

## Mathematricks

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In the previous issue we ended with a question, "There was a pond. One day there was one lotus, next day there were 2, third day there were 4. In 30 days the pond was full of lotus flowers. Can you tell (i) in how many days the pond was half filled with lotus flowers. (ii) In how many days the pond was one-fourth filled with lotus flowers?" Hope you found the answer. If not, the pond was half filled with lotus flowers in 29 days and the pond was one-fourth filled with lotus flowers in 28 days.

*Note: You should teach these techniques to kids only after they are ready to understand these methods. Then only they can appreciate these tips and the concepts behind. It is always better to use basic concrete methods to verify till they are comfortable.*

Some of Sanghamitra volunteers in bay area, California organized *Srinivasa Ramanujan Mathematricks Club* seminars on May 8<sup>th</sup>, 16<sup>th</sup> (in 2 different locations) and 17<sup>th</sup> (3 different locations) in different places. The participants enjoyed those Vedic Mathematics formulae. Sanghamitra appreciates all the volunteers for their time in organizing the events. We are going to bring some of the topics covered in bay area.

Solving  $3 \times 3$  matrix in such a way that the sum of numbers in any row, any column and any diagonal is equal to the given number. The number should be a multiple of 3 and greater than or equal to 15 (to get all positive integers).

Some of you already know the solution. How do you explain this to kids? If you take numbers from 1 through 9 to fill the nine places, then sum of all the digits is equal to  $1 + 2 + \dots + 9 = 45$ . You have 3 rows. Sum of the digits in all the three rows is equal to 45. So each row should have a sum 15. Similarly each column and diagonal should have a sum equal to 15.

Now if we arrange numbers in the way shown (Figure A) below. You can see 4 possible sets of (1, 9), (2, 8), (3, 7) and (4, 6), the sum of which comes to 10. Adding the remaining number 5 to each of those sets bring the sum to 15. So 5 should be at the center. For example,  $1 + 9 + 5 = 15$ . The four possible combinations are shown in Figure B below.

Figure A

$$\begin{array}{l} \textcircled{1} + \textcircled{9} = \textcircled{10} \\ \textcircled{2} + \textcircled{8} = \textcircled{10} \\ \textcircled{3} + \textcircled{7} = \textcircled{10} \\ \textcircled{4} + \textcircled{6} = \textcircled{10} \\ \textcircled{5} \end{array}$$

Figure B

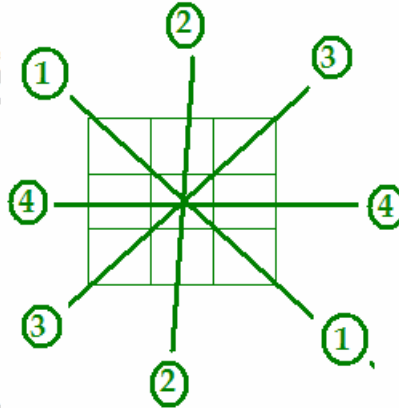


Figure C

8	1	6
3	5	7
4	9	2

If you see the solution in Figure C, the combination 1 is  $(8+5+2)$ , combination 2 is  $(1+5+9)$ , combination 3 is  $(4+5+6)$  and combination 4 is  $(3+5+7)$ . The other combinations we need to look for are first column, third column, first row and third row; which are not connected to the middle 5. This kind of thinking will lead to better solutions in variety of problems.

As an extension to this we can take any number multiple of 3 and greater than or equal to 15. For example, let us take 27. So the center number should be 9. The rest of the numbers should be 5, 6, 7, 8, 10, 11, 12 and 13. That means Four numbers on either side of 9. So the rows are  $\{12, 5, 10\}$ ,  $\{7, 9, 11\}$  and  $\{8, 13, 6\}$  respectively.

Isn't it interesting? Now you can try for other numbers, which are multiples of 3 and greater than or equal to 15. Verify your answers.

Find the value of  $\left\{ 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \dots + \frac{1}{99} \right\}$

*(Let us continue in the next issue, till then good bye!)*