Review: Ganitmala

By Swati Sircar

Ganitmala (Figure 1) is a powerful manipulative to develop number sense. It was introduced in India by Jodo Gyan[1] and later picked up by many resource organisations working in primary math. It can be easily made by threading 100 beads as follows: get 50 beads in one color (say white) and 50 more beads in a contrasting color (say blue); thread the beads in groups of 10 in alternating colours, i.e., 10 white, 10 blue, 10 white, 10 blue, etc. Check reference for more details especially for the accessories. It models the number line and allows a lot of exploration with the numbers 0-100 including comparing numbers and all four operations – addition, subtraction, multiplication and division.

Figure 1

It is a proportional manipulative since 10 beads represent a 'ten' while a single bead represents a 'one'. In a sense, it is pre-grouped[2], since the colours alternate for every 10 beads. On the other hand, each bead can be part of a 'ten' or be considered a 'one' depending on the number. So, it also has the advantages of groupable[3] materials. This makes ganitmala a powerful manipulative with some unique features. But before that, we need to discuss some dos and don'ts.

Since it models the number line, the zero should be on the left. So, both the teacher and the students should be on the same side of the mala to avoid left-right confusion. Second, each number is placed in between beads and it indicates how many beads are on the left (Figure 2). So, in a way each bead represents an interval

2 Other pre-grouped materials include static beads, Diene's blocks and Flat-Longs-Units (2D base-10 blocks)

3 Other groupable materials include bundle and stick where each stick can be used as a 'one' or be included in a bundle or 'ten'.

(0, 1), (1, 2), etc. Now for a 2-digit number, this automatically puts the 'tens' to the left and the 'ones' to the right. For example, the three tens of 31 are on the left and the one is on the right (Figure 3). This directly correlates with how we write a 2-digit number, i.e., TU and can help young children learn that 31 is 3 tens and one (and not 3 ones and ten). Moreover, it helps integrate the ordinal and the cardinal aspects of numbers.

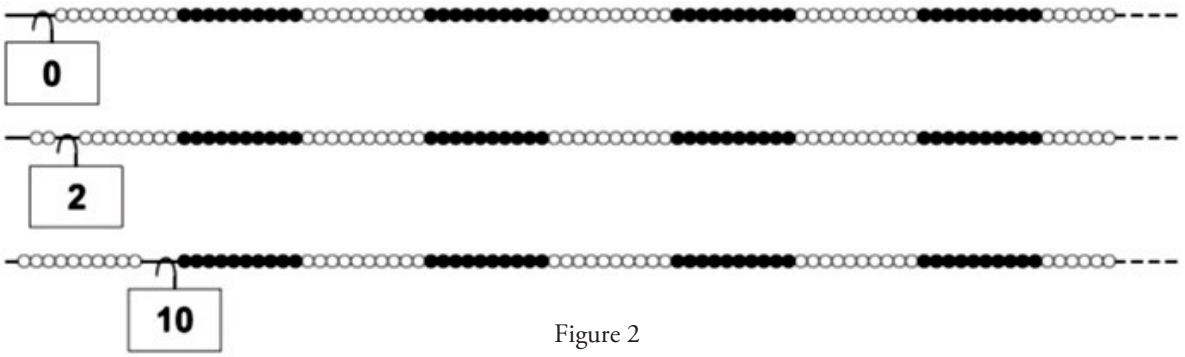


Figure 2

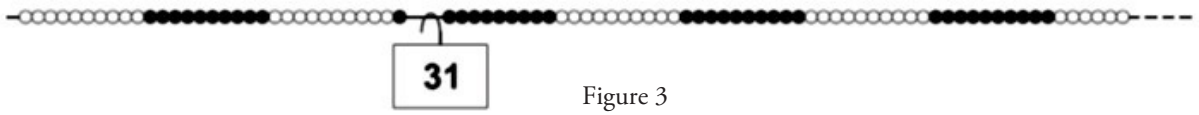


Figure 3

Ganitmala helps to transition to the open or empty number line where the order of the numbers is maintained but the distances between them are not scaled. It helps students find multiple strategies to add and subtract numbers < 100. Thus, it provides a lot of opportunity to play with numbers and develop number sense before getting into standard algorithm.

For multiplication and division (Figure 4), it is a good idea to use catchers, which can also be made locally. The reference includes details and diagrams. The mala can be used even for the division algorithm for HCF! This was discovered by a govt school teacher whose imagination was sparked by this manipulative.

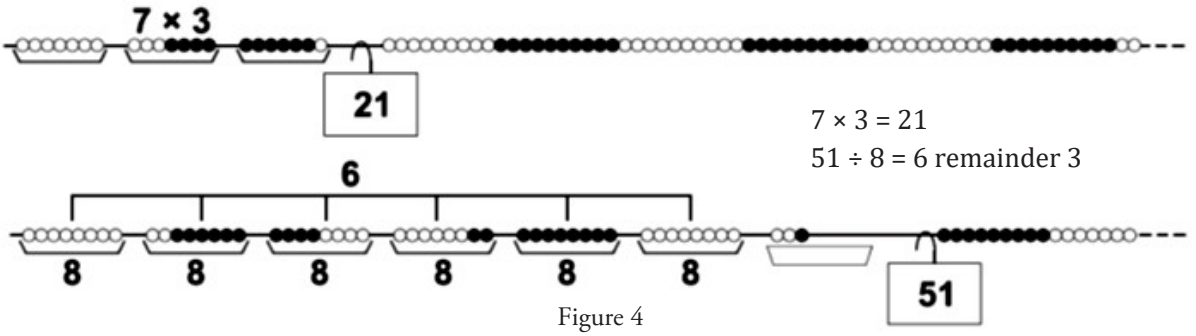


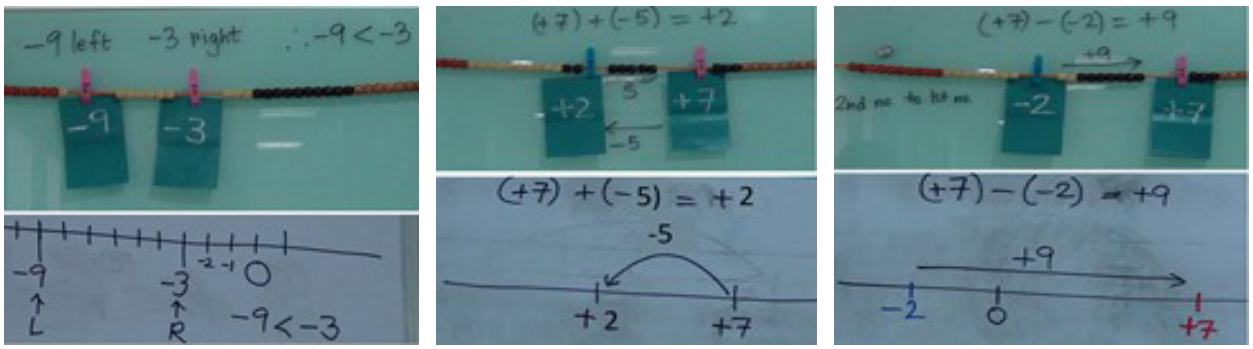
Figure 4

However, the standard ganitmala is limited to 100. Some can use a 200-bead mala with 4 colours (see p.2 of reference – double Ganitmala). There are 1000 bead malas also. But most classrooms won't have adequate space to hang such a long mala. Instead it is a better idea to transition to open number line for numbers > 100.

Just as the number line stretches to the negative side, similarly, the ganitmala also 'doubles' for integers. A 200-bead mala is used for that. It is essentially two 100-bead malas (with different colours) joined.

The 100 beads on the left represent the negative part of the number line, while the remaining model the positive part as before.

This is very good for introducing integers (ideally with a story), comparison and addition-subtraction of integers (Figure 5).



Comparing integers | Adding integers | Subtracting integers

Figure 5

Moreover, it can be used to solve a wide range of linear equations in single variable, eg. $(4 - x)/3 = 5$. In fact, it is safe to say that it can be used to solve any such equation as long as the variable appears only once, and the solution is an integer! The reference includes links to such details.

Reference: http://teachersofindia.org/en/article/making-ganitmala

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