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MATHS MODELS

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ABSTRACT

In this paper we made an effort to discuss innovations and innovative practices in teaching mathematics, under teaching methods. A Quadratic equation can be solved in different ways. Two ways are discussed in this paper. Arithmetic progressions are very interesting. The sum of first n natural numbers, the sum of squares of first n natural numbers and the sum of first n odd natural numbers are calculated in a play way method. The different ways to calculate area of Trapezium discussed in this paper. Area of irregular shape can be calculated in a play way method.

Key Words: Maths Models, *Puzzles, Building Blocks, Mathematical Concepts*

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INTRODUCTION

Mathematics being so important subject and occupying a central position since the Ancient period .

The process of innovation is generally described as consisting of three essential steps, starting with the outset of an idea, that is then proposed and finally it is adopted. Though many ideas have been conceived to bring about change in the teaching of mathematics, it is yet to be projected and adopted. So, the advances may not be new in provisions of the idea but is new in terms of practice.

1.Solving Quadratic Equation

In mathematics, factorization or factoring is the decomposition of an object into a product of otherobjects, or *factors*, which when multiplied together give the original.

For example, the number 15 factors into primes as 3 × 5,

the polynomial $x^2 - 4$ factors as $(x - 2)(x + 2)$.

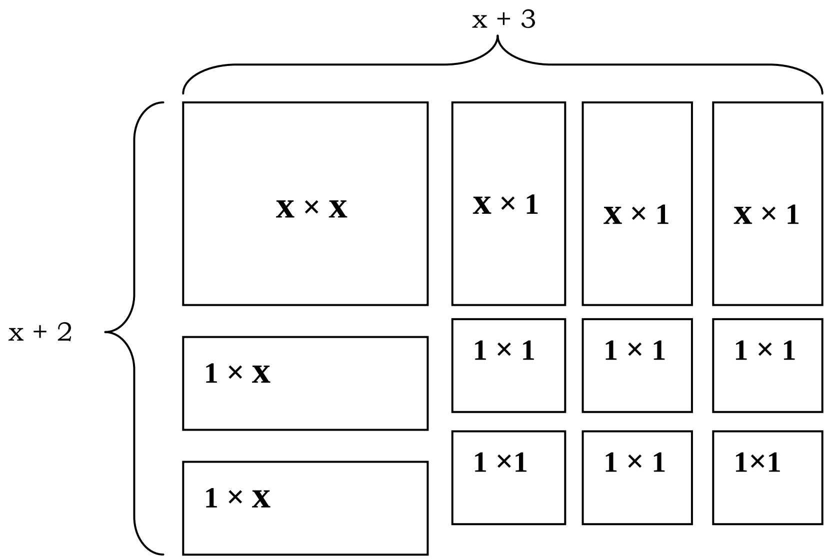
Generally we are solving a quadratic equation $x^2 + 5x + 6 = 0$

$$= x^2 + 3x + 2x + 6$$

$$= x(x+3) + 2(x+3)$$

$$= (x+3)\ (x+2)$$

Take One Square with area x sq. units, five rectangles with length x units and breadth one unit, and six squares with 1 sq. unit area. Arrange in the following way.



Now it is in the form of a rectangle Area = l × b

= (x+3) (x+2)

Note: If we give practice by using this the below average students they can easily understand resolving Quadratic equation.

Above Average Students

Another Method:

Example 1: $x^2 + 6x + 8 = 0$ ……. 1

Let x = P - $\frac{1}{2}$ coe. of x

= P $\frac{1}{2}$ × 6

= P - 3

In 1

$(P-3)^2 + 6(P-3) + 8 = 0$

$P^2 + 9 – 6P – 18 + 8 = 0$

$P^2 + 1 = 0$ → P = ± 1

Therefore x = P - 3 = 1-3= -2

→ x+2=0

x=P-3 = -1 -3 = -4 x+4=0

Therefore (x+2) (x+4)

Example 2: $x^2+5x+3=0$ ……. 1

Let x= P - $\frac{1}{2}$ coe. of x

$= P\ \frac{1}{2} \times 5 = P - 2.5$

In 1 $(P - 2.5)^2 + 5(P - 2.5) + 3 = 0$

$= P^2 – 5P + 6.25 + 5P – 12.5P + 3 = 0$

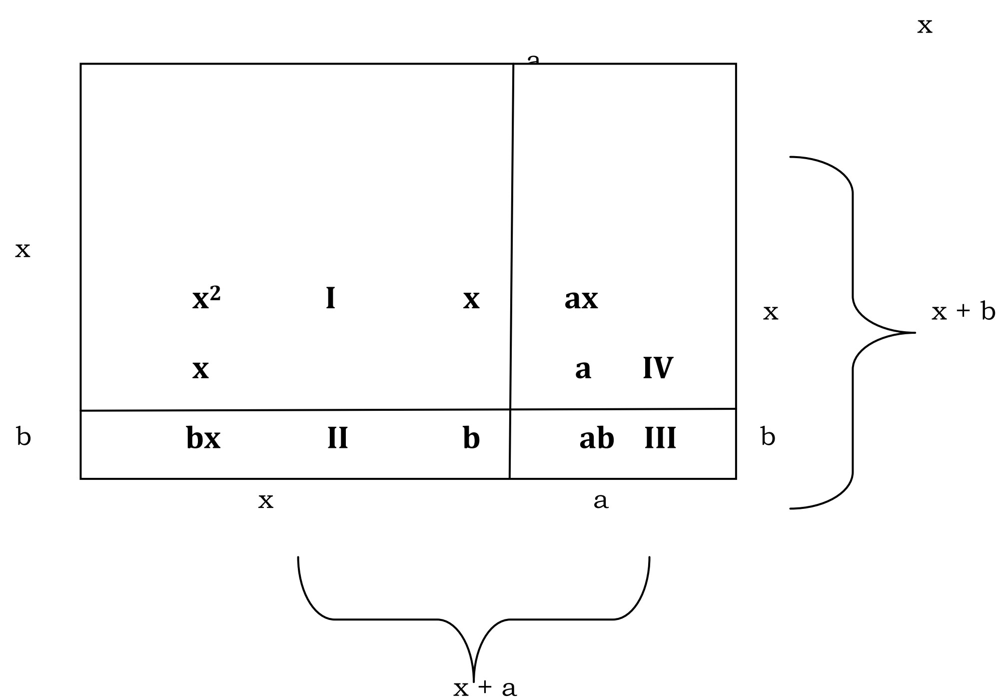
$= P^2 – 3.25 = 0 \quad \rightarrow P = \pm \sqrt{3.25}$

Therefore $x = (\sqrt{3.25} – 2.5)$

$x = - \sqrt{3.25} – 2.5$ roots are Imaginary

<u>2.PRODUCT OF BIONOMIAL:</u>

<u>(x + a) (x + b)</u>= $x^2 + ax + bx + ab$



Area of the Total Figure

(x + a) (x + b)

II rectangle area = bx

III rectangle area = ab

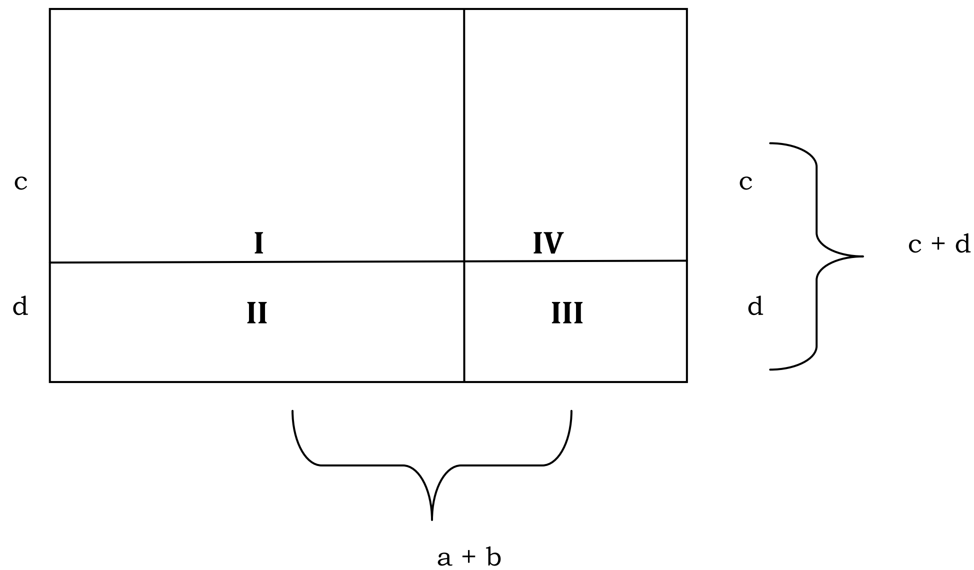
IV rectangle area = ax

I Square area = x^2

Therefore Total area = $x^2 + ax + bx + ab$

Note: Known to Unknown

3.(a + b) (c + d) = ac + bc + ad + bd   a   b



Total area = (a + b) (c + d)

Total figure is in the shape of rectangle

I rectangle area = a × b

II rectangle area = d × a

III rectangle area = b ×d

IV rectangle area = a ×d

I + II + III + IV = ac + ad + bd + ad

4. Sum of First ‘n’ natural numbers

$$1 + 2 + 3 + 4 + \cdots n = \frac{n(n+1)}{2} = \sum n$$

Procedure: Arrange the Wooden blocks as shown in the figure.

Ex:1+2+3=

Take one square box ,two square boxes ,three square boxes arrange in the following way

Take similar arrangement and add like fig 2.

It is in the shape of rectangle with length 3boxes+1box breadth 3boxes.

Area of rectangle=LxB=(3+1)x3=4x3=12

Half of the Area=1/2x(12)=6

1+2+3=6=n(n+1)/2

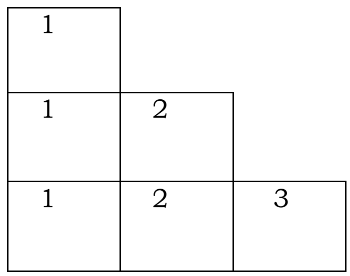
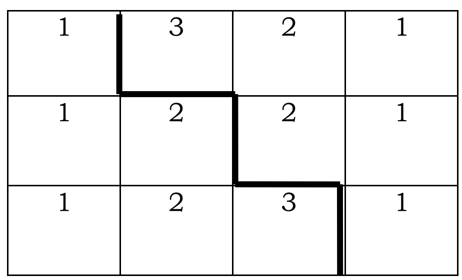


Fig (i)



Rectangle Fig (ii)

Conclusion:

Now this formation of rectangle is of length (n+1) and breadth n

The lengthof rectangle = (n+1)   Breadth = n

Area of Rectangle = lxb = n (n+1)

Half Area = $\frac{n(n+1)}{2}$

We can conclude $1 + 2 + 3 + 4 + \cdots n = \frac{n(n+1)}{2}$

Another Method:

$$S_8 = 1 + 2 + 3 + \cdots + 8$$

$$S_8 = 8 + 7 + 6 + \cdots + 1$$

$$2\,S_8 = 9 + 9 + 9 + \cdots + 9$$

$$2\,S_8 = 9 \times 8 = 72$$

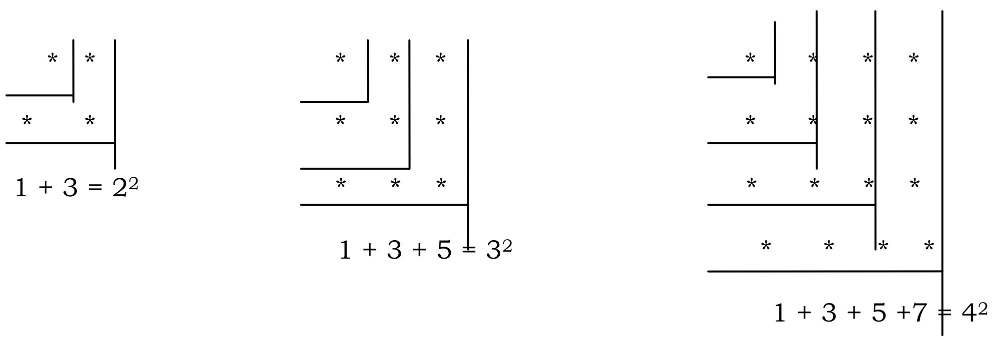
$$S_8 = \frac{9\times8}{2} = \frac{n(n+1)}{2}$$

$$S_n = \frac{n(n+1)}{2}$$

5. Sum of First ‘n’ odd natural numbers = n^2

$$1 + 3 + 5 + 7 + \cdots + 2n - 1 = n^2$$

If we arrange stickers in the following way



Here the stickers are arranged in a SQUARE shape.Area of Rectangle is LxB

First figure area=2x2=4=2^2

Second figure area=3x3=9=3^2 ....

When the students arrange and play with these they can identify the

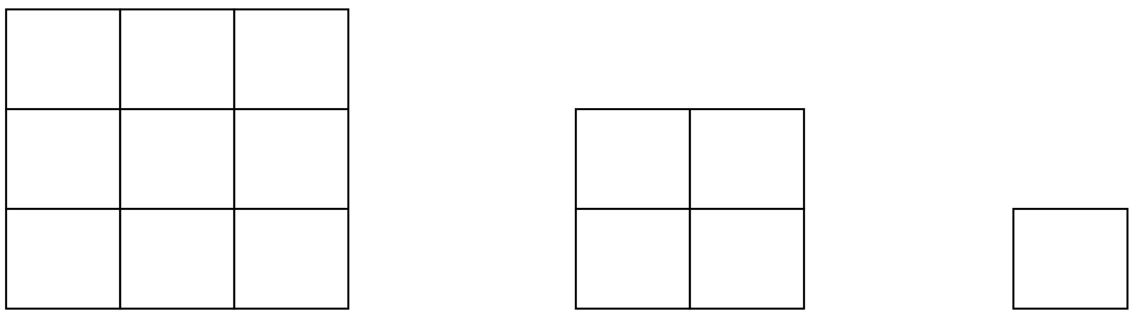
Sum of First ‘n’ odd natural numbers =$1 + 3 + 5 + 7 + \cdots + 2n - 1 = n^2$

6.Sum of Squares of First ‘n’ natural numbers

$$\sum n^2 = \frac{n(n+1)(2n+1)}{6}$$

PLAY WAY METHOD:

Prepare different Sizes of Squares



3 × 3 2 × 2 1 × 1

In the check board 3 × 3 find out how many 2 × 2 check boards are available and how many 1 × 1 check boards are available, by moving the smaller board over the bigger board.

No. of 3 × 3 check boards available = 9

No. of 2 × 2 check boards available = 4

No. of 1 × 1 check boards available = 1

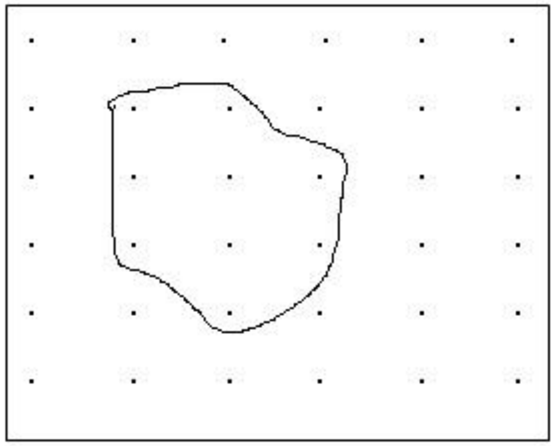
Total no. of check boards available = 14

Note: When they are playing with it they remember easily

VERIFICATION: $1^2+2^2+3^2=3(3+1)(2x3+1)/6=3x4x7/6=14$

CONCLUSION: $\sum n^2 = \frac{n(n+1)(2n+1)}{6}$

7. Area of Irregular Polygon



Area = $\frac{1}{2}$ P + Q – 1

P = No. of pins on the figure = 7

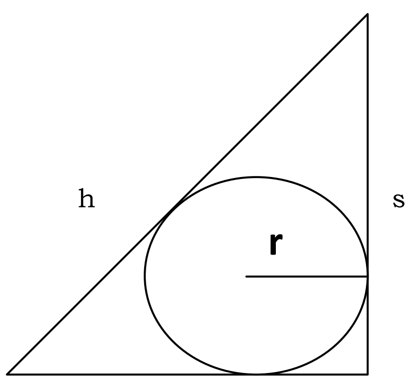
Q = No. of pins inside the figure = 2

Area = $\frac{1}{2} \times 7 + 2 - 1 = 3.5 + 1 = 4.5$ Sq.cm

Distance between two nails = 1 cm

Verification: 3 completed Squares and 3 half Squares = $3 + 1\frac{1}{2} = 4\frac{1}{2}$

8. In circle radius in Right angle triangle $= \frac{\text{Side} + \text{Side} - \text{hyp}}{2}$

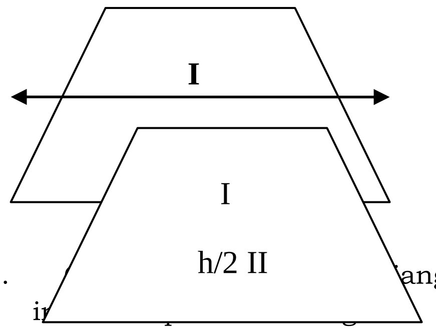


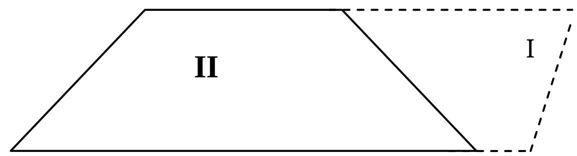
By taking a paper verify easily.

9.To find the area of Trapezium in different ways

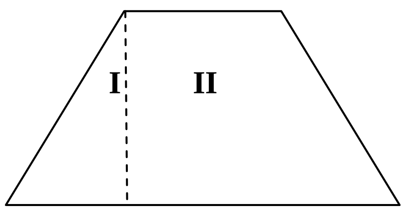
1. Cut the trapezium in to two parts. Arrange side by side parallelogram is formed.

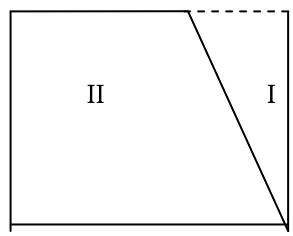
Then area of trapezium=area of parallelogram.





1. angle and trapezium. Arrange as shown in the figure. It is i
2. Then area of trapezium=Area of Rectangle.

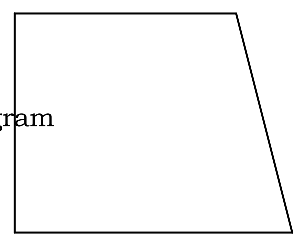


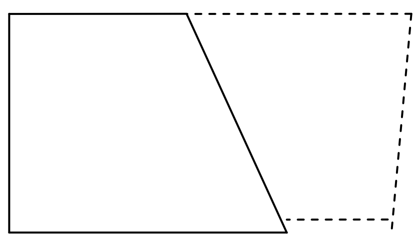


Rectangle

3. Take two same trapeziums, and then arrange as shown figure.

Parallelogram



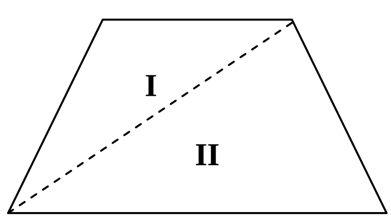


The figure formed like a rectangle.

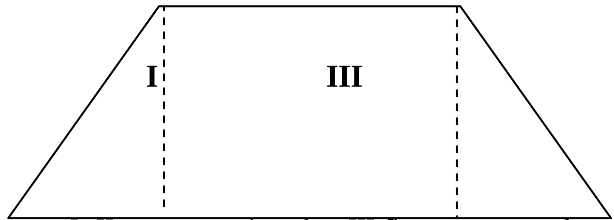
Area of Trapezium = ½ Area of parallelogram

4.Divide the trapezium in to into two triangles then the area of trapezium =

Area of I Triangle +Area of II Triangle

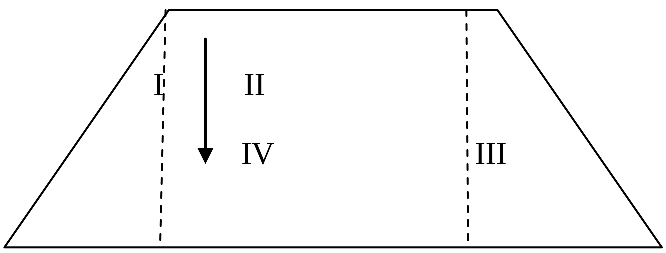


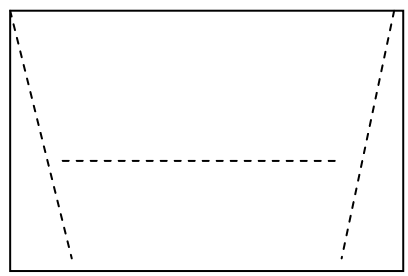
5. Divide the Trapezium in to as shown in the figure.



I, II are two triangles III figure rectangle

Therefore Area of Trapezium = Area of I triangle +Area of II triangle+ Area of III Rectangle





When we fold II part, I & III, parts then a rectangle is formed IV figure rectangle + this rectangle.

Therefore Area of Trapezium = Sum of area of two rectangles.