



**IB AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014**

**ROME • 16–19 OCTOBER**

# **Inquiry-Based Primary Mathematics Curriculum Development**

Friday 17 October 2014  
Session 1: 10:15-11:15



18 AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
NOV 16 - 19 OCTOBER

# Vienna International School

## Vienna, Austria



**Anika Sommer**

Grade Level Leader  
Grade Five Teacher



**Dr. Christine Orkisz Lang**  
Primary School Maths Coach  
Grade Two Teacher



10th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DOHA - 16-19 OCTOBER

## School Goal: Whole School Curriculum Ages 3-18

### Timeline:

- 2011-12: Parent community survey, teacher survey
- 2012-13: Cross School committee + Steering Groups to identify needs
- 2012-2013: Review of other Maths curricula
- 2013-14: New curriculum documentation creation
- 2014-15 Implementation Phase 1 (End of year review)
- 2015-2020: Implementation Phase 2



IN AFRICA, EUROPE & MIDDLE EAST  
INTERNATIONAL CONFERENCE 2014  
NOVEMBER 16-19 OCTOBER

# Reasons for a New Programme

- New powerful **technologies** to support learning available
- Extensive advances made in the field of pedagogy, particularly **research** into the brain and how it works
- Acknowledgement that genuine learning takes place in situations which are **authentic** and this was not reflected in previous curriculum
- A need for increased **detail and training** for teachers who are not Maths specialists was identified



IN AFRICA, EUROPE & MIDDLE EAST  
INTERNATIONAL COMMISSION ON MATHS 2016  
ICME - 16-19 OCTOBER

# Discussion Questions #1

1) Where is your school with regard to curriculum review and implementation in mathematics?

2) Which of the 5 reasons provided here for designing a new programme seems most important to you?

(technology, brain-based research, authentic experiences, detail/training for teachers, whole school articulation)



IN AFRICA, EUROPE & MIDDLE EAST  
INTERNATIONAL COMMISSION ON MATHS 2016  
ICME - 16-19 OCTOBER

# Goals of the New Programme

1. Rigorous, developmentally appropriate learning
1. Emphasis on communication in Mathematics
2. Emphasis on Mathematical processes: ways of working
3. Focus areas to allow for depth of study



18 AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2016  
DOHA - 16-19 OCTOBER

# Resources Used

1. VIS previous Scope & Sequence
2. First Steps (Government of Western Australia)
3. Ontario Province Curriculum
4. National Council of Teachers of Mathematics (NCTM)
5. New Zealand National Curriculum
6. John Van der Walle



18 AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
ROME - 16-19 OCTOBER

# Other Input

- Christine Lyons, M.Ed., PhD
- CEO, Dragonfly Educational Consulting Services, Inc.
  - Expertise
  - Training
  - Validation

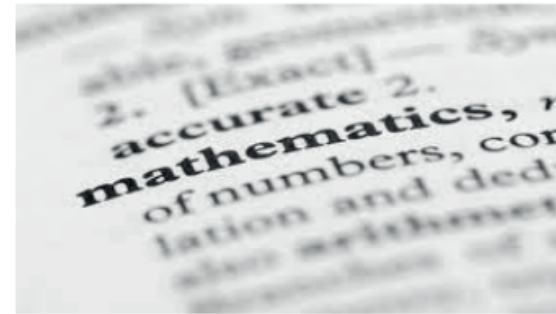




15th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DOHA - 16-19 OCTOBER

# Two Documents

- ELC-Grade 5 Mathematics Programme
- Calculation Policy and Practices Document



Vienna International School  
Mathematics Program  
ELC - Grade 5



Implementation Phase One  
2014 - 2015





18th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DOHA - 16-19 OCTOBER

# Maths Content Strands (PYP)

**Number** - all grade levels + all substrands

**Pattern and Function** - all grade levels

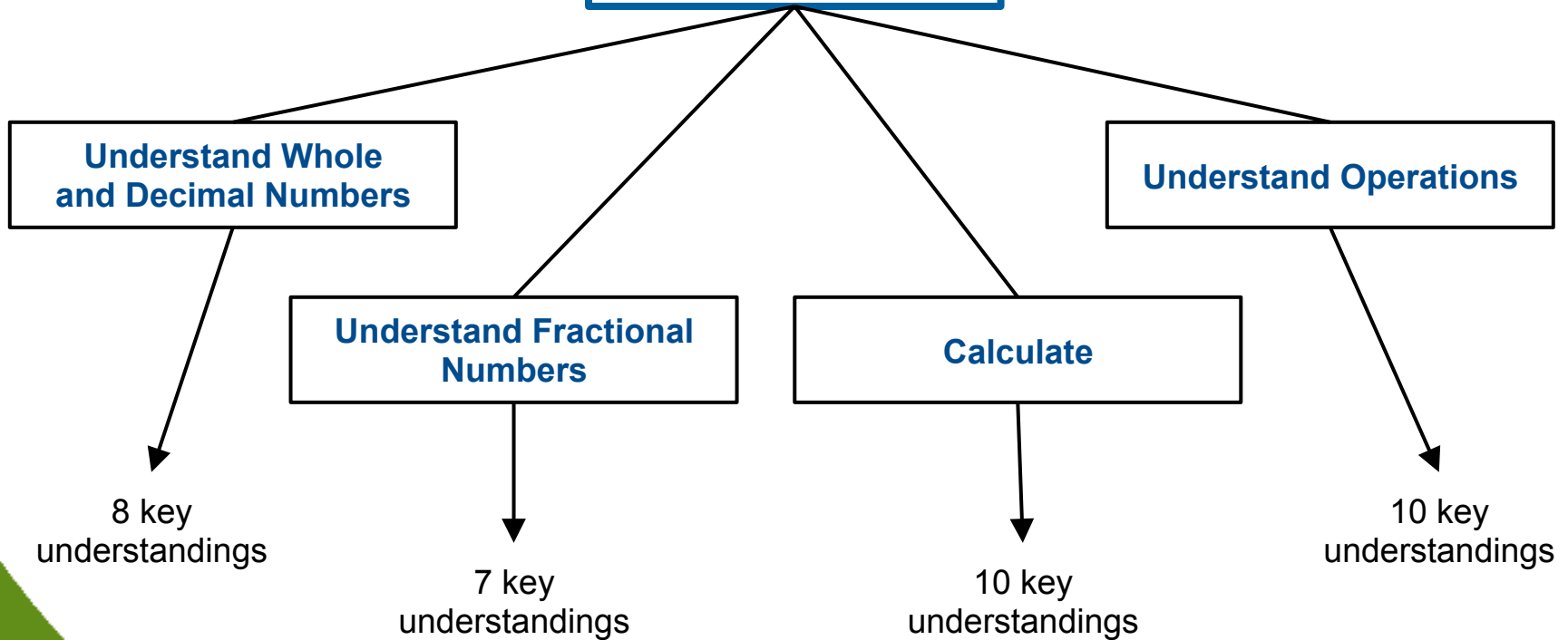
**Data Handling** - all grade levels, SOME substrands

**Shape and Spaces** - focus grades

**Measurement** - focus grades



# Number





IN AFRICA, EUROPE & MIDDLE EAST  
INTERNATIONAL COMMISSION ON MATHEMATICS 2014  
ICMI 2014 - 16-19 OCTOBER

# Pattern and Function

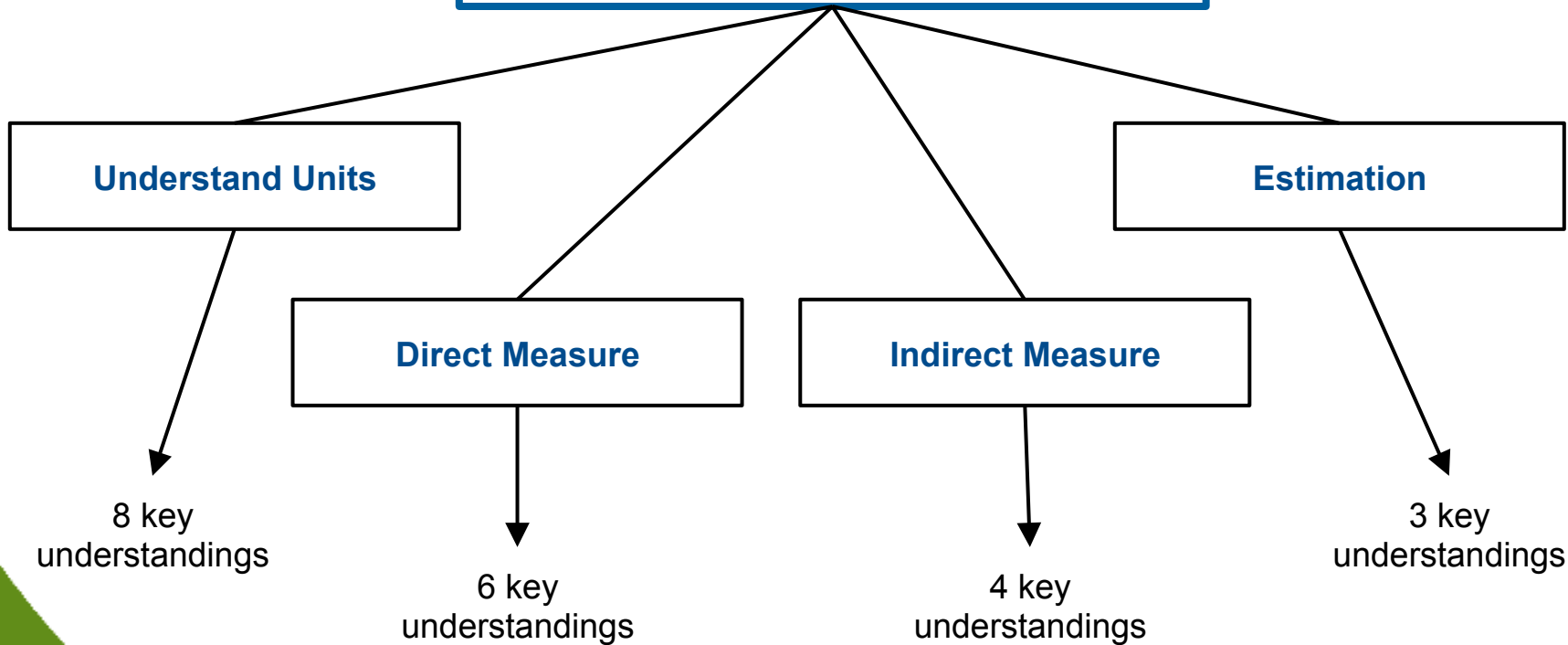
Reason About Number  
Patterns

6 key  
understandings



18 AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2019  
ROME - 16-19 OCTOBER

# Measurement





IN AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2019  
NOVEMBER 16-19 OCTOBER

# Shape and Space

**Represent Location**

3 key understandings

**Represent Shape**

3 key understandings

**Represent Transformation**

4 key understandings

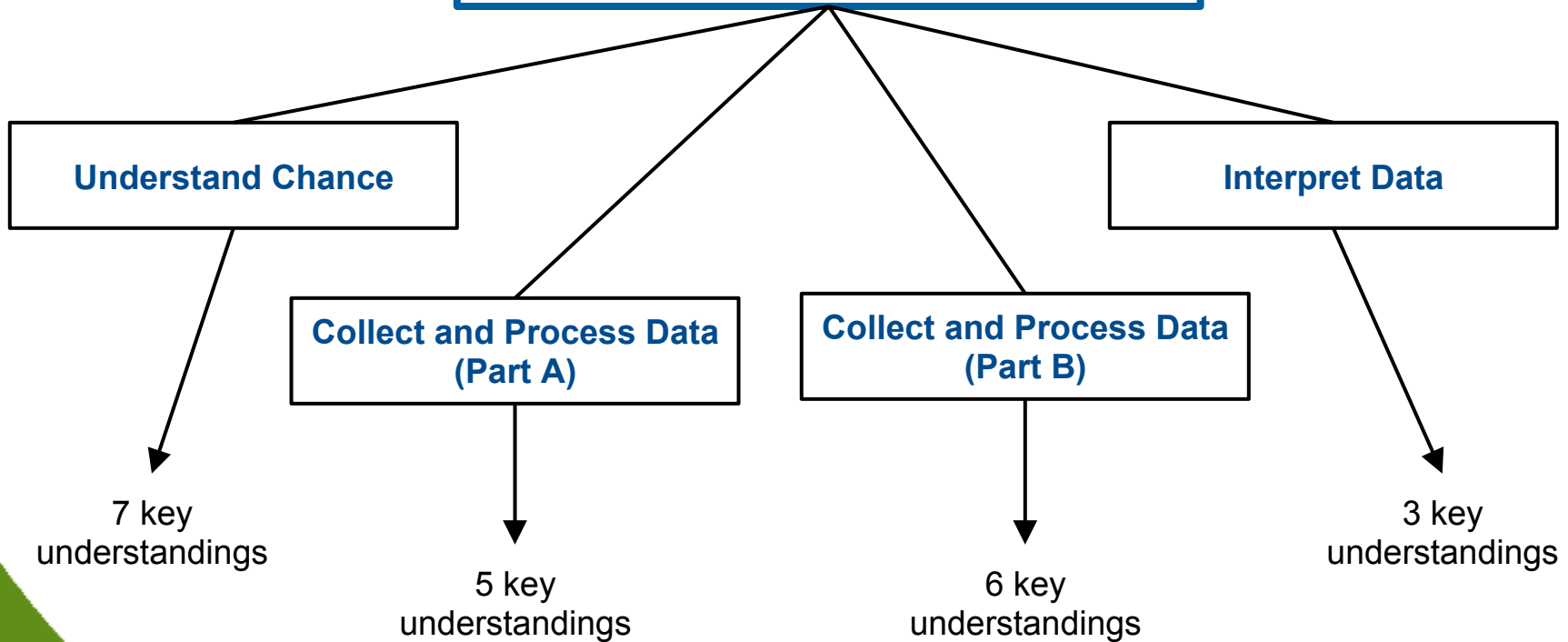
**Reason Geometrically**

4 key understandings



IN AFRICA, EUROPE & MIDDLE EAST  
INTERNATIONAL CONFERENCE 2019  
NOVEMBER 16-19 OCTOBER

# Data Handling





# Focus Overview

Focus Overview	Ages 3-5 (E1C)	Ages 5/6 (G1)	Ages 4/7 (G1)	Ages 7/8 (G2)	Ages 8/9 (G3)	Ages 9/10 (G4)	Ages 10/11 (G5)
Number	Whole & Decimal Numbers	Counting + Subitizing	Matching Number Words & Symbols + Counting Collections	Counting Collections + Conservation of Number	Numbers as Composed of Other Numbers + Counting with Money	Basic Place Value (Concrete Level)	Partitioning for Computation + Decimals + Working with Money
	Fractional Numbers	Sharing	Reading and Talking about Fractions of Things	Modeling and Talking about Fractions of Things	Fractions with Materials	Numerical Representations of Fractions	Comparing & Ordering Fractions
	Operations	Role Play Number Stories	Seeing Numbers in Everyday Situations	Representing Situations with Addition and Subtraction	Partitioning Numbers + Easy Multiplication and Division	Partitioning Numbers + Easy Multiplication and Division	Using & Applying Multiplication and Division
	Calculate	Less & More	Finding Answers with Manipulatives	Easy Partitioning + Basic Facts & Number Bonds to 10	Relating Addition and Subtraction + Basic Facts & Number Bonds to 20	Moving on with Addition and Subtraction + Mental Strategies	Mental Calculation Strategies + Using Place Value + Basic Multiplication and Division Facts
Pattern	Beats about Numbers	Noticing and Predicting Patterns	Copying and Continuing Patterns	Translating Patterns + Describing Patterns with Numbers	Investigating the Hundred Square	Reading and Continuing Numerical Patterns	Using Constant Rules
	Represent location		Language of Direction/Movement/Position	Path/Perspective	Beginning Mapping	Mapping and Directions	
Shapes & Space	Represent shape		Properties of 2D Shape		Connecting 2D & 3D Shapes	Properties of 3D Shape + Introducing Perspective	
	Represent Transformation	Completing Puzzles	Reproducing Routes + Symmetry		Beginning Translation	Translation	
	Reason Geometrically		Sorting 2D Shapes		Sorting and Classifying 2D & 3D Shapes	Form and Functions + Further Sorting of 3D Shapes	Sorting, Categorizing and Justifying
	Embedded Skills	Comparing Items		Comparing and Describing Attributes		Further Comparison and Choosing Units	Choosing Appropriate Units + Relationships between Units
Measure ment	Direct Measure		Early Measurement Skills using Everyday Items	Comparing or Measurement + Finding ways to measure indirectly	Introducing Standard Units of Length	Standard Measurement with Time and Capacity	Conservation of Area, Length, Mass and Capacity + Measuring Angles
	Indirect Measure					Introducing Indirect Measurement Strategies	Strategies for Measuring and Calculating Indirectly
	Estimate			Early Estimation According to Attribute		Making Judgments based on Knowledge of Units	Practising Estimation of Distance, Mass, Capacity and Area
	Classify	Talking About Events in our Daily Lives			Distinguishing Possible/Impossible/Unlikely/Probably		
Data Handling	Collect and Organize Data	Sorting	Collect and Discuss	Reading Ways to Describe or Classify Information and Things	Collecting Data to Answer Questions		
	Summarize and Represent Data					One-to-One Representation of Data	Many-to-One Representation of Data
	Interpret Data					Reading Graphs and Tables to Gain Information	Interpreting Data and Reflecting






# Strands broken into sub strands

Focus or big idea for that grade and that substrand

Grade Two: Number

Whole and Decimal Number: Read, write and understand the meaning, order and relative magnitudes of numbers, moving flexibly between equivalent forms.			
KEY UNDERSTANDINGS	FOCUS	DO (Indicating Behaviors)	KNOW
These may be developed over several years  <b>KU2</b> <b>KU4</b> <b>KU5</b> <b>KU3</b>	<b>Numbers as Composed of Other Numbers</b>  + <b>Counting with Money</b>	<ul style="list-style-type: none"><li>Count: Number string to 200 (by 1s and 2s) forwards and backwards</li><li>Interpret small numbers as compositions of other numbers (to 20)</li><li>Represent, compare and order whole numbers to 200 using materials and diagrams</li><li>Read and print in words whole numbers to twenty</li><li>Compose and decompose two-digit numbers in a variety of ways<ul style="list-style-type: none"><li>using concrete materials</li></ul></li><li>Determine using concrete materials the ten that is nearest to given two-digit numbers</li><li>Count coins in multiples of 5 cents, 10 cents, 20 cents, 50 cents, €1 and €2, and record total amounts</li><li>Read whole money amounts (to 100) and make up the amount with coins and bills in different ways</li><li>Decide whether or not they have more or less money than the price and whether to expect change</li></ul> <p> Further skip counting</p>	<ul style="list-style-type: none"><li>Skip counting or repeated addition will give the same result as counting by ones</li><li>The number string to 200 by 1s and 2s, forwards and backwards</li></ul>

Key Vocabulary:

Key: **Bold KU** (Key Understanding) = Focus Grade Level

• Indicating Behavior

◉ Indicating Behavior connected directly to Diagnostic Map

KUs from First Steps Resources

Coded bullet to point you to other documents

Indicating behaviours, not outcomes



# Problem Type Overview

## Addition and Subtraction Problem Types

	Ages 3-5 (ELC)	Ages 5/6 (GP)	Ages 6/7 (G1)	Ages 7/8 (G2)	Ages 8/9 (G3)	Ages 9/10 (G4)	Ages 10/11 (G5)
Change - join		<p>result unknown (<math>7 + 3 = \square</math>) Anna had 7 bears and then her brother gave her 3. How many does she now have?</p> <p>change unknown (<math>7 + \square = 10</math>) Anna had 7 bears but would like to have 10. How many more does she need to get?</p> <p>start unknown (<math>\square + 3 = 10</math>) Anna had some bears and then her brother gave her 3. Now she has 10. How many did she have to start with?</p>	<p>result unknown (<math>7 + 3 = \square</math>) Anna had 7 bears and then her brother gave her 3. How many does she now have?</p> <p>change unknown (<math>7 + \square = 10</math>) Anna had 7 bears but would like to have 10. How many more does she need to get?</p> <p>start unknown (<math>\square + 3 = 10</math>) Anna had some bears and then her brother gave her 3. Now she has 10. How many did she have to start with?</p>	<p>Use larger numbers to 100 result unknown (<math>7 + 3 = \square</math>) Anna had 7 bears and then her brother gave her 3. How many does she now have?</p> <p>change unknown (<math>7 + \square = 10</math>) Anna had 7 bears but would like to have 10. How many more does she need to get?</p> <p>start unknown (<math>\square + 3 = 10</math>) Anna had some bears and then her brother gave her 3. Now she has 10. How many did she have to start with?</p>	<p>Use larger numbers to 200 result unknown (<math>7 + 3 = \square</math>) Anna had 7 bears and then her brother gave her 3. How many does she now have?</p> <p>change unknown (<math>7 + \square = 10</math>) Anna had 7 bears but would like to have 10. How many more does she need to get?</p> <p>start unknown (<math>\square + 3 = 10</math>) Anna had some bears and then her brother gave her 3. Now she has 10. How many did she have to start with?</p>	<p>Use larger numbers to 1000 result unknown (<math>7 + 3 = \square</math>) Anna had 7 bears and then her brother gave her 3. How many does she now have?</p> <p>change unknown (<math>7 + \square = 10</math>) Anna had 7 bears but would like to have 10. How many more does she need to get?</p> <p>start unknown (<math>\square + 3 = 10</math>) Anna had some bears and then her brother gave her 3. Now she has 10. How many did she have to start with?</p>	<p>Use larger numbers and decimals result unknown (<math>7 + 3 = \square</math>) Anna had 7 bears and then her brother gave her 3. How many does she now have?</p> <p>change unknown (<math>7 + \square = 10</math>) Anna had 7 bears but would like to have 10. How many more does she need to get?</p> <p>start unknown (<math>\square + 3 = 10</math>) Anna had some bears and then her brother gave her 3. Now she has 10. How many did she have to start with?</p>
Change - separate		<p>result unknown (<math>9 - 5 = \square</math>) Anna had 7 bears and then she gave her brother 3. How many does she now have?</p> <p>change unknown (<math>10 - \square = 7</math>) Anna had 10 bears and then she gave her brother some. She now has 7. How many did she give her brother?</p>	<p>result unknown (<math>7 - 3 = \square</math>) Anna had 7 bears and then she gave her brother 3. How many does she now have?</p> <p>change unknown (<math>10 - \square = 7</math>) Anna had 10 bears and then she gave her brother some. She now has 7. How many did she give her brother?</p>	<p>Use larger numbers to 100 result unknown (<math>7 - 3 = \square</math>) Anna had 7 bears and then she gave her brother 3. How many does she now have?</p> <p>change unknown (<math>10 - \square = 7</math>) Anna had 10 bears and then she gave her brother some. She now has 7. How many did she give her brother?</p>	<p>Use larger numbers to 200 result unknown (<math>7 - 3 = \square</math>) Anna had 7 bears and then she gave her brother 3. How many does she now have?</p> <p>change unknown (<math>10 - \square = 7</math>) Anna had 10 bears and then she gave her brother some. She now has 7. How many did she give her brother?</p>	<p>Use larger numbers to 1000 result unknown (<math>7 - 3 = \square</math>) Anna had 7 bears and then she gave her brother 3. How many does she now have?</p> <p>change unknown (<math>10 - \square = 7</math>) Anna had 10 bears and then she gave her brother some. She now has 7. How many did she give her brother?</p>	<p>Use larger numbers and decimals result unknown (<math>7 - 3 = \square</math>) Anna had 7 bears and then she gave her brother 3. How many does she now have?</p> <p>change unknown (<math>10 - \square = 7</math>) Anna had 10 bears and then she gave her brother some. She now has 7. How many did she give her brother?</p>



# Vocabulary Overview

Vocab Overview		ELC	GP	G1	G2	G3	G4	G5
Number	Whole & Decimal Numbers	one, two, three, four, five, 1, 2, 3, 4, 5	number words to twenty	first, second, third - twentieth, 0 (zero)		Numbers written and spoken to 1000, ones place, tens place, hundredths place	Written and spoken numbers to into the 1000s, tenths and hundredths, decimal point	greater than >, less than <
	Fractional Numbers	share, sharing	half, halves, parts	fair shares	equal portions, one half - one tenth, part/whole	half, quarter/fourths, eighths, thirds, sixths, twelfths	fifths, sevenths, ninths, tenths, denominator, numerator, equivalence	
	Operate	bigger, smaller		take away, difference, how much more, number sentences	repeated addition, repeated subtraction, sharing out	*	array, square centimeters, combination	
	Calculate	bigger, smaller, the same, more, less		equal groups		partition, estimate		'front end'
Not an	Reason about Numbers	same, what comes next	pattern, over and over, repeat, again	rule, 'guess my rule'	rule, 'guess my rule'			
Shape & Space	Represent Location		back, forward, around, past, turn, up, under, around, behind, between, in front of, below, on, near	under, behind, in front of, below, on, beside, near, between, through, turn, around, past, backward, forward	bird's eye view, grid, gridlines, co-ordinates, key, labels, between, path, maze		north, south, east, west, right angle, quarter turn, right, left, key, symbol	
	Represent Shape		triangle, circle, square, rectangle, hexagon, side, angle, flat, point, straight		vertex, face, edge, roll, stack, two-dimensional, three-dimensional, cube, cylinder, cuboid, triangular prism, rectangular prism, triangular pyramid, square-based pyramid, square, rectangle, trapezoid, rhombus, parallelogram, hexagon, circle	cross-section, net, model, cube, cuboid, prism, pyramid, cone, and 2D shape names from 3- to 8-sided shapes, circle, vertex, face, edge, side	New this year: parallel, cone, sphere, pentagon, heptagon, octagon, ellipse Previously learned: faces, vertex, vertices, edge, right angle, vertex, rectangle, square, triangle, circle, cube, cuboid, pyramid, prism, cylinder, trapezoid/trapezium, rhombus, parallelogram, hexagon	
	Represent Transformation	match, turn	roll, slide, stack, rotate, turn, symmetry/flat, pattern, copy, exactly, same, like, unlike		translate, rotate, slide, reflect, repeat, line symmetry, rotational symmetry, reflective symmetry, flip, turn		New this year: rotate, slide, translate Previously learned: tessellate, reflective symmetry, rotational symmetry	
	Reason Geometrically		flat, straight, curved, side, round, angle, like, different, same, long, roll, slide, stacks, rectangle, square, triangle, circle		flat, curved, angle, side, round, square, edge, side, vertex, base, surface, curved, triangular, circular, cross-section		New this year: stable, stability, strong, strength, storage, Previously learned: edges, faces, vertex, vertices	New this year: right prism, right pyramid, perpendicular, plane Previously learned: side, face, edge, tessellate, tile, slide, parallel, acute, obtuse, right angles and 2D and 3D shape names



# Calculator Use Overview

Calculator Use Overview

Calculator Use		ELC	GP	G1	G2	G3	G4	G5
Number	Whole & Decimal Numbers	Exposure to calculators - available for free play	Whole class counting on whiteboard	Counting and skip counting	Further skip counting	Skip counting to support multiplication Standard partitioning	Further skip counting Exploring place value Wipe Out	Counting with decimals
	Fractional Numbers							
	Operate					Using inverse operations to solve irregular problems (+ and -)	Using inverse operations to solve irregular problems (+ and -)	Using inverse operations to solve irregular problems (+, -, x, ÷)
	Calculate		Role playing with calculators	Checking answers	Checking answers Target Addition	Checking answers Rounding Target Addition	Checking answers Rounding	Checking answers
Pattern	Reason about Numbers				Expanding known number bonds (Rainbow Ten)	Use constant function + Experimenting with rules	Following a rule	Following and determining rules
ICE	Represent Location							
	Represent Shape							



18 AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DOME - 16-19 OCTOBER

# Calculation Policy and Practices

- Divided into the four operations
- Each operation split into two sections:
  - mental calculation
  - written calculation



# Calculation Policy and Practices: Overview


Calculation Strategies Overview	ELC (ages 3-5)	GP (ages 5/6)	G1 (ages 6/7)	G2 (ages 7/8)	G3 (ages 8/9)	G4 (ages 9/10)	G5 (ages 10/11)
<b>Number String</b>	<ul style="list-style-type: none"> <li>Counting Stories</li> </ul>	<ul style="list-style-type: none"> <li>Number string to 20</li> </ul>	<ul style="list-style-type: none"> <li>Number string to 100 by 1s, 5s, 10s</li> </ul>	<ul style="list-style-type: none"> <li>Number string to 200 by 1s and 2s, forwards and backwards</li> </ul>	<ul style="list-style-type: none"> <li>Number string to 1000 by 1s, 10s, 100s and 25s, forwards and backwards</li> </ul>	<ul style="list-style-type: none"> <li>Number string to 10,000 (by 1s, 10s, 100s, 1000s, 25s, 50s), forwards and backwards</li> <li>Count by simple fractions (1/4, 1/2)</li> <li>Count by 9s and 4s</li> </ul>	<ul style="list-style-type: none"> <li>Number string - counting by tenths, hundredths, forwards and backwards</li> <li>Counting by mixed numbers, 1 1/3, 1 2/3, 2, ...</li> </ul>
<b>Estimation</b>					<ul style="list-style-type: none"> <li>Rounding to 10s to check validity of answers</li> <li>e.g. Car Strategy</li> </ul>	<ul style="list-style-type: none"> <li>Rounding to 100s to check validity of answers</li> <li>e.g. Car Strategy</li> </ul>	<ul style="list-style-type: none"> <li>Rounding decimals to check validity of answers</li> </ul>
		<ul style="list-style-type: none"> <li>Recognizing Amounts (to 10)</li> <li>Count on 1 (to 10)</li> </ul>	<ul style="list-style-type: none"> <li>Count on 0-3 (to 20)</li> <li>Doubles (to 20)</li> <li>Rainbow 10 (to 10)</li> </ul>	<ul style="list-style-type: none"> <li>Count on 0-3 (to 100)</li> <li>Doubles + Related Doubles + Doubles plus 1/Neighbors</li> <li>Double 2-digit numbers without exchanging (to 50)</li> <li>Rainbow 10 (+9, Think 10)</li> <li>Hundred Chart</li> <li><b>Number Bonds to 20 established</b></li> </ul>	<ul style="list-style-type: none"> <li>Count on 10 (to 200)</li> <li>Doubles and Doubles Plus One (multiples of 10 to 200)</li> <li>Double 2-digit numbers without exchanging (to 200)</li> <li>Rainbow 10 + Near 10 (extend to 100)</li> <li>Rainbow 10 add 19 (to 100)</li> <li>Rainbow 10 Add 90 (to 200)</li> </ul>	<ul style="list-style-type: none"> <li>Count on 100, 200, 300 (to 1000)</li> <li>Doubles and Doubles Plus one with multiples of 100 (to 1000)</li> <li>Double 2-digit numbers with exchanging (to 1000)</li> <li>Rainbow 10 + Near 10 + Think 10 in multiples of 10 &amp; 100 (extend to 1000)</li> <li>Use Frontloading to get approximate answer</li> </ul>	<ul style="list-style-type: none"> <li>Generalize Basic Facts</li> <li>Use Relationships (commutative &amp; inverse)</li> <li>Partitioning</li> <li>Visualize a Number Line</li> <li>Solve 2-digit problems using Frontload, Compensate, Compatible Numbers and Bridging strategies</li> </ul>
<b>Addition</b>		<ul style="list-style-type: none"> <li>Counting (to 10)</li> </ul>	<ul style="list-style-type: none"> <li>Ten Frame (to 20)</li> <li>Number Lines (numbered) (to 20, then 50)</li> <li>Partitioning</li> </ul>	<ul style="list-style-type: none"> <li>Partitioning with manipulatives (to 100)</li> </ul>	<ul style="list-style-type: none"> <li>Partitioning (to 200) with manipulatives</li> <li>Number Lines (numbered, then blank)</li> </ul>	<ul style="list-style-type: none"> <li>Partitioning (to 1000) with manipulatives</li> <li>Number Lines</li> </ul>	<ul style="list-style-type: none"> <li>Number Lines with decimals</li> <li>Numerical</li> </ul>

The big ideas for calculation in each grade



# Calculation Policy and Practices: cont'd



ADDITION				
	ELC	Primary	Grade One	Grade Two
<b>Mental Strategies</b>		<ul style="list-style-type: none"> <li><b>Recognize Amounts</b> -Subitize groups of objects or pictures of objects up to 5, using dot or picture cards in different arrangements</li> <li>-Recognize which group of objects up to 10 has 'more' or 'less' without counting</li> <li><b>Count on Strategies</b> -Count on 1 from any number up to 10; e.g. Ask: <i>What is 1 more than 14?</i> Think 'always count on from the larger number'; 'think big, count on'.</li> </ul>	<ul style="list-style-type: none"> <li><b>Count On Strategies</b> -Count on 0, 1, 2 and 3 for numbers to 20 and turnarounds (commutative law); e.g. Ask: <i>What is 3 more than 13?</i> Say: <i>3 more than 13 is 16.</i> Think 'always count on from the larger number'; 'think big, count on'.</li> <li><b>Doubles Strategy</b> -Double numbers to 20 e.g. Ask: <i>What is double 7?</i> Say: <i>Double 7 is 14.</i></li> <li><b>Rainbow Ten Strategy</b> -Know facts to 10; e.g.  -Know facts near to 10 (1 more or 1 less) Think 'rainbow 10'. For 3+6, think '4+6 is 10, so 3+6 is one less than 10. 3+6=9'.</li> </ul>	<ul style="list-style-type: none"> <li><b>Count On Strategies</b> -Count on 0, 1, 2 and 3 for numbers to 100 and turnarounds (commutative law)</li> <li><b>Doubles Strategy</b> -Doubles + 1/Neighbors to 20; e.g. <i>What is 6+7?</i> Think 'since 6+7 are next to each other in the number line, and 6+6 is 12, the answer must be one more or 13' (or 'since 7+7 is 14, the answer must be one less or 13')</li> <li>-Double multiples of 10; e.g. 50 + 50 Think '1n tens'; 'double 5 tens is 10 tens; double 50 is 100'.</li> <li><b>Rainbow Ten Strategy</b> -Add 9; e.g. <i>What is 9+6?</i> Think 'add 10, count back 1'; '10+6=16, count back 1 is 15'. -Think to 10; e.g. <i>What is 8+5?</i> Think 'build to 10', then add what is left. For 8 + 5, think '(8 + 2) + 3'; for 7 + 6, think '(7 + 3) + 3'.</li> <li><b>100 Chart Strategy</b> -Adding 10 to a 2-digit number; e.g. 35+10=45 Think '100s Chart', start on 35, go down one'.</li> </ul>
			Number bonds to 10 established	Number bonds to 20 established
<b>Key Vocabulary</b>	less, more	count on, more, add, plus, altogether	add, addition, plus, and, count on, more, sum, total, altogether, increase	add, addition, plus, and, count on, more, sum, total, altogether, increase, turnarounds
<b>Counting</b>	<ul style="list-style-type: none"> <li><b>Counting Objects</b> -Count one to one using manipulatives up to 10</li> </ul>	<ul style="list-style-type: none"> <li><b>Counting</b> -Number conservation for numbers up to 10 ('trust the count')</li> </ul>	<ul style="list-style-type: none"> <li><b>Counting</b> -Use 100 Chart to practice the number sequences, including skip counting by 5 and 10</li> </ul>	<ul style="list-style-type: none"> <li><b>Counting</b> -Use the 100 Chart to count by 2s Use 100 Charts and number lines to count on 4 - 9</li> </ul>



# Calculation Policy and Practices: cont'd

VIS' agreed  
formal written  
method of  
calculation for  
each operation

## • Algorithm

-Represent and solve vertical addition problems to 200, using expanded notation

2	6	+	4	5	=				
	2	6	→	(20	+	6)			
+	4	5	→	(40	+	5)			
	7	1	→	(60	+	11)			
				(60	+	10	+	1)	

### Grade 3 Approach to Teaching Addition

1. Write the first number.
2. Write the second number underneath the first number making sure the digits are in the correct columns.
3. Partition each number into tens and units and write them next to the problem underneath each other.
4. Add the units FIRST
5. Next add the tens.
6. Total the tens and units to get the answer.

## • Algorithm

-Extend to adding 3-digit numbers and numbers with different amounts of digits (up to two decimal places, only for money); e.g. €528.00 + €7.49 =

Line up the decimal points...

$$\begin{array}{r} 528 + 7.49 \\ \phantom{528.} + \phantom{7.}49 \\ \hline 535.49 \end{array}$$


### Grade 4 & 5 Approach to Teaching Addition

1. Write the first number.
2. Write the next number underneath the first number, making sure the digits are in the correct columns and the decimal points (if there are any) are underneath each other.
3. Add each column from right to left.
4. Indicate any needed exchanges above the appropriate column.





# Calculation Policy and Practices: cont'd

Grade Three	Grade Four	Grade Five
<p data-bbox="311 330 683 464"><b>Revise from Grade Two:</b></p> <ul data-bbox="388 372 606 440" style="list-style-type: none"><li>- Quotient sharing</li><li>- Partition sharing</li><li>- Use of division symbol</li></ul> <p data-bbox="311 508 672 707"><b>House method connected to arrays</b></p> <ul data-bbox="311 536 658 707" style="list-style-type: none"><li>- Connect 'house' symbol to arrays</li></ul> <p data-bbox="311 563 629 707">Children will understand division as grouping rather than just sharing and will be taught the meaning and significance of remainders.</p> 	<p data-bbox="720 330 1130 464"><b>Revise from Grade Three:</b></p> <ul data-bbox="774 350 1078 445" style="list-style-type: none"><li>- House method connected to arrays</li><li>- Chunking on a number line</li><li>- Remainders on a number line</li></ul> <p data-bbox="707 505 1149 601"><b>House Method for single digit divisors:</b></p> <ul data-bbox="707 530 1149 601" style="list-style-type: none"><li>- Students must see this in connection with a corresponding array or known multiplication fact</li></ul> $\begin{array}{r} \text{quotient} \rightarrow 5 \\ \text{divisor} \rightarrow 3 \overline{) 16} \\ \text{dividend} \nearrow 15 \\ \text{remainder} \rightarrow 1 \end{array}$	<p data-bbox="1219 330 1702 518"><b>Revise from Grade Four:</b></p> <ul data-bbox="1277 372 1653 489" style="list-style-type: none"><li>- House method connected to arrays</li><li>- Chunking on a number line with remainders</li><li>- Informal methods</li><li>- Estimation</li></ul> <p data-bbox="1170 560 1576 631"><b>Double Digit Divisors</b></p> <ul data-bbox="1170 587 1576 631" style="list-style-type: none"><li>- chunking; short division; double division</li></ul> <p data-bbox="1170 612 1315 631">e.g. <math>324 \div 18 =</math></p> $\begin{array}{r} 18 \quad 324 \\ - 180 \quad \times 10 \\ \hline 144 \\ - 90 \quad \times 5 \\ \hline \end{array}$





18th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DQVE - 16-19 OCTOBER

Mathematical  
vocabulary that  
will help US and  
students

ESL  
teachers, we  
need your  
help!

# Glossary

## Glossary

*Note: Words and phrases printed in boldface italics in the following definitions are also defined in this glossary.*

**abstraction.** In *counting*, the idea that a *quantity* can be represented by different things. For example,

5 can be represented by 5 like objects, by 5 different objects, by 5 invisible things (5 ideas), or by 5 points on a line.

**abstract level of understanding.** Understanding of mathematics at a symbolic level.

**accommodation.** A support given to a student to assist him or her in completing a task (e.g., providing more time for task completion, reading printed instructions orally to the student, scribing for the

achievement. Level 3 is defined as the provincial standard.

**algorithm.** A systematic procedure for carrying out a *computation*. See also *flexible algorithm* and *standard algorithm*.

**anchors (of 5 and 10).** Significant numbers, inasmuch as 10 is the basis of our number system, and two 5's make up 10. Relating other numbers to 5 and 10 (e.g., 7 as 2 more than 5 and 3 less than 10) helps students to develop an understanding of number *magnitude*, to learn basic addition and subtraction facts, and to acquire *number sense* and *operational sense*. See also *five frame* and *ten frame*.

**array.** A rectangular arrangement of objects into rows and columns, used to represent multiplication (e.g.,  $5 \times 3$  can be represented by 15 objects arranged into 5 columns and 3 rows).



IN AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DOME - 16-19 OCTOBER

## Discussion Questions #2

- 1) What are your first impressions of the components and structure of the curriculum?
- 2) What questions do you have about the components and structure of the curriculum?

## How can we make this work?

## What are our Ways of Knowing that it is working?

### New Curriculum $\neq$ Improved Learning



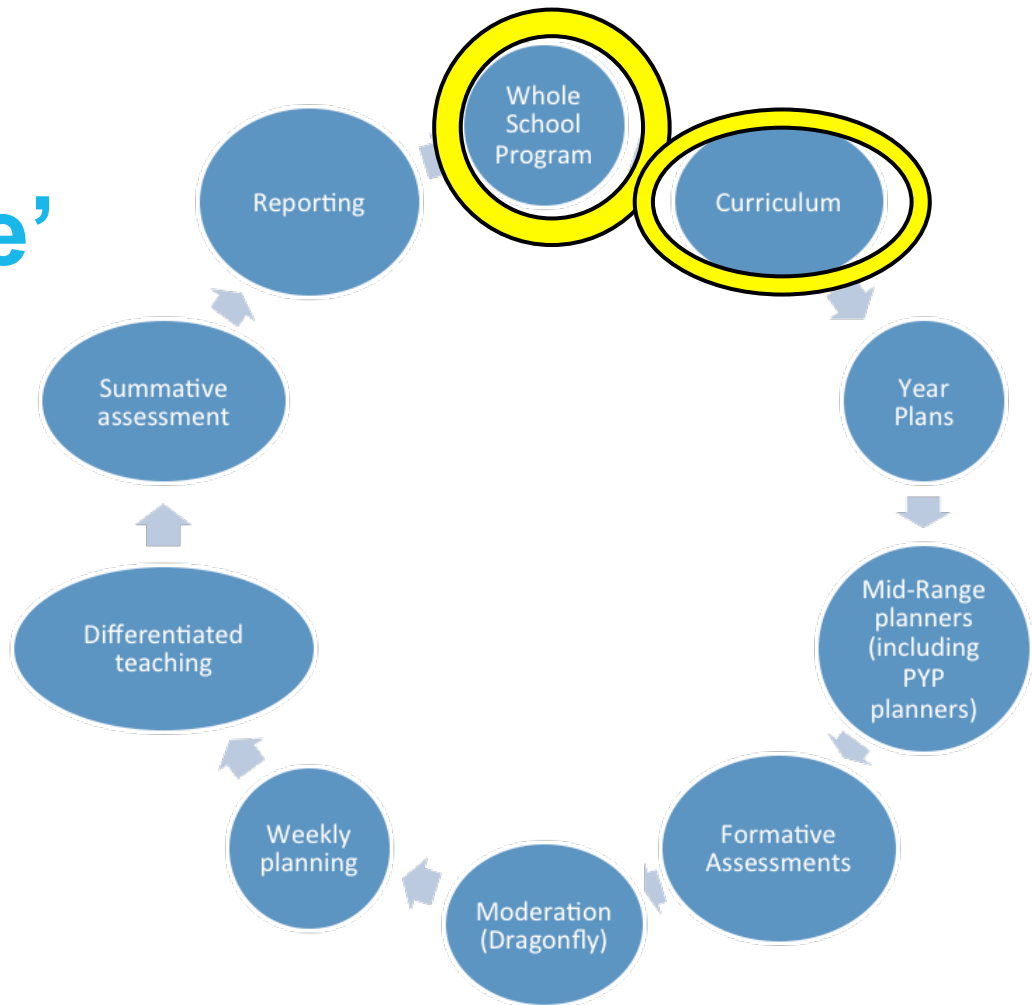


AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2016  
15-19 OCTOBER

# 'Closed Circle'

The program is supported by:

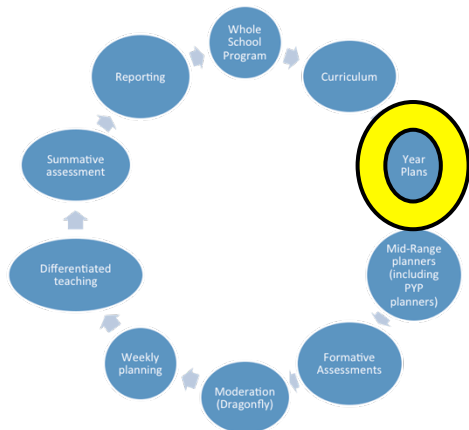
- Maths Coach
- Parent Partnerships
- Ongoing teacher training





AFRICA, EUROPE & MIDDLE EAST  
 REGIONAL CONFERENCE 2014  
 DUBEI - 16-19 OCTOBER

# Year Planning



Grade 2 Yearly Mathematics Planning 2014-15				
Week	Units of Inquiry	Other Strands	Number Strand	On-Going
1. Aug 25-29	How We Express Ourselves	Distinguishing Possible/ Impossible Likely/Unlikely	Investigating the Hundred Square	Basic Facts & Number Bonds to 20
2. Sept 1-5				
3. Sept 8-12				
4. Sept 15-19				
5. Sept 22-25				
6. Sept 29-Oct 3				
7. Oct 6-10	Where We are in Place and Time	Beginning Mapping	Numbers as Composed of Others Numbers	
8. Oct 13-17		Introducing Standard Units of Length	Conservation of Number	
9. Oct 20-24				
10. Nov 3-7	How the World Works	Connecting 2D & 3D Shapes	Learning and Using Basic Facts	
11. Nov 10-14				
12. Nov 17-21				
13. Nov 24-28				
14. Dec 1-5				
15. Dec 9-12				
16. Dec 15-19	Who We Are	Collecting Data to Answer Questions NB: last indicator from Chance + Place Value	Working Out Addition and Subtraction Relationships	
17. Jan 7-9				
18. Jan 12-16				
19. Jan 19-23				
20. Jan 26-30				
21. Feb 2-6				
22. Feb 9-13	Sharing the Planet	Beginning Tessellation	Early Multiplication (Equal Groups)	
23. Feb 23-27				
24. Mar 2-6				
25. Mar 9-13				
26. Mar 16-20				
27. Mar 23-27				
28. Apr 6-10	How We Organise Ourselves	Sorting and Categorizing 2D & 3D Shapes	Fractions with Materials 1	
29. Apr 13-17				
30. Apr 20-24				
31. Apr 27-30				
32. May 4-8				
33. May 11-15				
34. May 18-22	Fractions with Materials 2			
35. May 25-29				
36. June 1-5				
37. June 8-12				
38. June 15-19				
39. June 22-26				



13th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
ROME - 15-19 OCTOBER

# Mid-Range Planning + Inquiry Cycles



Planning the inquiry

1. What is our purpose?

**Stand alone Mathematics unit** with strong links to the following **transdisciplinary** theme:

**How we organize ourselves:**

- An inquiry into the interconnectedness of human-made systems and communities;
- the structure and function of organizations;
- societal decision-making;
- economic activities and their impact on humankind and the environment

• central idea

**Numbers help us organize our world.**

**Summative assessment task(s):**

What are the possible ways of assessing students' understanding of the central idea? What evidence, including student-initiated actions, will we look for?

**Strategy:** Open-ended response

**Prompt** – How do we use numbers?

Response may be recorded using any method selected by individual students e.g. drawn, written, oral

**Criteria** –

Quality responses will include:

- a variety of examples of how we use number to organize our world
- examples other than those looked at in class.
- Justification of why the use of number systems is important in different

Class/grade: Grade 1

Age group: 6-7 yo

School: Vienna IS

School code: 7019

Title: Number the World

Teacher(s): AL, CT, HP, RJ, BQ

Date: March–May 2013

Proposed duration: number of hours over number of weeks



PYP planner

2. What do we want to learn?

**What are the key concepts to be emphasized within this inquiry?**

- Function – numbers have a purpose, and are used in systems to organize our world.
- Change – when numbers are used in different situations their purpose may change.

**What lines of inquiry will define the scope of the inquiry into the central idea?**

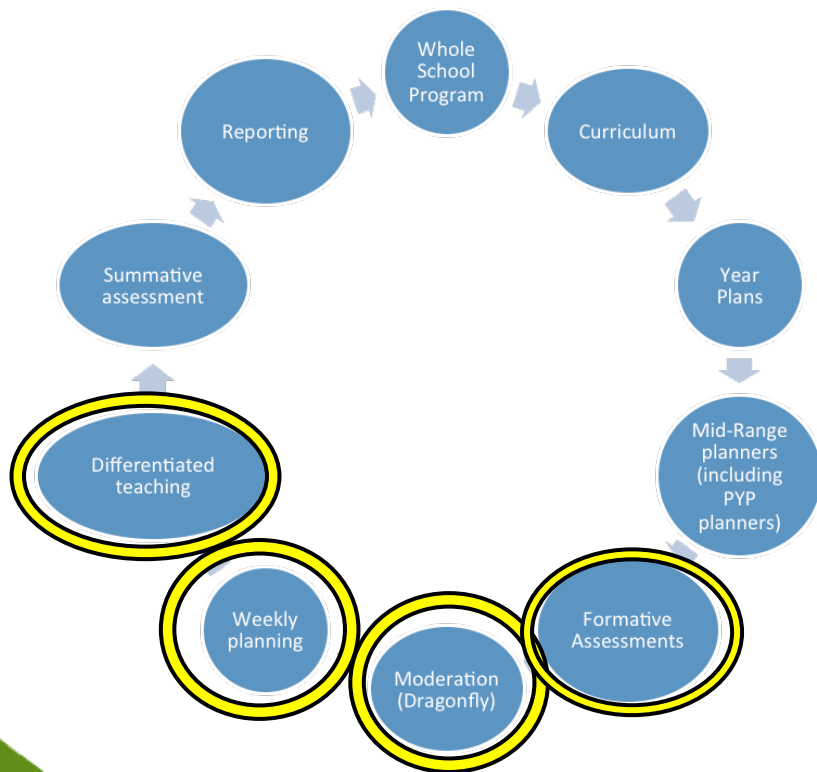
- Use of systems to organize our world helps us function as a group.
- Numbers are everywhere, and have different purposes in different situations
- Numbers organize things in our world. (e.g. time, money, length, weight, fractions? capacity)

**What teacher questions/provocations will drive these inquiries?**



AFRICA, EUROPE & MIDDLE EAST  
REGIONAL COMPETENCE 2014  
RQVE - 15-19 OCTOBER

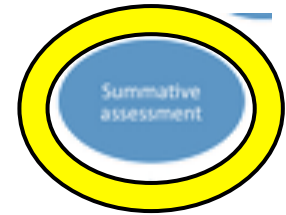
# From Formative Assessment to Differentiated Teaching







AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
10-15 OCTOBER



# Summative Assessment

- InCas standardised testing (new)
- ISA standardised testing
- Repeat of Diagnostic Tasks
- Trial of VIS Numeracy Assessment (emphasising practices <-> MYP)
- Teacher-created assessments

**Numeracy Assessment**

Name: \_\_\_\_\_ Vienna International School  
Grade: 5-6 Date: \_\_\_\_\_

**Problem**

\_\_\_\_\_

**Solution**  
Make your best estimate \_\_\_\_\_  
Explain your strategy \_\_\_\_\_

**Show how to solve**  
Draw a sketch \_\_\_\_\_

Calculate \_\_\_\_\_

**Explain your calculation and sketch:**

\_\_\_\_\_

**Give an example of how to use this maths in real life:**

\_\_\_\_\_

**Reflect on your thinking:**

\_\_\_\_\_

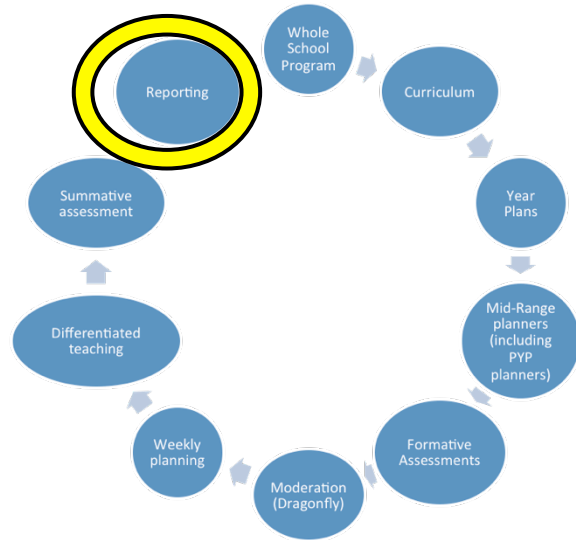
Useful job bag?  
Useful math?  
Useful tool?

1	2	3	4
<b>1.1</b> Understand the problem and plan a solution.	<b>1.2</b> Carry out the solution.	<b>1.3</b> Check the solution.	<b>1.4</b> Reflect on the solution.
<b>2.1</b> Understand the problem and plan a solution.	<b>2.2</b> Carry out the solution.	<b>2.3</b> Check the solution.	<b>2.4</b> Reflect on the solution.
<b>3.1</b> Understand the problem and plan a solution.	<b>3.2</b> Carry out the solution.	<b>3.3</b> Check the solution.	<b>3.4</b> Reflect on the solution.
<b>4.1</b> Understand the problem and plan a solution.	<b>4.2</b> Carry out the solution.	<b>4.3</b> Check the solution.	<b>4.4</b> Reflect on the solution.



AFRICA, EUROPE & MIDDLE EAST  
REGIONAL COMPETITION 2014  
RQVE - 15-19 OCTOBER

# Reporting



AL-PRIMARY SCHOOL			Grade Two (Ages 7-8) Mathematics Report			
Strand	Sub-Strand	Grade Level Focus Area	Performance Descriptors			
			Beginning	Developing	Consolidated	Established
Number	Whole & Decimal Numbers	Numbers as Composed of Other Numbers	I			
		Conservation of Number				
	Fractional Numbers	Fractions with Materials				
	Operate	Working Out Addition and Subtraction Relationships				
Calculate		Learning and Using Basic Facts				
		Early Multiplication (Equal Groups)				
Pattern	Reason about Numbers	Investigating the Hundred Square				
Shape & Space	Represent Location	Beginning Mapping				
		Connecting 2D & 3D Shapes				
	Represent Transformation	Beginning Tessellation				
	Reason Geometrically	Sorting and Categorizing 2D & 3D Shapes				
Measure	Direct Measure	Introducing Standard Units of Length				
Data Handling	Chance	Distinguishing Possible/Impossible/Likely/Unlikely				
		Collect and Organize Data	Collecting Data to Answer Questions			
Mathematical Practices	Knowing and Understanding Mathematics	Knowing and Understanding Mathematics				
		Communicating Mathematics				
	Applying Mathematics in Real-life Contexts					
	Developing Positive Approaches to Learning Mathematics					

Comments/Goals: (Do not repeat anything from above - summarize the above, add any student specific information)



AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2016  
16-19 OCTOBER

## Discussion Questions #3

- 1) Do you feel that your mathematics programme has a 'closed circle' to support teachers?
- 2) If not, what might be a next step for you? If it does, what might you add to ours?



10th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
DOVE - 16-19 OCTOBER

# Comments and Questions



18th AFRICA, EUROPE & MIDDLE EAST  
REGIONAL CONFERENCE 2014  
NOVEMBER 16-19 OCTOBER



Dr. Christine Orkisz Lang  
[clang@vis.ac.at](mailto:clang@vis.ac.at)

Anika Sommer  
[asommer@vis.ac.at](mailto:asommer@vis.ac.at)