Implementation of a Simplified Slide Rule for Elementary Study

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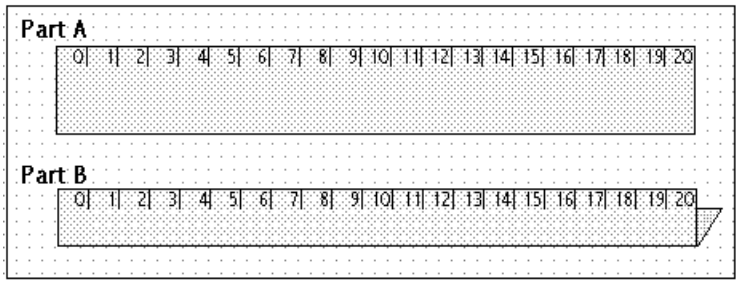
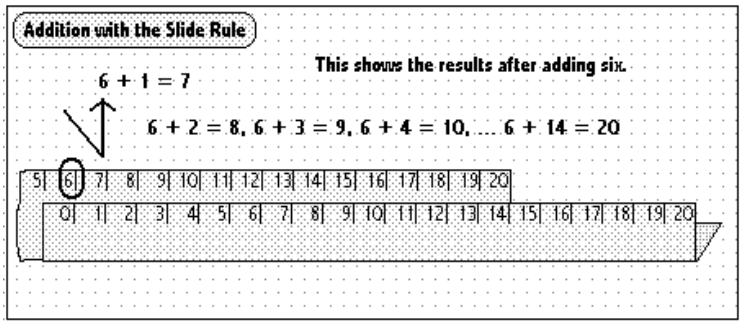
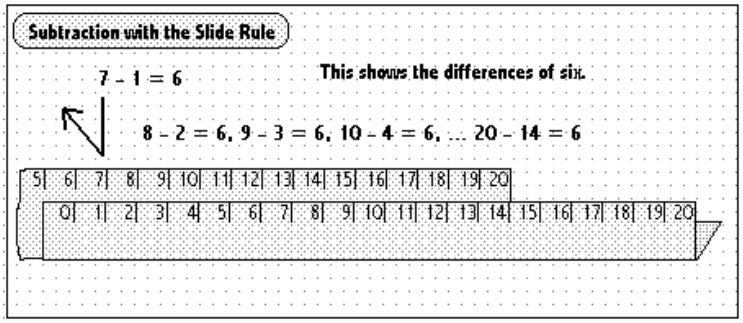
Between the abacus and the calculator, the slide rule once ruled as the favored instrument for complex calculations. Based on the principle of logarithms, developed by John Napier (1550-1617), Henry Briggs (1561-1631), and others, the slide rule was used for calculating, multiplication, division, square roots, cube roots, and trigonometry. The paper slide rule, presented in this paper and available at www.athens.edu/vinsobm/sliderule, is a simplified version of the slide rules used in advanced mathematics. It can be used to show addition and subtraction facts, as well as equivalent fractions (Vinson, 2004, p. 316; Vinson, 2005, 15). When making a class set, it is important to photocopy Part A on a different color of paper than Part B. In doing so, each slide rule would have two different colors so that students can differentiate between the two sets of numbers. Part A can be yellow, with Part B copied on light blue paper, for example. Part B is folded in half, like a hotdog bun. The smaller part (Part A) is laid inside the "bun" (Part B).



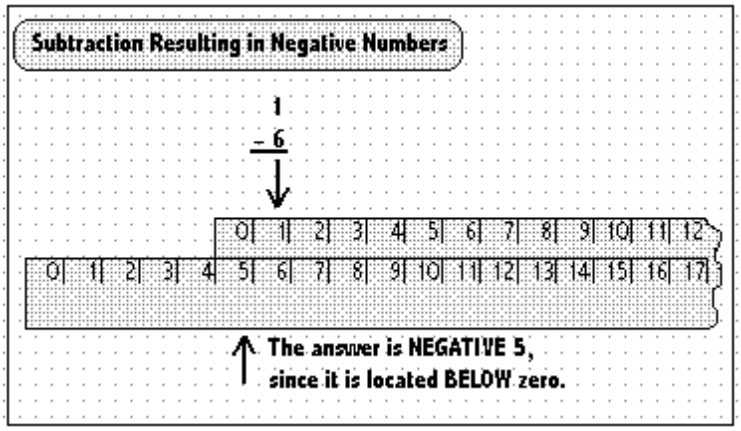
The following diagram shows how to use the slide rule to demonstrate related addition facts. Let us say that the top color is yellow and the bottom color (the envelope) is light blue. We might say, "Slide your yellow 6 on top of your light blue 0. Put your thumb on the light blue 0. Right above that is a 6. The first fact is $6 + 1 = 7$. Let's move to the right: $6 + 2 = 8$, $6 + 3 = 9$, and so on all the way across the slide rule to $6 + 14 = 20$. The answer is above the second addend." This example shows the "plus 6" facts. Notice that we can slide the pieces of paper to represent different addition sentences. Putting the 3 above the 0, we can represent all the "plus 3" facts. It is helpful for the teacher to demonstrate this with small groups of students, or to show this on the overhead projector. It can be a technical process when just beginning. However, students will see how facts relate to one another. Students should begin to notice that addition proceeds left to right on the slide rule.



The following diagram shows how to use the slide rule to demonstrate related subtraction facts. Let us say that the top color is yellow and the bottom color (the envelope) is light blue. We might say, "Slide your yellow 6 on top of your light blue 0. Put your thumb on the light blue 0. Right above that is a 6. The first fact is $7 - 1 = 6$. Let's move to the right: $8 - 2 = 6$, $9 - 3 = 6$, and so on all the way across the slide rule to $20 - 14 = 6$. The answer is above the second addend." This example shows the "difference of 6" facts. Notice that we can slide the pieces of paper to represent different subtraction sentences. Putting the 3 above the 0, we can represent all the "difference of 3" facts. Students should begin to notice that subtraction proceeds right to left on the slide rule.

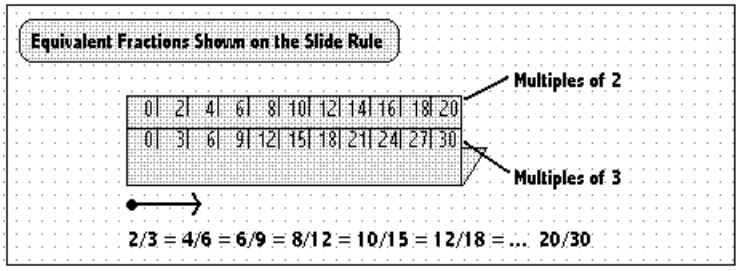


What kind of subtraction sentence can you make with the yellow 0 above the light blue 5? You would have number sentences like 1 – 6 and 2 – 7. The answer would be BELOW the 0, resulting in a negative number. The answer to both subtraction sentences would be "negative 5." What other numbers sentences, as shown on this slide rule, result in an answer of negative 5?



Special slide rules can also be used to show equivalent fractions. Students can turn their lined paper so that the line segments are vertical, thus allowing them to write evenly spaced numerals. This way, they can customize their own slide rules for mathematical investigations, a National Council of Teachers of Mathematics goal for all students (NCTM, 2000). In the example below, multiples of 2 (on top) are compared with multiples of 3 (on bottom). Notice the many fractions that are equivalent to 2/3. Given the introduction to the paper version of the slide rule, students will be able to

create problems and answers using their own replica of this age-old mathematical tool.



References

[1] *Principles and Standards for School Mathematics,* (2000), Reston, VA, The National Council for Teachers of Mathematics, Inc.

[2] Vinson, B.M. (2004), *Mathematics in the Preschool and Primary Grades,* Colorado Springs, CO, Innovative Learning Concepts, Inc.

[3] Vinson, B. M. (2005), *Primary Mathematics Handbook,* Athens, AL, Athens State University Bookstore.

[4] http://www.sliderule.ca/index.shtml

[5] http://www.dotpoint.com/xnumber/hp.htm

[6] http://www.taswegian.com/SRTP/JavaSlide/javaslide.html

[7] http://www.math.wichita.edu/history/topics/calculators.html

[8] http://www.sliderules.clara.net/a-to-z/a-to-z.htm

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