NUMBER SENSE AND NUMERATION WITH THE ABACUS

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WHAT IS THE ABACUS?

- Counting frame
- Computation device
- Comes in many shapes and forms

Chinese *Suanpan* - 2:5 beads for a base 10 system

Japanese *Soroban* -1:4 beads for a base 10 system. This form is now recognised as the modern abacus

WHY THE REKENREK?

- Designed in 1991 by Dutch mathematician Adrian Treffers to "support the natural mathematical development of children" in arithmetic (Blanke, 2008)
- Base-10 system, with 10 counters
- Accessible
- Manipulative tool - making 'thinking' visible

GAMEIFY IT!

- **Get to 10! (Complementary Numbers)** - Roll a dice and race a friend to see who can complete more full bars of 10 on their Rekenrek! Must use full numbers
- **Tug of War (Place Values)** - Row three dice; one for the ones, one of the tens, and one for the hundreds. This number is the 'starting point'. With each roll, figure out how to stay further away from the middle number than your friend!
- **Stealth (Composing/Decomposing Numbers)** - Roll 2 dice. First player to collect 3 full rows with nothing "left over" wins, but you can never take the total amount of the roll from any one row

WHAT IS IT GOOD FOR?

- **Pattern spotting** and exploring **number relationships** through **natural discovery** – "Students are also encouraged to think quantitatively (and more and more abstractly), model mathematics, and look for patterns and structures." (Clarke, 2014)
- Understanding **place value**
- Develop **compensation** (use of multiple strategies and representations i.e. friendly groupings) to develop **automaticity** and lessen cognitive load
- **Tactile** & **Visual** (Tournaki, 2008)
- Computation does not require notation
- Sense of confidence and success in dealing with large sums in addition, subtraction, multiplication and division

RESOURCES

Online Rekenrek - https://apps.mathlearningcenter.org/number-rack/

Blanke, B. (2008). Using the Rekenrek as a visual model for strategic reasoning in mathematics. The Math Learning Centre. Retrieved from https://bridges1.mathlearningcenter.org/files/media/Rekenrek_0308.pdf.

Clarke, G., Isenegger, R., Grafton, A., Corrigan, K. & Margerm, P. (2014). What's new with CLIPS? There's an app for that! (the Rekenrek tool app!). Gazette - *Ontario Association for Mathematics, 52* (3), 23-26.

Tournaki, N., Young, S.B., & Kerekes, J. (2008). Rekenrek: A manipulative used to teach addition and subtraction to students with learning disabilities. *Learning Disabilities: A Contemporary Journal 6* (2), 41-59.

WHAT CAN YOU DO WITH THE ABACUS?

COUNT

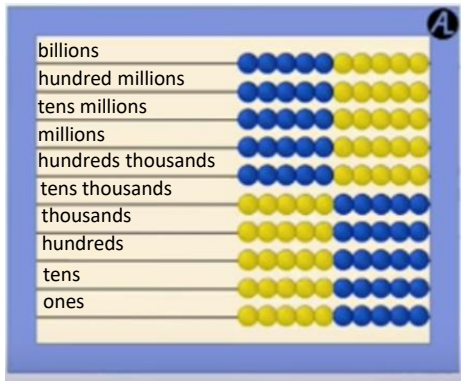
- Use the beads to represent 1 and count from 1-100!
- Develop one-to-one correspondence!
- Stable-order!
- Cardinality!
- Conservation!
- Composing & Decomposing numbers!
- Subitizing!
- Grouping – 1s, 2s, 3s, 4s, 5s etc.

ADDITION/SUBTRACTION

- Beads representing **ones** *or* rows as **place holders** (image below)
- Grouping – 1s, 2s, 3s, 4s, 5s etc.
- Discovering complementary numbers i.e. 2 & 8, 4 & 6 etc.

MINDS ON

- ➢ *How would you represent 1486 + 832 on the abacus?*
- ➢ *What are other ways to show 14?*
- ➢ *What are some ways of showing 15-9?*

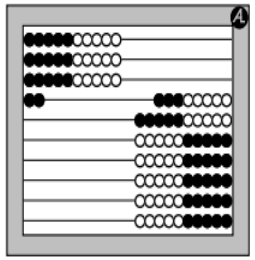


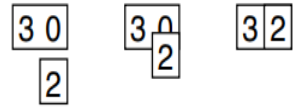
PLACE VALUE

- 10 Bar System
- Visually demonstrates relationship between place values

MINDS ON

- ➢ *How would you represent 56+45 on an abacus?*
- ➢ *How would you represent 73x4 ?*





Overlapping the 2-card on the 0 of the 30 card to show 3-ten 2.

MULTIPLICATION/DIVISION

- Beads representing **ones** *or* rows as **place holders**
- Demonstrates mirror relationship between multiplication ←→ division
- Visually demonstrates the operation and relationship between place values (similar to multiplication grid method)

x	20	6
30		
1		

- Discovering factors (image on right)

Final Digit	Always Divisible By	Sometimes Divisible By
1	-	1,3,7,9
2	2	3,4,6,7,8,9
3	3	7,9
4	2	3,4,6,7,8,9
5	5	3,7,9
6	2	3,4,6,7,8,9
7	-	3,9
8	2	3,4,6,7,8,9
9	-	3,7
0	2,10	4,6,8

MINDS ON

- ➢ *What are other ways of showing 8 groups of 4 for a total of 32 beads?*
- ➢ *Show 21x3. Now show 63/3. What do you notice about these two calculations?*
- ➢ *Multiply 12 by 9 on the abacus. What do you notice? Now try to show your answer in as many different groupings as possible.*