

Mathematics on Chess Board

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This article relates basic mathematics with chess boards. It may help students to understand mathematics easily and practically.

Mathematics is a very interesting subject. In our daily life there is enormous application of mathematics. Anyone without knowledge of basic arithmetic may be cheated anywhere in the world ! Hence from the beginning, students should do arithmetic, geometry, mensuration etc. clearly and logically to avoid such frauds.

Chess is a kind of game which is believed to be invented in India by Mandodari, the queen of Ravana, to make the king avoid direct fight in the battlefield.

There is no bloodshed in chess ! It is a mind game involving visualization, calculation with patience. To be a Grandmaster (GM) in chess, vigorous toil and perseverance is highly needed for years .

For a student reading in primary level, chess can help increase imagination and visualization with a bit of patience. It is already observed that little students are gradually becoming restless in the COVID time. Chess can help them concentrate and meditate as well.

There are very interesting mathematical applications on chess boards that I have found in my research for years. These findings include arithmetic like multiplication, addition, factors and multiples etc; geometry like squares, rectangles etc; Mensuration like area, perimeters, diagonals etc. these ideas are fit for primary level students. However for secondary and higher level students , there are mathematical ideas like combinatorics , sum of squares, coloring problems , graph theory etc. using the chess board. All are very helpful and joyful to grow basic ideas of mathematics among students . Nevertheless, there is a bit of logo programming found in the movement of knights also !!

Let us first see the arithmetic . In a chess board we can easily count tables of numbers from any side.

For example take 6 squares on one side and three square in any adjustment side, we get a total of $6 \times 3 = 18$ squares in all. The student can either round all 18 squares or multiply 6×3 to get the same result ! For factors and multipliers we can take any $3 \times 2 = 6$ adjacent squares and check that these squares can be arranged also as $6 \times 1 = 6$ squares leading to the result that the number 6 have 4 factors 1, 2, 3 and 6 itself. So 6 is not a prime number !

In the case of geometry, students can easily find the squares and rectangles of different sizes and include different numbers of smallest squares. He or she can even draw diagonals and find its length to check Pythagoras theorem. Each smallest square will have a length of $\sqrt{2}$ unit when each smallest side is assumed to be of 1 unit.

In case of mensuration, the area of quadrilaterals of size 2×2 , 2×3 , 4×7 or any such can be found and checked with the conventional formula length \times breadth sq.unit . Perimeters can also be found by going over the outline borders of any combination of squares viz. 6×8 and calculating the number of smallest squares passed. For this example, the finger will pass through $6 + 8 + 6 + 8 = 2(6 + 8) = 2 \times 14 = 28$ smallest squares. Hence the perimeter of 6×8 squares is 28 units. One unit is obviously the length of a side of a smallest square . Last of all, not the least, the movement of Knight ignite some logical thinking leading to logo programming turtle movement as follows –

FD 2 (Forward 2 steps)

RT 90 (Right turn 90°)

FD 1

When a knight is in a central position it can jump to a maximum of eight possible squares all depending on a logical decision. So the students, knights of future globe, are hereby advised to think logically,



calculate physically and mentally with an ambition
to know everything around them

Please play chess and learn most of it !

References : 1. www.owlcation.com
2. en.m.wikipedia.org
3. www.ucd.ie