## Problems in Teaching Primary School Mathematics

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An Associated College of The University of Dublin, Trinity College

### Introductions

Who here:

- Teaches junior/senior infants
- Teaches 1<sup>st</sup>/2<sup>nd</sup> class
- Teaches 3<sup>rd</sup>/4<sup>th</sup> class
- Teaches 5<sup>th</sup>/6<sup>th</sup> class
- Teaches a single class level
- Teaches two class levels
- Teaches three or more class levels
- Teaches in a DEIS school
- Is a learning support teacher
- Is a resource teacher
- Is a principal

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# What's on your mind about teaching mathematics?

- Language of mathematics reading problems can be tough
- How to make problem solving fun children's faces drop when they're doing the SIGMA (especially children with special needs)
- Link between primary school maths and Junior Cert Project Maths – what is worth emphasising in senior classes?
- Recommend any good maths games?
- Ideas for use of interactive boards in maths class
- Use of hands-on materials in senior classes when you could have 30+ in the class
- Creating a maths-friendly environment in the school changing it
- Preparing for a WSE in relation to maths
- Challenging "brighter" children

### How will this evening help you?

New habits change practice

Choose one maths teaching habit that you can adopt based on this evening's presentation and from discussion before during and after the presentation

#### Plan for Presentation

- Key element in improving the teaching of maths
- My story in teaching maths
- An example of teaching maths to promote children's thinking
- Teaching maths using problems
- Finding and choosing problems
- The problem of differentiation in maths class

# A key element in improving the teaching of maths is ...



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BUT...

# ...getting children to think and talk mathematically



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#### How I taught maths

- Check the children's homework or do a tables or mental maths activity
- Demonstrate how to do some sample problems by doing them on the board
- Ask the children to practise problems similar to those for which solutions were demonstrated. Give individual help to children who were having difficulties.
- Correct class work and assign homework



#### Why I began to teach maths differently







<u>Video</u>

If children only learn to memorise, they give up thinking for themselves

#### There are other ways to teach

#### Α

Review homework or remind children of accomplishments so far

Present the topic and problems for the day

Students or teachers develop procedures to solve the problem(s) at the board, taking suggestions from other students and the teacher

Practise doing problems similar to those worked on above

#### GERMANY

#### В

Review the previous lesson with a brief teacher lecture or summary by students

Present the problem for the day. One problem only.

Students work individually on problems first and then in groups for 5-10 minutes

Students (selected by teacher) present and discuss one or more solution methods.

Highlight and summarise major points JAPAN

#### С

Review previous material: Check homework or engage in warm-up activity

Demonstrate how to solve problems for the day by presenting a few sample problems and demonstrating how to solve them

Practise problems similar to those for which solutions were demonstrated

Correct class work and assign homework UNITED STATES

#### How I try to teach maths now

- Much more talking about maths in the classroom
- Children share their ideas with each other
- Get the children reasoning and justifying their answers
- Use fewer problems
- Use more open-ended problems
- Use the problems to teach a new maths topic, not just to check if the children understand it

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#### Sample Open-ended Problem

Dublin Zoo has just received two new sheep for the Family Farm part of the zoo. The zoo keeper wants to build an enclosure for the sheep. She decides that the enclosure must be square or rectangular with an area of 100 square metres.

- 1. Which different configurations could she build?
- 2. How many metres of fencing will she need for each possible design?
- 3. Use your copy or some graph paper to draw all the possible rectangular or square designs.
- 4. Include a key to tell how much each unit on the grid paper equals.
- 5. Which fence would you recommend that the zoo keeper builds? Why?

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# Sample of Teaching Using Problems

- Video Clip
- 20 Fifth class children
- Recruited from 11 different schools (4 DEIS), mostly around Marino area
- Topic: Area
- After school on a Friday afternoon in May 2011
- Maths Laboratory: Goal is not to offer model teaching, but public teaching
- Observed by 20 educators
- Amplified and video recorded



## Problem Solving Strategy 1

#### RUDE

- Read the problem
- Underline the key words
- Draw a diagram of the problem
- Estimate your answer and then solve the problem



## Problem Solving Strategy 2

#### STAR

- Search the word problem (info)
- Translate the words into an equation or picture (plan)
- Answer the problem (solve)
- Review the solution (check)

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## Problem Solving Strategy 3

#### LUV2C

- Look
- Underline
- Visualise
- Choose Numbers
- Calculate



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#### **Teaching Mathematics Using Problems**

- Little evidence that such strategies work
- Some evidence that classifying problems into problem-types can be helpful for children with learning disabilities
- Best way to learn problem solving is to practise solving problems
- Skill in problem solving develops slowly over time
- Many textbooks have too many problems, and many of the problems are of poor quality



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# Worked Example in a Textbook from Taiwan

How many fewer meters of colorful belts did Gi-Wen use compared to Wen-Ting? Write the corresponding mathematical expression and then find the answer.



From Charalambous et al, 2010

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MARI

#### Worked Examples in 2 Textbooks from Ireland **Example 2:** $4\frac{1}{6} - 2\frac{3}{4}$ 12 6 34 $= 4\frac{2}{12} = 3\frac{14}{12}$ (by renaming) $-2\frac{9}{12} = -2\frac{9}{12}$ 15



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From Charalambous et al, 2010

#### Sources of Problems

• <u>http://nrich.maths.org/frontpage</u>

<u>http://www.nctm.org/</u> (Annual subscription necessary)



# Choosing a Problem

A good problem...

- Should leave the solver feeling "stuck" at first
- The maths is what makes the problem problematic
- Relates to the children's experience
- Connects different maths topics
- Allows children with different attainment levels to achieve success with it
- May take time, even days, to complete
- Requires children to justify and explain their answers and methods



# The problem of differentiation in teaching maths

Children differ in many ways

- Within maths (from strand to strand)
- Within maths skills
- How they learn
- Motivation
- Learning disabilities
- Giftedness

Generic labels, such as weak, bright, lazy, clever, etc., can disguise children's specific talents and shortcomings

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#### **Differentiation Strategies**

 Encourage all children to work together to help the class as a whole to learn maths – learning maths through talking through ideas

Use problems that children can approach at different levels



#### Sample Problem for Differentiation

I have 10-cent, 5-cent and 1-cent coins in my money box. If I open the box and take out three coins, how much money could I have? How can you be sure that you have found all the possible amounts?



#### Skills Children Need in Order to Succeed in Maths

- Conceptual processing (e.g. identifying and extending patterns)
- Language (e.g. reading a word problem)
- Visual-spatial processing (e.g. working with 2-d and 3-d representations)
- Organisation (e.g. collecting and recording data)
- Memory (e.g. remembering number facts; remembering the steps of a mathematical procedure)
- Attention (e.g. focusing on the details in a maths problem)
- Psycho-social (e.g. working with a partner or in a group)
- Fine-motor skills (e.g. drawing geometric figures)

(Brodesky, 2002)



### A child with dyslexia

Possible Learner Difficulties	Possible Teacher Response		
Language comprehension impairment	Use vocabulary that is familiar to the student Explain new vocabulary carefully Monitor and vary the level of text learners are expected to read in mathematics problems Highlight words that have different meanings in different contexts (e.g. third, prime, factor)		
Counting speed is slower than in other learners	Provide more time in tables and other maths tests to allow students to use strategies when they can't recall number facts		
Memory problems	Give short instructions Recap at end of lesson and revisit topics frequently Monitor early work on new topics carefully so that incorrect strategies are not practised Use concrete materials (including fingers or pictures)		
Omission of digits and numerals	Encourage learners to compare answers with estimates	5	
Directional confusion in writing digits and doing algorithms	Work on the concepts first and on recording later	INSTITIÚID OIDEACHAIS	

### A Child with dyslexia

Possible Learner Difficulties	Possible Teacher Response
Phonological (speech sounds) processing	Exaggerate differences in words that sound similar (e.g. Tens and tenths; hundreds and hundredths; fifteen and fifty)
Difficulty with the decimal place	Highlight the decimal point – possibly by recording it in a different colour

Possible Learner Strengths	
Estimation	
Subitising	
Place value	



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#### **Supplementary Material**



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### **Concrete Materials & Visual Aids**

- Base Ten Materials
- Geoboards
- Rulers
- Hundred Square
- Addition Table
- Multiplication Table

#### **Base Ten Materials**



#### Naming Them

- Small cubes
- Longs
- Flats
- Large Cubes

#### Uses of Base Ten Materials

- Estimate how many small cubes on the table
- Equivalent Representations
- Demonstrating addition, subtraction and division
- Introducing Decimals (Re-define the unit)

#### Geoboards


## Uses of Geoboards

- Angles
- Symmetry
- Percentages
- Fractions
- 2-D Shapes
- Area and perimeter

## **Rulers or Measuring Tapes**



# Uses of Rulers

- Number lines
- Measuring
- Fractions and decimals

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

### Addition Table (1 - 10)

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

X	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

# Addition and Multiplication Number Facts

### ADDITION NUMBER FACTS IN FIRST CLASS

Start with a blank 12x12 grid

Show the children how the addition square works by giving some examples e.g. 1+

+	0	1	2	3	4	5	6	7	8	9	10
0		1									
1		2									
2		3									
3		4									
4		5									
5		6									
6		7									
7		8									
8		9									
9		10									
10		11									

Or 6+

+	0	1	2	3	4	5	6	7	8	9	10
0							6				
1							7				
2							8				
3							9				
4							10				
5							11				
6							12				
7							13				
8							14				
9							15				
10							16				

### BUILD UP THE REST OF THE ADDITION SQUARE

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

#### MAKE THE ADDITION FACTS EASIER BY ELIMINATING THE ...

#### COMMUTATIVE PAIRS

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

	+	0	1	2	3	4	5	6	7	8	9	10
I HE +0 FAC I S	0	0	1	2	3	4	5	6	7	8	9	10
0+0	1	1	2	3	4	5	6	7	8	9	10	11
1+0 2+0	2	2	3	4	5	6	7	8	9	10	11	12
2+0 3+0	3	3	4	5	6	7	8	9	10	11	12	13
4+0	4	4	5	6	7	8	9	10	11	12	13	14
5+0 6+0	5	5	6	7	8	9	10	11	12	13	14	15
7+0	6	6	7	8	9	10	11	12	13	14	15	16
8+0 9+0	7	7	8	9	10	11	12	13	14	15	16	17
10+0	8	8	9	10	11	12	13	14	15	16	17	18
	9	9	10	11	12	13	14	15	16	17	18	19
	10	10	11	12	13	14	15	16	17	18	19	20

	+	0	1	2	3	4	5	6	7	8	9	10
THE +1 FACTS	0	0	1	2	3	4	5	6	7	8	9	10
1+1	1	1	2	3	4	5	6	7	8	9	10	11
2+1	2	2	3	4	5	6	7	8	9	10	11	12
3+1 4+1	3	3	4	5	6	7	8	9	10	11	12	13
5+1	4	4	5	6	7	8	9	10	11	12	13	14
6+1 7+1	5	5	6	7	8	9	10	11	12	13	14	15
8+1	6	6	7	8	9	10	11	12	13	14	15	16
9+1 10+1	7	7	8	9	10	11	12	13	14	15	16	17
	8	8	9	10	11	12	13	14	15	16	17	18
	9	9	10	11	12	13	14	15	16	17	18	19
	10	10	11	12	13	14	15	16	17	18	19	20

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

- ...THE +2 FACTS 2+2 3+2
- 4+2
- 5+2
- 6+2
- 7+2
- 8+2
- 9+2
- 10+2

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

...THE TEN AND FACTS

10+3

**10+4** 

10+5

10+6

10+7

10+8

10+9

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

...THE DOUBLES

3+3

4+4

5+5

6+6

7+7

**8+8** 

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

...THE NEAR DOUBLES

3+4

4+5

**5+6** 

6+7

**7+8** 

#### ...THE TEN AND NINE FACTS AND FIVE AND FACTS

6+4

7+3

6+3

+	0	1	2	3	4	5	6	7	8	9	10
0	0	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10	11
2	2	3	4	5	6	7	8	9	10	11	12
3	3	4	5	6	7	8	9	10	11	12	13
4	4	5	6	7	8	9	10	11	12	13	14
5	5	6	7	8	9	10	11	12	13	14	15
6	6	7	8	9	10	11	12	13	14	15	16
7	7	8	9	10	11	12	13	14	15	16	17
8	8	9	10	11	12	13	14	15	16	17	18
9	9	10	11	12	13	14	15	16	17	18	19
10	10	11	12	13	14	15	16	17	18	19	20

	+	0	1	2	3	4	5	6	7	8	9	10
THE THROUGH TEN	0	0	1	2	3	4	5	6	7	8	9	10
FACIS	1	1	2	3	4	5	6	7	8	9	10	11
7+4	2	2	3	4	5	6	7	8	9	10	11	12
7+5	3	3	4	5	6	7	8	9	10	11	12	13
8+3	4	4	5	6	7	8	9	10	11	12	13	14
8+4	5	5	6	7	8	9	10	11	12	13	14	15
8+5 8+6	6	6	7	8	9	10	11	12	13	14	15	16
	7	7	8	9	10	11	12	13	14	15	16	17
9+3 9+4	8	8	9	10	11	12	13	14	15	16	17	18
9+5	9	9	10	11	12	13	14	15	16	17	18	19
9+6 9+7	10	10	11	12	13	14	15	16	17	18	19	20

## Multiplication

### MULTIPLICA TION NUMBER FACTS IN THIRD CLASS

Start with a blank 12x12 grid

SHOW THE CHILDREN HOW IT WORKS BY GIVING SOME EXAMPLES

x	0	1	2	3	4	5	6	7	8	9	10
0				0							
1				3							
2				6							
3				9							
4				12							
5				15							
6				18							
7				21							
8				24							
9				27							
10				30							

SHOW THE CHILDREN HOW IT WORKS BY GIVING SOME EXAMPLES

x	0	1	2	3	4	5	6	7	8	9	10
0							0				
1							6				
2							12				
3							18				
4							24				
5							30				
6							36				
7							42				
8							48				
9							54				
10							60				

<b>BUILD UP</b>
THE REST
<b>OF THE</b>
MULTIPLI-
CATION
TABLE

X	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	X	0	1	2	3	4	5	6	7	8	9	10
UNDER- STANDING	0	0	0	0	0	0	0	0	0	0	0	0
OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING OUT:	3	0	3	6	9	12	15	18	21	24	27	30
	4	0	4	8	12	16	20	24	28	32	36	40
COMMUT-	5	0	5	10	15	20	25	30	35	40	45	50
ATIVE PAIRS	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	X	0	1	2	3	4	5	6	7	8	9	10
UNDER- STANDING	0	0	0	0	0	0	0	0	0	0	0	0
OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING OUT:	3	0	3	6	9	12	15	18	21	24	27	30
	4	0	4	8	12	16	20	24	28	32	36	40
ZERO	5	0	5	10	15	20	25	30	35	40	45	50
FACIS	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	X	0	1	2	3	4	5	6	7	8	9	10
UNDER- STANDING	0	0	0	0	0	0	0	0	0	0	0	0
OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING OUT:	3	0	3	6	9	12	15	18	21	24	27	30
	4	0	4	8	12	16	20	24	28	32	36	40
ONE FACTS	5	0	5	10	15	20	25	30	35	40	45	50
	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	X	0	1	2	3	4	5	6	7	8	9	10
UNDER- STANDING	0	0	0	0	0	0	0	0	0	0	0	0
OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING OUT:	3	0	3	6	9	12	15	18	21	24	27	30
	4	0	4	8	12	16	20	24	28	32	36	40
TEN FACTS	5	0	5	10	15	20	25	30	35	40	45	50
	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	X	0	1	2	3	4	5	6	7	8	9	10
UNDER- STANDING	0	0	0	0	0	0	0	0	0	0	0	0
OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING OUT:	3	0	3	6	9	12	15	18	21	24	27	30
	4	0	4	8	12	16	20	24	28	32	36	40
TWO FACTS	5	0	5	10	15	20	25	30	35	40	45	50
	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	X	0	1	2	3	4	5	6	7	8	9	10
UNDER-	0	0	0	0	0	0	0	0	0	0	0	0
STANDING OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
PLICATION FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING	3	0	3	6	9	12	15	18	21	24	27	30
001:	4	0	4	8	12	16	20	24	28	32	36	40
FIVE FACTS	5	0	5	10	15	20	25	30	35	40	45	50
	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE	x	0	1	2	3	4	5	6	7	8	9	10
UNDER-	0	0	0	0	0	0	0	0	0	0	0	0
STANDING OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
PLICATION FACTS BY	2	0	2	4	6	8	10	12	14	16	18	20
POINTING OUT:	3	0	3	6	9	12	15	18	21	24	27	30
	4	0	4	8	12	16	20	24	28	32	36	40
NINE	5	0	5	10	15	20	25	30	35	40	45	50
FACTS	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100
	-											

OTE	X	0	1	2	3	4	5	6	7	8	9	10
CR-	0	0	0	0	0	0	0	0	0	0	0	0
LTI-	1	0	1	2	3	4	5	6	7	8	9	10
LION BY	2	0	2	4	6	8	10	12	14	16	18	20
ING F:	3	0	3	6	9	12	15	18	21	24	27	30
- •	4	0	4	8	12	16	20	24	28	32	36	40
R	5	0	5	10	15	20	25	30	35	40	45	50
ſS	6	0	6	12	18	24	30	36	42	48	54	60
	7	0	7	14	21	28	35	42	49	56	63	70
	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

PROMOTE UNDER-STANDING OF MULTI-PLICATION FACTS BY POINTING OUT:

> FOUR FACTS

	X	0	1	2	3	4	5	6	7	8	9	10
PROMOTE UNDER-	0	0	0	0	0	0	0	0	0	0	0	0
STANDING OF MULTI-	1	0	1	2	3	4	5	6	7	8	9	10
PLICATION FACTS BV	2	0	2	4	6	8	10	12	14	16	18	20
POINTING	3	0	3	6	9	12	15	18	21	24	27	30
OUT:	4	0	4	8	12	16	20	24	28	32	36	40
THREE	5	0	5	10	15	20	25	30	35	40	45	50
FACTS	6	0	6	12	18	24	30	36	42	48	54	60
(2 TIMES, ADD ONE	7	0	7	14	21	28	35	42	49	56	63	70
MORE)	8	0	8	16	24	32	40	48	56	64	72	80
	9	0	9	18	27	36	45	54	63	72	81	90
	10	0	10	20	30	40	50	60	70	80	90	100

SEVEN
EIGHT
CTS
MAIN.

X	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

### Abstract

In this session Seán Delaney will discuss the use of problems in mathematics teaching in primary classrooms (2nd to 6th class). Topics covered will include approaches to teaching mathematics using problems, differentiation using problems, teaching maths skills using problems, and choosing problems. Questions and discussion about mathematics teaching are welcome.