Status of learning

According to National Curriculum framework (2005) , the attitude of Mathematics Teachers should be based on two key pillars – first, the children may feel the need to learn Maths; second all the children can learn Maths. But usually, Maths as a subject is considered boring and children think it as a less interesting subject. It is also believed that it is difficult to learn Maths for a child. To avoid these prejudices,. it is tried to generate the interest by relating Maths concepts with the things in his surroundings , using activities , using approach known to unknown ,giving freedom to students to think and respond to problem independently etc .

Interaction with TGTs from KV at Dwarka on 21/5/18

In the beginning, it was asked," what are the things children learn on their own" which was replaced by teachers that

1. Speaking 2. Walking 3.Playing 4. Mobile etc.

The next question was," why they learn all things themselves and no teacher is required". The answer came as

- they do it themselves,
- they have interest in it,
- they have challenge in it,
- they are not afraid of any one who will scold them for failure.

Next point was

If they do not play or use mobile for ten days, will they forget?

All replied that they will not forget.

Ok, then why they forget what is being discussed in classroom.

This is because teacher tells or teaches in class, students cram and reproduce in the exam. Students may not be interested. No challenges may be given . May be No struggling chance given. Overall ,no thinking involved.

As learning of games or using mobile is permanent ,so if same methodology be applied while interacting in the classroom with the children ,i.e., By Giving challenging and interesting opportunities to children to participate. They will start thinking with interest and then learning will take place.

1. **Call attention to a void in students' knowledge:** Revealing to students a gap in their understanding capitalizes on their desire to learn more. For instance, you may present a few simple exercises involving familiar situations, followed by exercises involving unfamiliar situations on the same topic. The more dramatically you reveal the gap in understanding, the more effective the motivation.

   For example to introduce to concept of area, we can start with an easy question

   Which of the following carpets will occupy more region on the floor?

   Next question is- Can you tell how much more region will be occupied ?

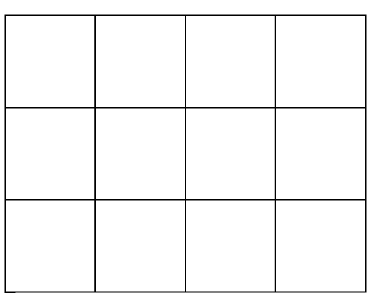
   Give time to children to think and try their own way may be some non- standard and non-uniform or non-standard but uniform.

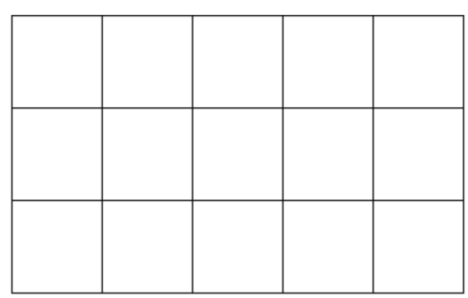
   How can we measure it ?

   Students will start thinking the ways to measure the region.

   What should be the unit ?

   It may be circle, triangle, square, rectangle etc. by keeping these on the object it will be observed that square is one of the best among these. Now draw five rectangles and make squares of one cm. as shown





Area = 12 square cm.= 4×3

Area = 15 square cm.= 5×3

Students can generalize themselves

Area of rectangle = Length × breadth

2. Show a sequential achievement: Closely related to the preceding technique is having students appreciate a logical sequence of concepts. This differs from the previous method in that it depends on students' desire to increase, not complete, their knowledge. One example of a sequential process is how special quadrilaterals lead from one to another, from the point of view of their properties.

3. Discover a pattern: Setting up a contrived situation that leads students to discover a pattern can often be quite motivating, as they take pleasure in finding and then owning an idea. An example could be adding the numbers from 1 to 100. Rather than adding the numbers in sequence, students add the first and last (1 + 100 = 101), and then the second and next-to-last (2 + 99 = 101), and so on. Then all they have to do to get the required sum is solve 50 × 101 = 5,050. The exercise will give students an enlightening experience with a truly lasting effect. There are patterns that can be motivating, especially if they are discovered by the student—of course, being guided by the teacher.

4. Present a challenge: When students are challenged intellectually, they react with enthusiasm. Great care must be taken in selecting the challenge. The problem (if that is the type of challenge) must definitely lead into the lesson and be within reach of the students' abilities. Care should be taken so that the challenge does not detract from the lesson but in fact leads to it.

Make a cylinder whose curved surface area is 50 square cm by paper folding

Make a cone whose curved surface area is 50 square cm by paper folding

Make a cuboid whose volume is 50 cubic cm by paper folding

Make a frustum whose curved surface area is 50 square cm by paper folding

Three methods of learning

Banking model

Speaking counting, Cramming tables are remembered by just repetition practice only.

No thinking involved. It is similar to jewelry/ornaments kept in bank and then brought back as required. No change in bank and while using yourself .

Programming Model

In this, we remember the steps or methodology and reproduce in exam.

- Steps of Multiplication of 23 by 45
- Steps of division of 250 by 5
- Simple interest= $\dfrac{\text{Principal x rate x time}}{100}$

Constructive model of learning

In this model

- No one tells ,they do it themselves and struggle .
- Due to some context (may be game or any other way) ,they have interest in it,
- Solution is not direct ,they have challenge in it,
- For their mistakes , no one will scold them . They are not afraid of any one who will scold them for failure.

For example

<u>Euclid's Division Lemma</u>

In class 10 th , introduction of Euclid,s Division Lemma.
For any two numbers *a* and *b*, there exists unique Quotient , *q* , and remainder , r such that a = bq + r , where $0 \le r < b$

Consider numbers 19, 21, 20, 3 ask all students to divide them with 5

T : Students!! Divide 19 by 5.

$$5 \,\overline{)\begin{array}{r} 19 \\ \underline{-15} \\ 4 \end{array}}^{\;3}$$

S :

T : What is the quotient?

S : 3

T : What is the remainder?

S : 4

T : What are 19 and 5 called?

S : 19 is the dividend and 5 the divisor.

T : Do you observe any relation between 5,19,3 and 4?

No response from students.

T : We can write 19 as $19 = 5 \times 3 + 4$

i.e., Dividend = Divisor × Quotient + Remainder

T : Divide 21 by 5 and write the process in the above form.

S : $\begin{array}{r} 4 \\ 5\overline{)21} \\ \underline{20} \\ 1 \end{array}$

So, $21 = 5 \times 4 + 1$

T : Now divide 20 by 5.

S : $\begin{array}{r} 4 \\ 5\overline{)20} \\ \underline{20} \\ 0 \end{array}$

$\begin{array}{r} 0 \\ 5\overline{)3} \\ \underline{-0} \\ 3 \end{array}$

T : What will be the quotient when we divide 3 by 5 ?

S : We cannot divide 3 by 5.

T : In such cases when the dividend is smaller than the divisor, we can say

that the quotient is 0.

Thus, in

We note that q can be zero (0) also.

T : How will you write this division in the form a $a = bq + r$?

S_1 : $5 = 3 \times 0 +$ ___.

S_2 : Mam! It should be

$3 = 5 \times 0$

as we are dividing 3 by 5 and not 5 by 3

T : Good. You are correct, but give the complete answer.

S_2 : $3 = 5 \times 0 + 3$

T : Very good.

T : Good!

Thus, if a and b are any two positive integers and we divide a by b, then write in the above form when quotient is q and remainder r.

S : $a = bq + r$

T : Very good.

T : If we divide 10, 11,12,13,14,15,16,17 by 5 what remainders do we obtain ?

S : The remainders are 0, 1,2,3,4,0,1,2… respectively.

T : Can we have any other remainders for these divisions?

S : No.

T : So, we can say that the remainder in a particular division in unique.

We see the remainders have started repeating after 4. We conclude that when we divide a number by 5 the possible remainders are 0 or 1 or 2or 3 or 4.

T : Can we have remainder 5 or 6 here?

S : No.

T : So what is the maximum value that the remainder can take here?

S : 4

T : What is the minimum value of the remainder here?

S : 0

Let us check for other numbers

T : When we divide 12,13,14,15,16,17,18,19,20 by 6, what are the remainders? They are:

S : 0,1,2,3,4,5,0,1,2… respectively.

T : Here also, we observe that on division by 6, the possible remainders are 0 or 1 or 2 or 3 or 4 or 5 and cannot have any other remainder except these. What are the maximum and minimum values of the remainder?

So, we conclude from the two examples above that 0 ≤ remainder < the number by which we are dividing

i.e., 0≤ remainder < divisor

In general, when we divide a by b and if q is the quotient and r the remainder, then we have already seen that

$a = bq + r$

What is the condition on *r*?

S : $0 \leq r <$ divisor *(b)*

T : So we get

$0 \leq r < b$

T : In the above divisions, could we have remainders other than those obtained?

S : No.

T : Thus, we conclude that the remainder in a particular division in unique.

T : All of you divide 128 by 5 and tell me the quotient.

S_1 : It is 25

S_2 : 25

S_3 : 25

T : Raise your hands who have obtained the quotient as 25.

All the students raised their hands.

T : So, answer obtained by all of you is 25. Therefore, we can say that we cannot obtain any other quotient.

T : In the division of 2180 by 9, what is the quotient?

S` : It is 242.

T : Has anyone of you obtained the quotient other than 242?

S : No.

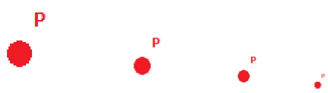
T : Thus, we conclude that quotient is also unique.

Thus, if a and b are any two positive integers, then there exists unique integers q and r satisfying
$a = bq + r, 0 \leq r < b$
This result is known as **Euclid's Division Lemma.**

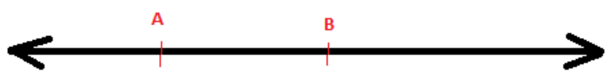
Basic Geometry concepts

Point, line and plane

A point in geometry is a location. A point is represented or shown by a dot but it is undefined. For representation, its size varies according to requirement of accuracy. On paper we use pencil fine tip, (mm and cm but part of mm can neglected) on board we may use chalk or marker (cm and m but mm can neglected), while moving from one city to other city the mile stone will be the point (in km and m but cm can neglected)



A line represents direction. It can be represented by a line segment and arrows at both ends as it extends infinitely in two directions. As shown below. It has one dimension, length. Points that are on the same line are called collinear points.



A line is defined by two points and is written as shown below with an arrowhead.

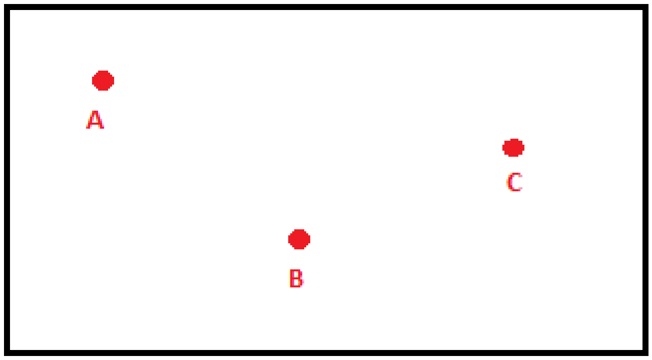
$$\overleftrightarrow{AB} \quad \overleftrightarrow{AB}$$

Two lines that meet in a point are called intersecting lines.

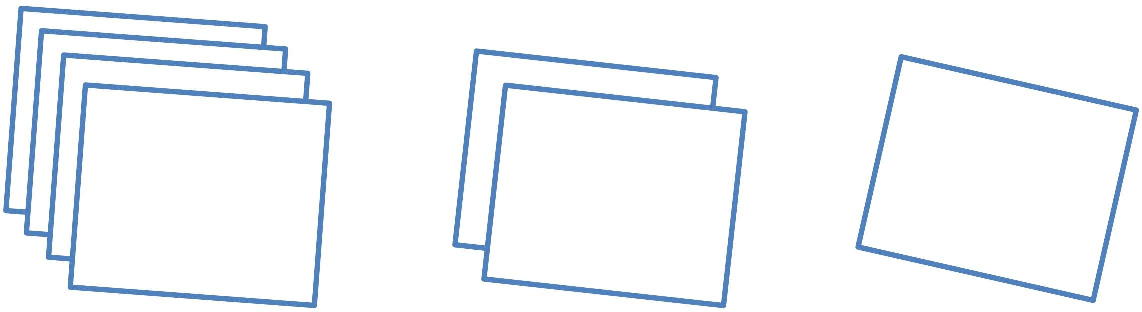
A part of a line that has defined endpoints is called a line segment. A line segment as the segment between A and B above is written as:

$$\overline{AB} \quad \overline{AB}$$

A plane extends infinitely in two dimensions. Plane is also undefined. Here below we see part of a plane ABC.



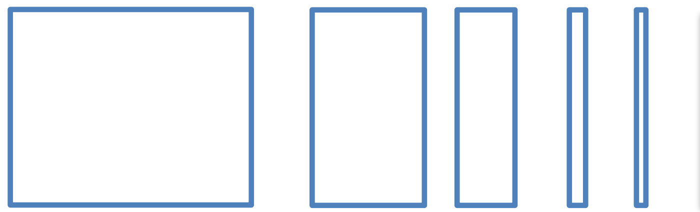
We can represent three dimensional object as a stack of papers. It is cuboid having some length, breadth, height.



(height is approaching to zero)

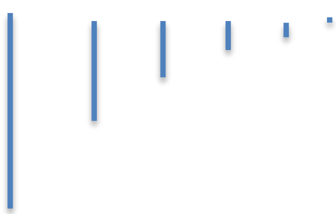
If we decrease one dimension say height means remove all the papers and keep last single page (height is approaching to zero) which represents a plane with two dimension left that is length and breadth.

If we decrease one more dimension say breadth as shown below and keep last single line (breadth is approaching to zero) which represents a line with one dimension left that is length only.



(breadth is approaching to zero)

If we decrease one more dimension that is length as shown below and (length is approaching to zero) which represents a point with zero dimension.

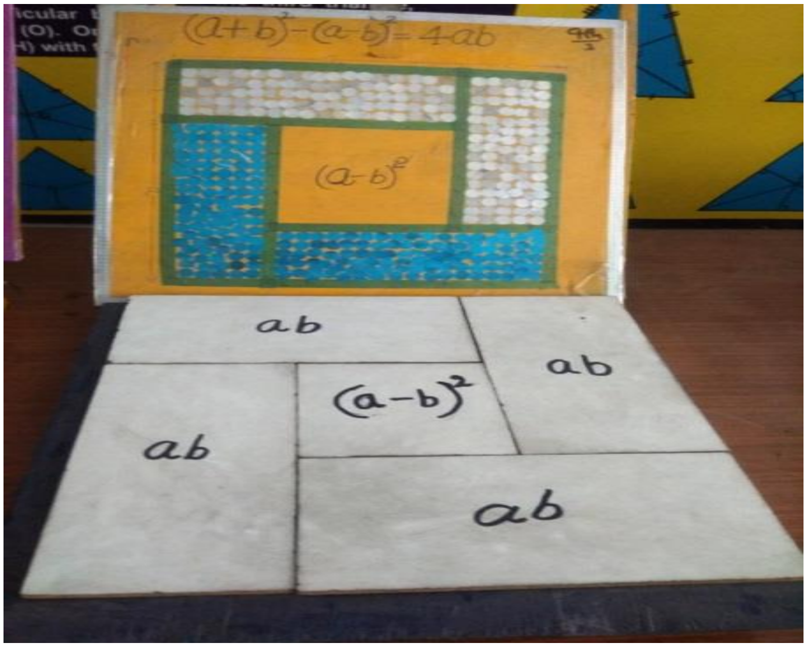


(length is approaching to zero)

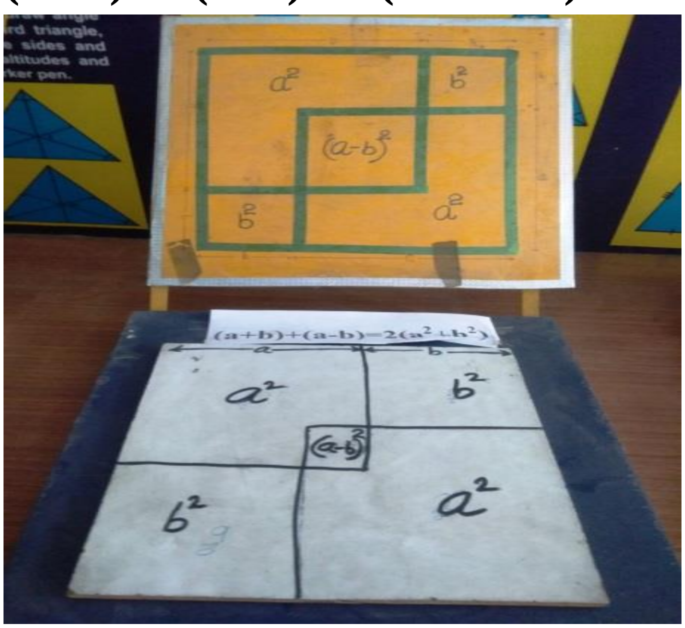
Activities

Algebraic identities

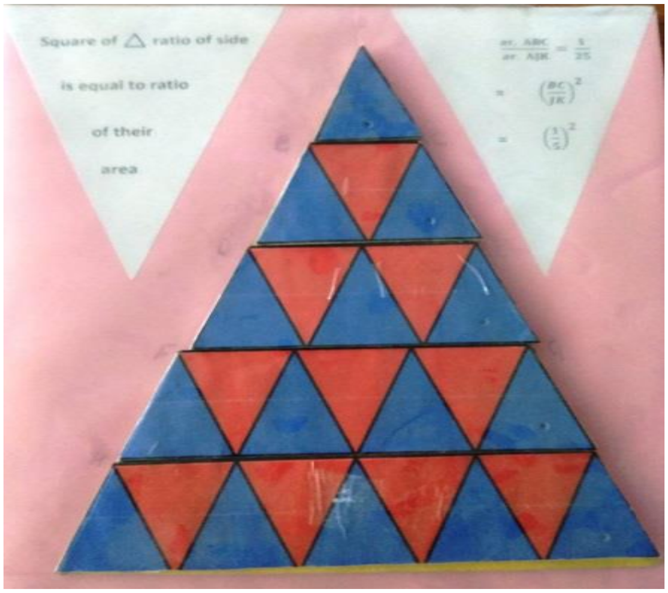
$(a+b)^2 – 4ab = (a-b)^2$



$(a+b)^2 + (a-b) = 2(a^2 + b^2)$



Ratio of areas of Similar triangles is equal to Ratio of square of corresponding sides

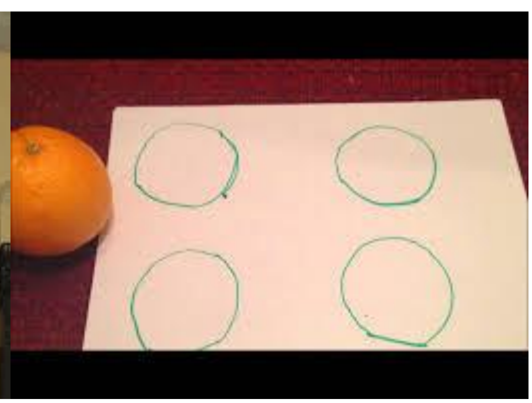


Surface area of sphere by taking an oragne

Surface area of sphere by taking an oragne and peel it.

before peeling Draw four circles and paste peels on paper . The peels will cover all four circles.

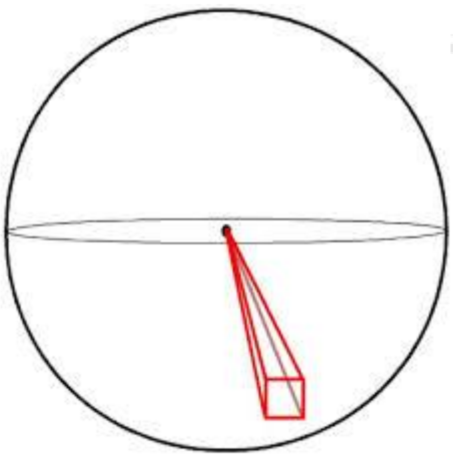
$S = 4 \pi r^2$

Volume of sphere

Volume of a sphere using water melon by cutting in to small pieces in the shape of pyramids whose height will be radius as limiting case of smaller and add all base areas.

S = 4/3 πr^3



$$
\begin{aligned}
V &= \text{Volume of the sphere} \\
&= \text{Sum of the volumes of all pyramids} \\
&= \frac{1}{3}A_1r + \frac{1}{3}A_2r + \frac{1}{3}A_3r + \frac{1}{3}A_4r + \ldots + \frac{1}{3}A_nr \\
&= \frac{1}{3}(A_1 + A_2 + A_3 + A_4 + \ldots + A_n)r \\
&= \frac{1}{3}(\text{Surface area of the sphere})r \\
&= \frac{1}{3} \times 4\pi r^2 \times r \\
&= \frac{4}{3}\pi r^3
\end{aligned}
$$

By

Sunil Bajaj

SCERT Haryana

Gurugram

Email:

bajajsunil68@gmail.com