# A. NUMBERS AND NUMERATION SYSTEMS

## A.1 Whole Numbers

### Patterns in Numbers: Grade VII *(Falk)*

OUTLINE  Various lists of numbers are given: the natural numbers, the counting numbers, various arithmetic series, various geometric series, triangular numbers, square numbers.

Students are asked to discover the way in which the lists are made up and to continue the lists.  They are shown, by examples, how to find successive differences, successive sums, successive products, moving sums, series of the form an + b.  It is envisioned to extend the ideas and activities in order to lead students into graphing the linear relationships that the activities contain, then to further extend the ideas into quadratic and hyperbolic relationships.  Some examples of the activities follow.

Card 2  Use the method of successive differences to find the pattern in this list:

B:  2, 5, 8, 11, 14, 17 ...

Can you continue the list?  Make up a list of numbers according to a pattern.  See if your partner can continue your list.

Card 5  Sometimes you cannot tell from the first few numbers in a list, how the list was made.  For example, continue this list in two or more different ways.

G:  2, 4, 8 ...

Explain to your partner how you continued the list.  Make up a list which could be continued in more than one way.

Card 8  Triangular numbers are introduced.

Card 9  See if you and your partner can agree on what a *square* number should be.  Make a list of square numbers.  Arrange them in order and see if there are any "gaps" in the list.  If so, try to fill these gaps.  Continue the list as far as you wish. Can you find another way to get square numbers?

Card 15  Here is a new list of numbers

F:  1, 1, 2, 3, 5, 8, 13, 21 ...

Can you continue the list?  See if you and your partner can discover some interesting properties of list F.

Cards 17 to 19
    In cards 17 to 19, "___ times n" and "n plus ___" rules are
    used to generate linear functions.

Card 20  A "___ n" rule, and an "n plus ___" rule could be combined
         to get a new rule. [A list M is given and it is shown that
         it was made up by a "2 times n plus 4" rule.] Find the 7th
         and 8th members of M. Continue list M as far as you wish.
         Make up some lists using different "___ times n plus ___"
         rules. See if your partner can figure out what rule you
         have used.

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