SA NUMERACY CHAIR PROJECT

Early Number Fun
Grade R Teacher Development Programme

Session Three Teacher Handbook

Name

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School

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www.ru.ac.za/sanc
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Maths is fun

Table of contents

Introduction to session

In the first part of this session we will focus on teacher learning experiences of using the activities engaged with in session 2.

These included:

1. Using 5 monkey story books for developing number sense

Here, in particular we will reflect on learner responses to these stories, ways that teachers have adapted the stories and the way in which they enabled (or not) the intended skills of:

- Context bound counting 1-5 and calculating (1 less)
- Object bound counting 1-5 and calculating (1 less) with fingers or drawings
- numeral and word recognition (1-5)
- compare quantities and develop language of more/ less/ many/ none
- develop comparative language for size – big and small; more and less
- recognition of words like 'more' 'less' 'big' 'small'
- develop a patterned sense of bonds to 5 (i.e. 5-0; 4-1; 3-2; 2-3; 1-4; 0-5
- use written tallies and/or numbers to represent the patterned story of how the 'number of …' changes in each place in each stage of the story (the 'worksheet')

We will also reflect on how the story books were used beyond the demonstrated activities in session 2 (i.e. imitative reading and various adapted activities).

2. Learner cognitive control - shapes

In the second session we worked with a pack of multiple shapes of varied sizes and colours. Sets were given for use with learners in groups. Various games were suggested that focused on either flexibility (shifting attention) or working memory. We will reflect on learner experiences of these, their progress (if any) as they became more familiar with the games. Any adaptations to the games?

3. Mindset posters

In the second session the posters given related to loving working with numbers.

- What kinds of discussion or engagement did learners have with you and these posters?
- Are these posters useful for enabling engagement around positive learning dispositions?
- If so, how were they useful?

This section provides details of the activities that are be presented in this workshop.

Every workshop will have a similar section so you know where to look in the handbook.

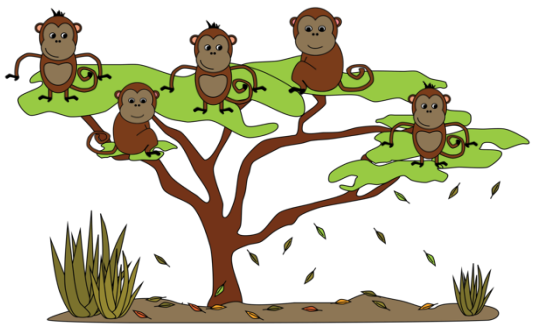
Resources

Reflection Activity

Get into groups of 3-5 teachers who are from a different school to you.

Reflect on your use of the following activities from the last session.

1. ***Using 5 monkey story books* for developing number sense**



In particular, reflect on learner responses to the story.

In what way did they enable (or not) the intended skills of:

- Context bound counting 1-5 and calculating (1 less)
- Object bound counting 1-5 and calculating (1 less) with fingers or drawings
- numeral and word recognition (1-5)
- compare quantities and develop language of more/ less/ many/ none
- develop comparative language for size – big and small; more and less
- recognition of words like 'more' 'less' 'big' 'small'
- develop a patterned sense of bonds to 5 (i.e. 5-0; 4-1; 3-2; 2-3; 1-4; 0-5
- use written tallies and/or numbers to represent the patterned story of how the 'number of …' changes in each place in each stage of the story (the 'worksheet')

Did you notice any progress in your learners in general (or in some in particular) in terms of each of these skills as your use of the resource progressed? Explain.

How did you adapt the activity format (if at all)?

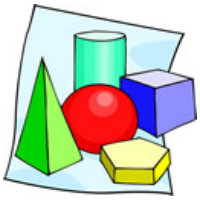
Did any of the learners engage with the books to do imitative reading with each other? Were there any other ways that learners engaged with the book / story?

If so explain your experience of this.

NOTES:

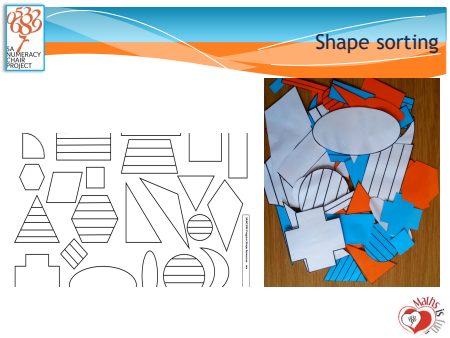
Reflection Activity continued

2. *Learner cognitive control*



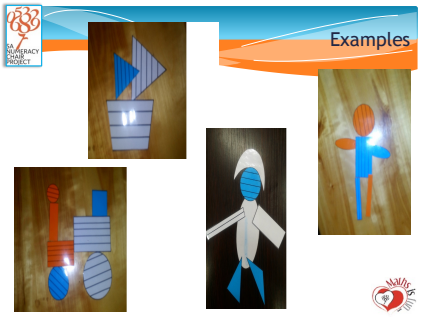
In the second session we worked with a pack of multiple shapes of varied sizes and colours. Sets were given for use with learners in groups. Various games were suggested that focused on either flexibility (shifting attention) or working memory.

- Reflect on learner experiences of the use of **shapes for working memory** (e.g. Which shape is missing? Which shapes were there)? Did you notice any progress in your learners in general (or in some in particular) in terms of what they could remember as your use of the resource progressed? Explain. Any adaptations to the games?



- Reflect on learner experiences of the use of **shapes for sorting** in various ways and shifting attention. Did you notice any progress in your learners in general (or in some in particular) in terms of what they could remember as your use of the resource progressed? Explain. Any adaptations to the games?

- One activity suggested included **shape recognition and description and then asking learners to position** the selected shape, for example, above their head or below their chair. Reflect on learner experiences of the use of shapes for developing language of description and positionality (and listening skills). Did you notice any progress in your learners in general (or in some in particular) in terms of what they could do as the activity progressed? Explain. Did you make any adaptations to the games?

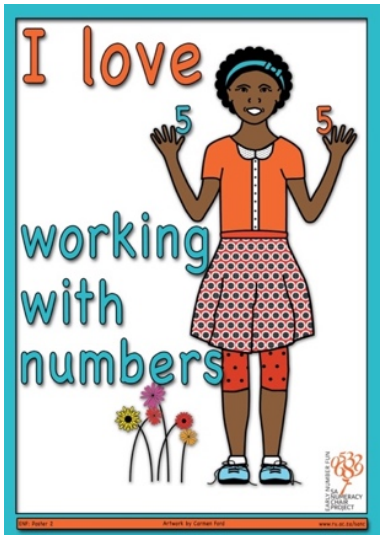


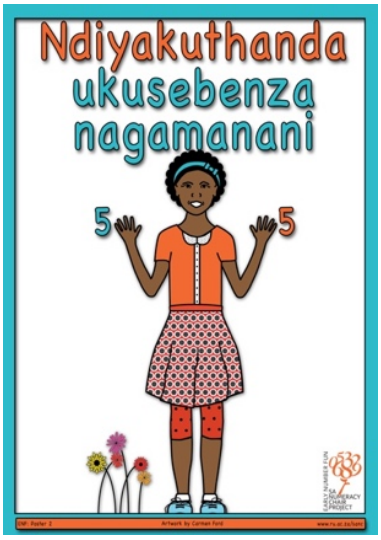
- Another activity involved learners using the **shapes to make various pictures from the shapes** and possible drawings of these (or getting other learners to make their own picture). What were your learner experiences of these activities? To what extent did learners develop their creativity in making pictures? Explain.

NOTES:

Reflection Activity continued

3. Mindset posters: I love working with numbers





In the last session the posters given related to **loving working with numbers**.

Did you put the poster up in your classroom? Where have you placed it?

What kinds of discussion or engagement did learners have with you and these posters? Are these posters useful for enabling engagement around positive learning dispositions? Explain

NOTES:

Story-based activities – The Children and the Umbrellas

Getting started with the story book

First read the story to your learners. This could be with the whole class on the mat or with smaller groups of learners on the mat while other learners are occupied with other activities.

As you read,

- pause to ask the questions such as "which umbrella has more or less children?"
- encourage learners to use expressions whilst listening to the story
- Allow learners to point to the story. It is laminated so they can touch it. For example, when counting the learners under each umbrella.
- Point out the words – **more, less, big, small** and the **numeral and number words** on each page that describe what is happening on each page.
  Ask learners to repeat these words as you point to them.

Re-enact the story

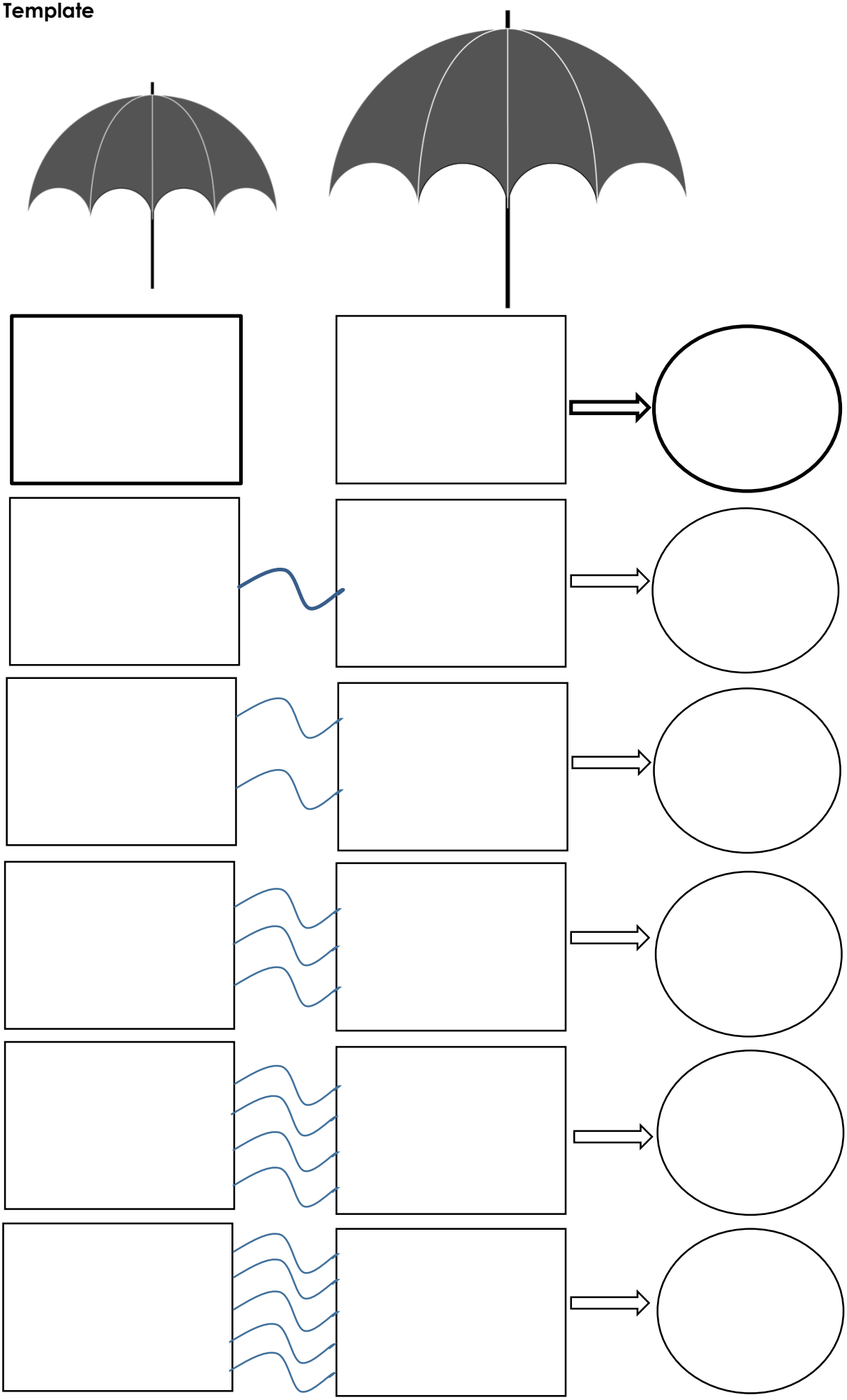
Now get learners to re-enact the story from memory.

- Have one learner be the small umbrella holding 5 children (using five puppets you will make as you did with the children puppets).
  Have another learner be the big Umbrella (s/he can stand on a chair to be taller) – at the start this learner has no children.
  Alternatively, use real umbrellas and children to act out the story
  Allow another learner to be the one moving the children between the umbrellas.
- Point to the 'small umbrella' and say to the learners "here are the 5 children under the small umbrella and no children under the big umbrella like at the start of our story – do you agree? Are there 5 here?"
- Ask individual learners to put the word cards and number cards at the feet of the 'umbrellas'

  i.e. more; big and 5-five at the foot of the small umbrella and less; small; and 0-zero at the foot of the big umbrella.
- Ask the other learners if they agree with the cards placed at the feet of the 'umbrellas'.
- Then ask learners what happened next in the story.
- The learner tasked with moving the children takes the one child from under the small umbrella to under the big umbrella.
- Now ask learners "How many children are there now under each umbrella? Which umbrella has more children?"
- At each stage ask the learners: "How many children are there altogether under both umbrellas?".
- Ask learners to change the cards at the bottom of each umbrella so that they correctly represent the situation at each part of the story. .
  The card for the size of the umbrella will stay and the more and less will stay until the 3rd child moves.
- Continue like this for each stage of the story.

It is important to emphasise that there are always 5 children that are shared between the umbrellas in different combinations of 5.
i.e. 5 and 0; 4 and 1; 3 and 2; 2 and 3; 1 and 4; 0 and 5.

Template



Story-based activities – The Children and the Umbrellas continued

POST STORY CONSOLIDATIONS

These activities can be done in the days and weeks following these activities.

Flashcards and fingers

Resources required:	**Skills:**
Numeral and number word flash cards	Numeral and number word recognition, relating fingers with the numerals and words.

- Using a flash card, ask learners: "Show me this many fingers".
- Once learners can recognise the words and numerals together switch to hiding the numeral and focus only on the word recognition.

Finger puppets

Resources required:	**Skills:**
Crayons, prestik, glue or sellotape, scissors Sheets of children (5 children per learner)	Numeral and number word recognition, relating fingers with the numerals and words. The colouring and cutting is also important for developing fine motor co-ordination.

- Get learners to colour in 5 children puppets and then cut them out to turn them into a finger puppet using prestik, glue or sellotape.
- Learners put the 5 children on one hand and then using their hands, they 'act out' each part of the story, step-by-step.
- The one hand with the 5 children puppets and the other with no children s represents the start of the story with 5children under the small umbrella and no children under the big umbrella.
- Ask learners to remember what happened next in the story and get them to 'act it out' by moving the children one at a time to the other hand.
- At each stage ask: "How many children under the small umbrella? How many children under the big umbrella? How many children are there altogether under the umbrellas?"

Story-based activities – The Children and the Umbrellas continued

Extension activities
Below are some ideas for extending the learning using other activities.

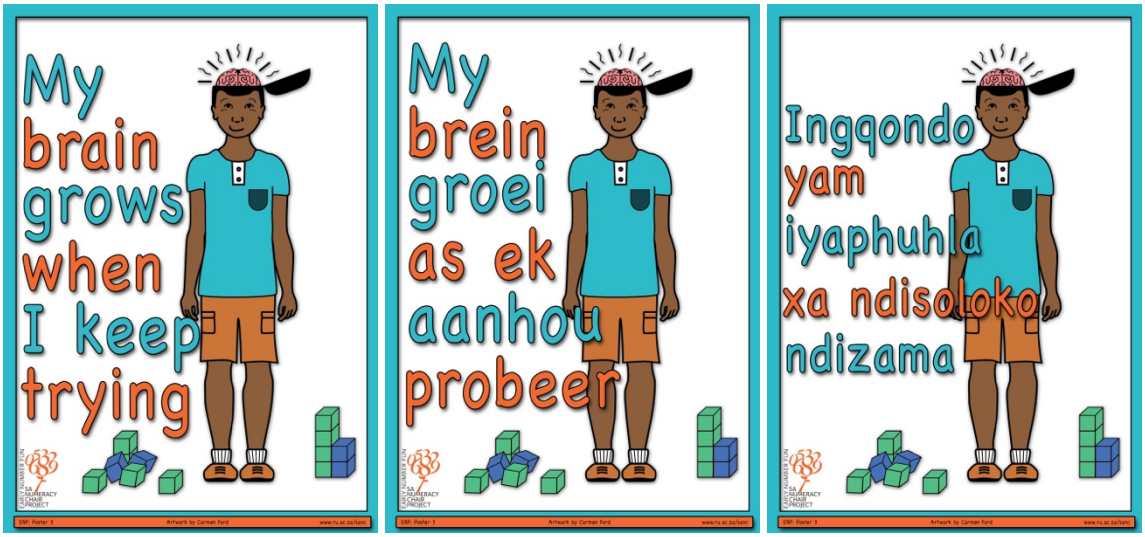
1. For learners who are easily managing to act out the story with finger puppets, encourage them to begin to show the story with only their fingers (no puppets). In this case you are progressing them to object-based counting as fingers represent the children.
   Emphasise the movement with "runnnnnnnn" as a finger on one hand goes down and then appears on the other hand.
2. Encourage learners to tell other students the story using the final blank umbrella page of the story book. Learners can place their children under the umbrellas using prestik and then move them from one to the other as they tell/enact the story
3. Some learners may be ready to represent the story stages by drawing dots or lines for children or writing numbers to show what happens each stage of the story. You can give them a template (see next page for a template) for the story or allow them to come up with a way to draw the story their own way. Encourage the learners to see the pattern in the number representations down each column.
   The next page shows an example of what one pair of learners did after working with the story in the way described above.
4. Encourage learners to 'read' the story to you or to other learners as they show each page to the audience. Such imitative reading is a first step towards reading.
5. Of course other learning can be integrated across the story activities based on discussion of the story:
   - "Have you been caught in the rain before?"
   - "What do we use an umbrella for?"
   - "What are umbrellas made of?

One can also bring an umbrella to school and let learners feel the material used (non porous/ waterproof) and discuss the design of how it expands and closes again.

Discuss why we shouldn't open umbrellas indoors. And so on.

My brain grows when I keep trying

In this session, you will receive one of these posters to display in your classroom.



Learner discussion

As you put this poster up, you could have a discussion with the learners about this.

- Perhaps you and your class could think of a name for this boy such as Thabo
- Refer the learners back to poster one: **My brain grows when I think hard**
- Remind them about revisiting mistakes and grappling with it because the brain grows from the **experience of struggle**. When learners struggle with mathematics, their brains grow.
- Being outside their comfort zone is important and learners must develop to resilience in the face of unfamiliar challenges.

The harder you work at something, the more you keep trying, the better you will be at it.

- Ask the learners:
  - How do you get better at sport (running, swimming, or some other sport they are familiar with)?
  - How do you get better at throwing and kicking a ball?
- Point out that the important thing is to 'practice' and keep trying.
- Ask the learners:
  - What do you think Thabo is trying to do in this picture? Gather some ideas
- Talk about Thabo's positive attitude and ask the learners to read along as you point to the words "My brain grows when I keep trying".

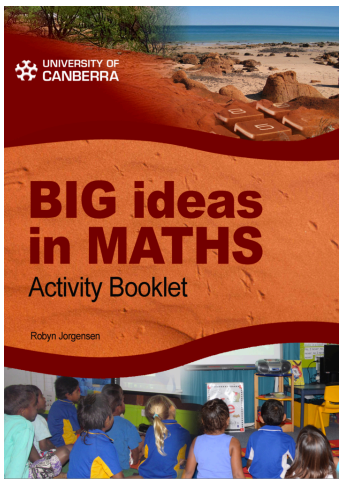
Look up and watch the following Jo Boaler YouTube clips on how the brain grows when we make mistakes

- Jo Boaler: The Brain Science On Growth Mindset: https://www.youtube.com/watch?v=s4xqzgBy-lM
- How you can be good at math, and other surprising facts about learning | Jo Boaler | TEDxStanford https://www.youtube.com/watch?v=3icoSeGqQtY

Robyn Jorgensen – Introduction and biography

Guest speakers are an important part of teacher learning communities. They provide opportunities for engagement with and learning from experiences of educators from other contexts, parts of the country or world. In this session we are privileged to have Professor Robyn Jorgensen of Australia working with us.

Robyn Jorgensen – biography



Robyn is Professor of Education: Equity and Pedagogy at the University of Canberra. She is an internationally renowned educational researcher who has led many significant research projects including lead researcher on twelve Australian Research Council grants. She has worked extensively across a wide range of settings. As a very hands-on educator and academic, she has worked across all sectors of schooling and is currently undertaking a large national project exploring successful numeracy practices in remote communities.

She has been part of the Ministerial Advisory Committee for Science, Technology, Engineering and Mathematics (STEM) and was Chair of the Mathematics Advisory Committee for the Queensland Studies Authority. She recently served as Editor-in-Chief for the Mathematics Education Research Journal for 7 years.

She has served as the eminent mathematics education professor on the Australian Association of Mathematics Teachers' national project for enhancing mathematics learning for Indigenous Australians (Make it Count), on numerous advisory boards in large projects for mathematics education, and is currently working as ASSA's Honorary Chair of Early Childhood Education. She has also worked in an advisory capacity for State Projects and innovations in various states including Queensland, South Australia and the Northern Territory.

In 2009-2010, she took leave from the University to take a role of CEO and Principal of an Aboriginal Corporation in the Northern Territory. In this role, the Corporation was in charge of a remote boarding school for Anangu students from the Central Desert area of the Northern Territory.

Robyn's work in Australia connects well with our project work. Robyn, with Shelley Dole, authored the book 'Teaching math in primary schools'. This book has lovely ideas relevant to South African teachers.

See http://www.canberra.edu.au/research/faculty-research-centres/stem-education-research-centre/research-projects/remote-numeracy

Robyn Jorgensen – Themes and Activities

In this session Robyn will draw on a range of these ideas in order to illuminate *four* key mathematical themes that guide her work:

- math is a language
- maths is a tool
- maths is an art
- maths is power

She will follow this with several hands on activities that can be used with primary learners. These activities are part of a resource book she authored entitled "Big ideas in maths: Activity booklet'.

Activity 1

Place Value

Train Game

Objective

- *Group, partition and rearrange collections in hundreds, tens and ones to facilitate more efficient counting*
- *Apply **place value** to partition, rearrange and regroup numbers*

Equipment

- *Appendix 1 - Train board (copy for each student)*
- *MAB blocks*
- *6-sided die*

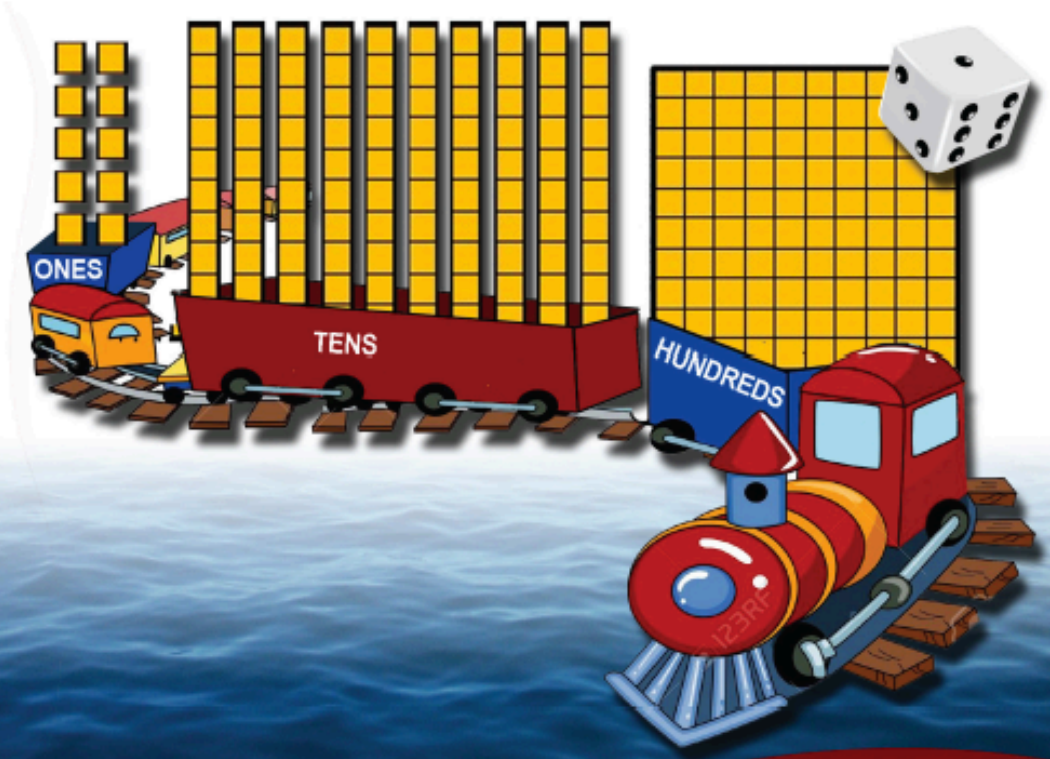
Instructions

In small groups, the children throw a die and with the number shown take one's (units) that are of that value. As they get 10 ones (units), they replace this with a 10s (long). When they get 10 longs, they replace that with a 100 (flat). The winner is the first to 100.

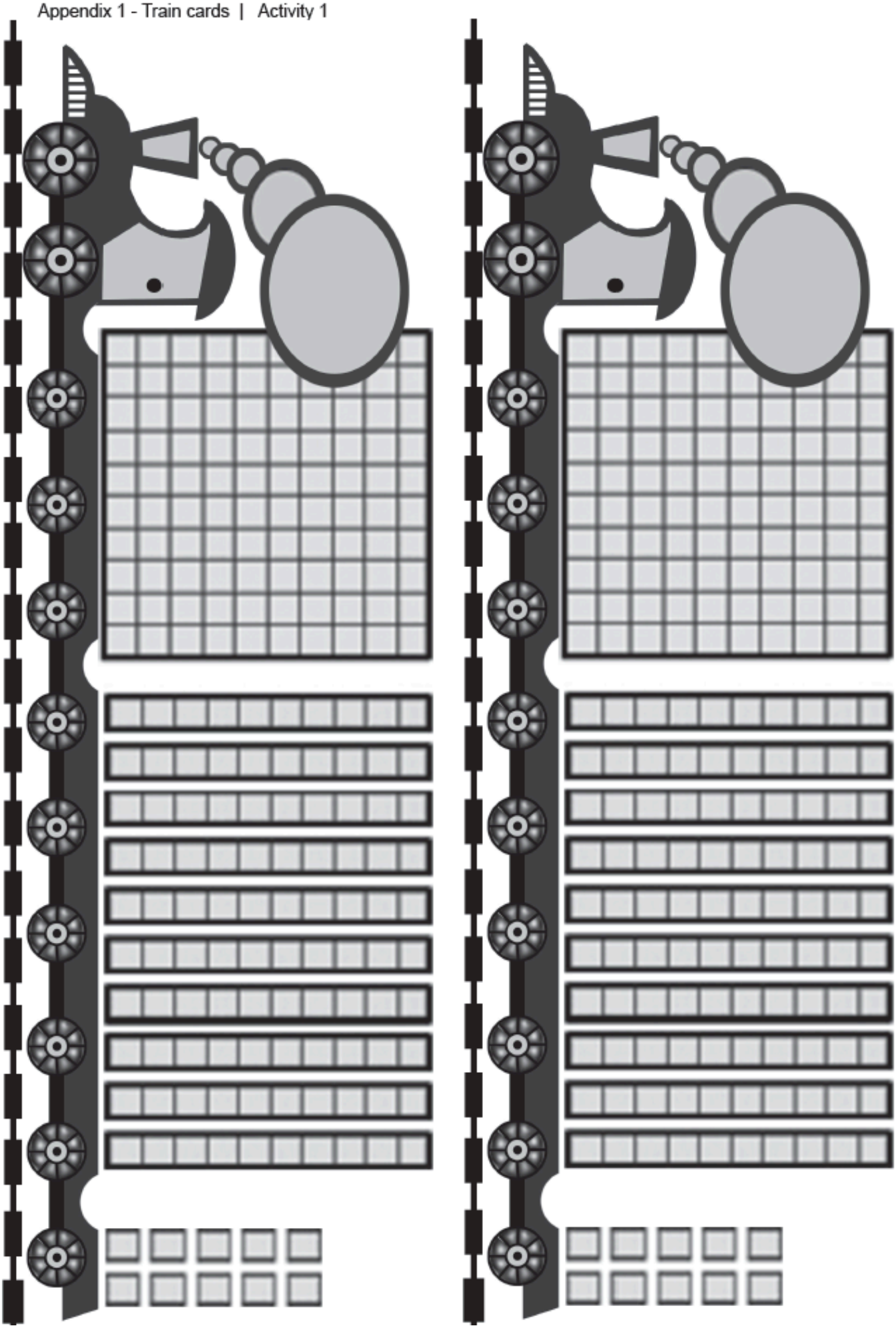
Throughout the game, ask the children 'how many' do they have so that they can revise the place value concept.

Variations

- A 10 sided die will make the game quicker, but won't help consolidate the notion of trading.



Appendix 1 - Train cards | Activity 1



Source: Jorgensen (Zevenbergen), R. (n.d.). Big ideas in maths: Activity booklet. University of Canberra.

Activity 2

Place Value

Make the Biggest Number

Objective

- *Recognise, model, represent and order numbers*
- *Apply **place value** to partition, rearrange and regroup numbers*

Equipment

- *Appendix 2 - HTO board (copy for each student)*
- *Deck of cards with only the Ace-9*

Instructions

Place the shuffled deck of cards over so students can't see what is showing. They each take one card and place it on their HTO chart. The idea is for them to create the biggest number possible.

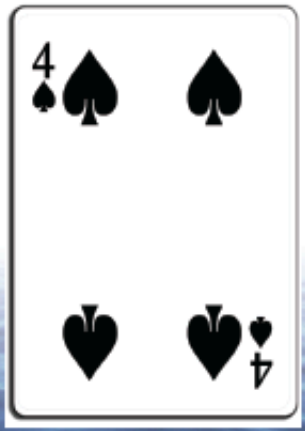
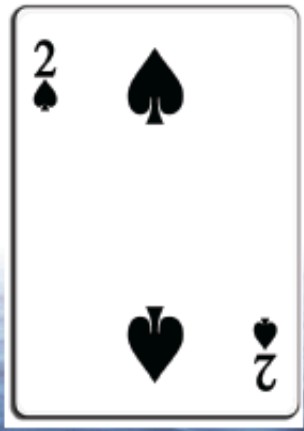
There is an element of chance in the game which can make the game fun for the students.

At the end of each round, the students should say their number.

Ask them, as a group – which number is the biggest, which number is the smallest, always ask the students 'why' or how do they know that? This helps them to justify their thinking and understand the way/s that numbers work.

Variations

- *Make the smallest number*
- *Change the values on the chart to only tens and ones; use one whole number and then use for decimal values.*

Hundreds	Tens	Ones
		

Source: Jorgensen (Zevenbergen), R. (n.d.). Big ideas in maths: Activity booklet. University of Canberra

Activity 5

Place Value

Closest Number To....

Objective

- *Apply **place value** to partition, rearrange and regroup numbers*
- *Recognise, model, represent and order numbers up to 1000*

Equipment

- *Appendix 2 - HTO board (copy for each student)*
- *Deck of cards with only the Ace-9*

Instructions

Teacher nominates a number (such as 558).

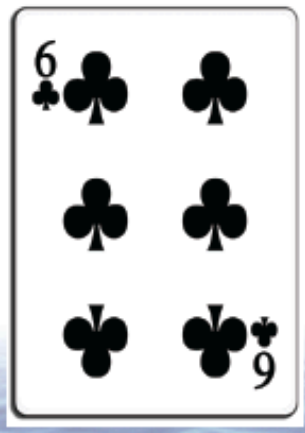
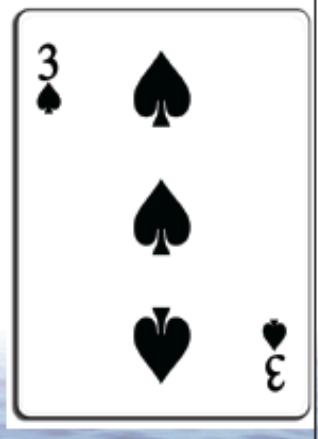
Students take a card from the pack (turned upside down). They place the number in one of the places on their chart. Repeat three times so that there is a card in each place on the chart. The person who is the closest to the nominated number wins.

Students have to say why the numbers are the closes to the nominated number

Reinforce place values (used expanded notation terms 456 is 400+50+9 or 4 one hundreds, 5 tens and 9 ones.

The winner gets a tally mark for their win in that round.

Play until someone gets 5 tally marks.

Hundreds	Tens	Ones
		

Source: Jorgensen (Zevenbergen), R. (n.d.). Big ideas in maths: Activity booklet. University of Canberra

Hundreds	Tens	Ones

Hundreds	Tens	Ones

Source: Jorgensen (Zevenbergen), R. (n.d.). Big ideas in maths: Activity booklet. University of Canberra

Activity 3

Number Sequence

Objective

- *Develop confidence with **number sequences** to and from 120 from any starting point*
- *Describe patterns with numbers and identify missing elements*

Hiding Numbers

Equipment

Whole class:

- *Whiteboard / Overhead projector*
- *Paper to cut jigsaw pieces*

Small groups:

- *Appendix 3 - 1-120 Chart*
- *Appendix 4 - Jigsaw template*

Instructions

This activity can be played in a number of ways – whole class or small groups. Using the 120s board, on the overhead projector or Whiteboard in the whole class or just a large sheet with a small group, cover up some numbers using a 'jigsaw' piece.

Start with numbers in a straight line, and only a few numbers (one, two or three numbers). Students have to guess what the hidden number/s are. Ask them to explain how they know that is the number. Only use one shape at any time.

Start to use more complex shapes – such as Ls and Ts – and then move to shapes that are like Hs or odd shapes and cover a number of numbers in different rows and columns.

Always ask the students how they know the missing numbers. This should help them see the patterns in the numbers – the columns always end the same number, and the rows always start with the same number (except with the 10s column).

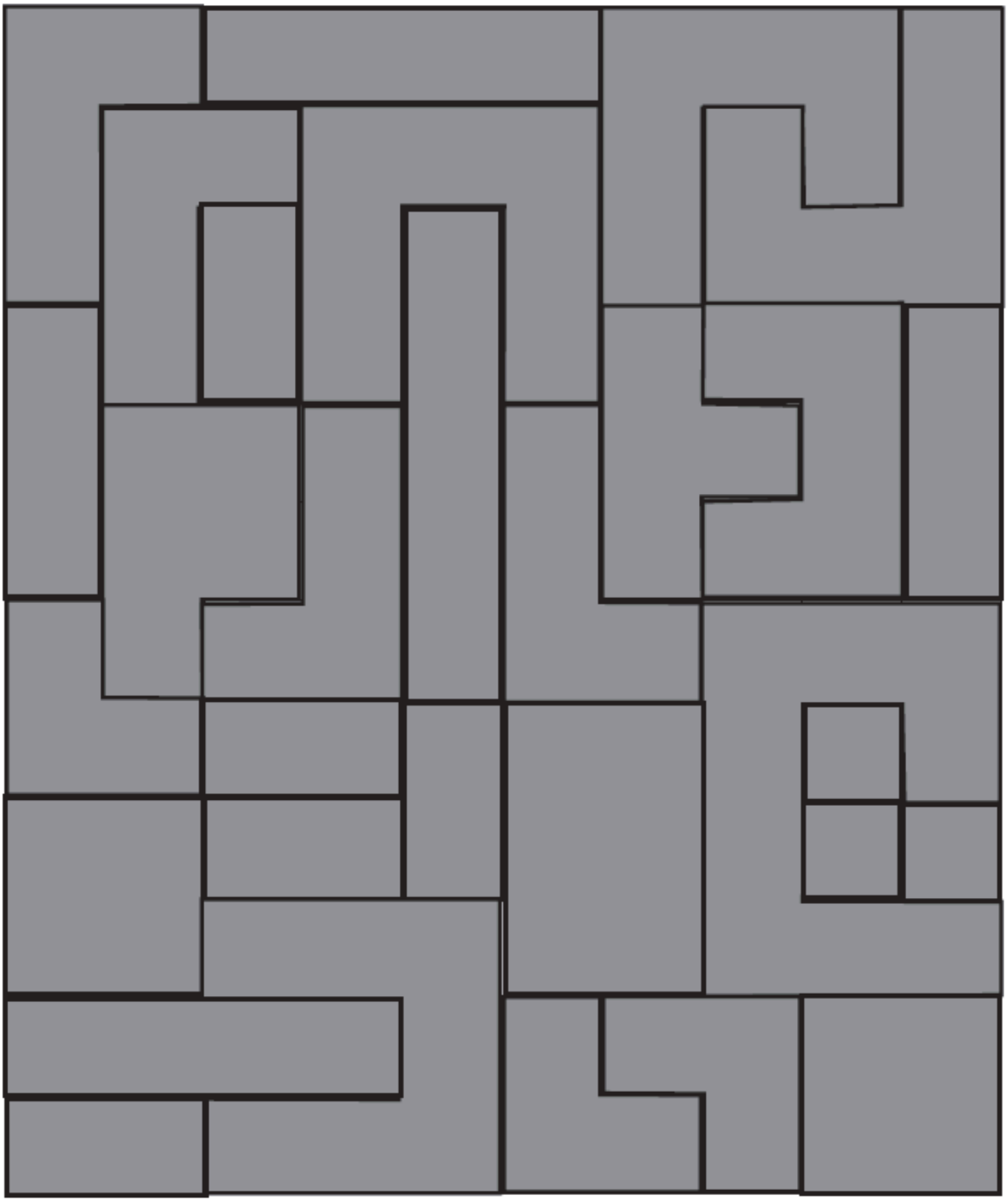
120 Chart

1	2		4			7	8		10
11	12	13	14	15	16	17	18		20
			24	25	26		28		30
	32	33	34				38	39	40
	42	43	44	45	46			49	50
51	52	53	54	55	56		58	59	60
61	62	63			66	67	68	69	70
71	72	73		75	76	77	78	79	80
81		83			86				90
		93	94	95	96		98	99	100
	102	103	104	105	106			109	110
		113	114				118	119	120

Source: Jorgensen (Zevenbergen), R. (n.d.). Big ideas in maths: Activity booklet. University of Canberra

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
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120

Source: Jorgensen (Zevenbergen), R. (n.d.). Big ideas in maths: Activity booklet. University of Canberra



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