guide: Term 1*. Complete Activity 15 in your group.



### Activity 15

Find Weeks 6, 7, 8 and 9 in *Activity Guide: Term 1*. Answer the questions.

1. What is the Content Area Focus for each week?
2. What topics and new knowledge are taught in each week?
3. How does the 'Practise' content link to the previous week?
4. What do you need to get ready before teaching each week?
5. Read the whole class activities and small group activities.
6. Discuss in your small group how you will plan and organise your class for these four weeks of teaching.



Remember that in Grade R assessment is informal and continuous. We need to observe learners throughout the day, inside and outside the classroom. The eye icon reminds us that we need to observe the learners while they are busy, and we need to listen carefully while they are talking to us and to their peers.

The Maths Programme is designed around the rotation of small groups during a week and the teacher pays special attention to one group a day, watching and listening as the learners complete specific tasks. This time gives the teacher the opportunity to carefully observe each learner and gather information on their progress.

Look at the shaded block at the end of the teacher-guided activity: '**Check that learners are able to**'. The teacher makes a mental note of each learner and once the learners have left for the day she writes down her observations in a dedicated observation book that has space for each learner's notes.

## Closing activities



### Activity 16

**Lessons learnt:** Think about what you learnt during the workshop and complete the table.

Things I am already doing that work well	New ideas that I would like to try



### Take back to school task

1. Read the *Concept Guide* pages that were referred to during this workshop.
2. Use *Activity Guide: Term 1* to plan and implement Weeks 6–9 of the Maths Programme, including creating a maths area with a focus on the concept for each week.
3. Write an evaluation of what worked well and what did not work so well. Bring your plan and evaluation to the next workshop.
4. Bring examples or photographs of work that learners did.

### Evaluation

Complete the Evaluation Form.

## APPENDIX A: TERM 1 WEEKLY CONTENT SUMMARY (WEEKS 6-9)

### Term 1: Activity Plan

Week 6				
<b>CONTENT AREA:</b> PATTERNS, FUNCTIONS and ALGEBRA				
<b>TOPIC:</b> Geometric patterns				
<b>INTRODUCE NEW KNOWLEDGE:</b> Identify patterns, copy patterns, complete patterns, introduce number 3, sequencing numbers 1-3. Making groups the same.				
<b>PRACTISE:</b> Oral counting 1-5, counting objects 1-5, number concept 1 and 2, circle, square, big and small, forwards and backwards				
Whole class activities		Teacher-guided activity	Workstation activities	
<b>Day 1</b>	Introduce number 3 number frieze story.	Play a movement game using symbols 1 and 2. Match and order dot picture/number cards 1-3. Simple pattern using counters. Discuss the pattern, use counters to copy the pattern. Problem solving 1-3. Making groups the same.	<b>Activity 1</b>	Frame a picture using pattern and draw three objects.
<b>Day 2</b>	Uses different sized and coloured circles to make simple patterns. Discuss patterns (repetition, differences, similarities).		<b>Activity 2</b>	Fingerprint counting.
<b>Day 3</b>	Body percussion patterns and problem solving.		<b>Activity 3</b>	Pattern cards using counters and sticks.
<b>Day 4</b>	Using big and small circles and objects to make simple patterns. Identify patterns in classroom.		<b>Activity 4</b>	Template with playdough – make 3.
<b>Day 5</b>	Problem solving 1-3. Making groups the same.			
Week 7				
<b>CONTENT AREA:</b> SPACE and SHAPE (GEOMETRY)				
<b>TOPIC: Recognise, identify and name 2-D shapes: triangle; describe and compare 3-D objects and 2-D shapes: triangles; sort 2-D shapes; figure ground; symmetry</b>				
<b>INTRODUCE NEW KNOWLEDGE:</b> Triangle; figure ground; position (in front and behind); oral counting 1-10				
<b>PRACTISE:</b> Oral counting 1-10, sequencing number 1-3, counting objects 1-5, reinforce number concept 1-3, what number before/after, circle, square, symmetry, big and small				
Whole class activities		Teacher-guided activity	Workstation activities	
<b>Day 1</b>	Introduce triangle and its properties.	Oral counting. Touch and count using number towers 1-3 (Unifix blocks). One-to-one correspondence. Properties of a triangle (2-D). Sort and compare 3-D objects and 2-D shapes into two groups, one of triangles and one not triangles.	<b>Activity 1</b>	Triangle activity – cut and decorate four triangles.
<b>Day 2</b>	Identify triangle shapes in <i>Poster Book</i> , problem solving.		<b>Activity 2</b>	Butterfly prints – symmetry.
<b>Day 3</b>	In front of and behind; midline crossing.		<b>Activity 3</b>	Shape person – use pre-cut shapes.
<b>Day 4</b>	Compare biggest and smallest. Bigger and smaller.		<b>Activity 4</b>	Shape puzzles – (minimum six pieces).
<b>Day 5</b>	Symmetry.			

Week 8				
<b>CONTENT AREA:</b> MEASUREMENT				
<b>TOPIC:</b> Time: day and night; Length: compare and order objects to describe height				
<b>INTRODUCE NEW KNOWLEDGE:</b> Sequencing day and night, light and dark; height chart; position (on, under, on top, below, next to, between); counting backwards 5-1				
<b>PRACTISE:</b> Oral counting 1-10, counting backwards from 5, sequencing numbers 1-3, counting objects 1-5, reinforce number concept 1-3, patterns				
Whole class activities		Teacher-guided activity	Workstation activities	
<b>Day 1</b>	Day and night; light and dark.	Routine introduction.	<b>Activity 1</b>	Day and night activity – cutting out pictures.
<b>Day 2</b>	Introduce height chart; position vocabulary.	Day and night; dark and light activities:	<b>Activity 2</b>	Draw from shortest to tallest.
<b>Day 3</b>	Height chart. Sorting day and night everyday objects.	- blanket - activity cards.	<b>Activity 3</b>	Paste shapes from biggest to smallest.
<b>Day 4</b>	Poster – Day and night. Positional vocabulary: on, under, below and on top.	Day and night story and sequencing.	<b>Activity 4</b>	Day/night matching cards.
<b>Day 5</b>	Compare heights. Movement-positions.	Position (on, under, below, on top, next to, between). Pattern (animals). Height chart.		
Week 9				
<b>CONTENT AREA:</b> NUMBERS, OPERATIONS and RELATIONSHIPS				
<b>TOPIC:</b> Describe, order and compare numbers; estimation; problem-solving techniques; using numbers in familiar contexts; position				
<b>INTRODUCE NEW KNOWLEDGE:</b> Estimation, numbers in familiar contexts, one more, one less, position (up/down)				
<b>PRACTISE:</b> Oral counting 1-10, counting backwards from 5, sequencing numbers 1-3, counting objects 1-5, number concept 1-3, problem-solving techniques. Circle, square and triangle.				
Whole class activities		Teacher-guided activity	Workstation activities	
<b>Day 1</b>	Describe and order numbers 1-3.	Oral counting.	<b>Activity 1</b>	Playdough making 1-3 objects.
<b>Day 2</b>	Matching number representations 1-3. Estimation.	One-to-one correspondence. Describe and order numbers 1-3.	<b>Activity 2</b>	Draw pictures 1-3 in shapes.
<b>Day 3</b>	Counting – one more/one less. Position: up and down.	Estimation. Shake and break.	<b>Activity 3</b>	Pasting. Picture with three stars, two trees, one moon.
<b>Day 4</b>	Problem solving (more/less). Poster 1.		<b>Activity 4</b>	Puzzles (minimum six piece).
<b>Day 5</b>	Using number in familiar context: How old are you?			

# Workshop 3 Evaluation Form

1. Did the workshop meet your expectations?

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2. What did you learn in this workshop that helped you the most?

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3. Was there anything that you did not like or had difficulty understanding?

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4. How will you apply what you have learnt in your Grade R classroom?

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5. Do you have any suggestions for improving further workshops?

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