TRAINING PROGRAMME FOR TEACHER EDUCATORS OF TAMILNADU, KERALA AND LAKSHADWEEP ON THE CONTENT-CUM-METHODOLOGY OF TEACHING MATHEMATICS AT SECONDARY LEVEL

REPORT

DR B S P RAJU
Academic Coordinator

REGIONAL INSTITUTE OF EDUCATION (NCERT)
MYSORE 570 006

March 2003

PREFACE

The PAC programme titled "Training Programme for Teacher Educators of Tamil Nadu, Kerala and Lakshadweep on the content-cum-methodology of Teaching Mathematics at secondary level was taken up at the request of the Tamil Nadu and Kerala States.

Since there were many changes in the curriculum at secondary level in recent years and this requires the development of the skills and competencies of a professional quality among teachers of mathematics, this programme is designed to meet such a need, with the following main specific objectives.

To enrich the Teacher Educators :

(i) with various methods of teaching mathematics

(ii) in planning for effective instruction

The programme was held here at RIE, Mysore from 10.3.2003 to 14.3.2003. Eight participants participated in the programme. All of them are lecturers in CTEs and IASEs. They have been given training in analyzing a concept, the ways of teaching a concept and a generalization and also to analyse the classroom teaching of a B.Ed. trainee in a simulated condition.

The participants actively participated and developed some of the teaching material given in this report.

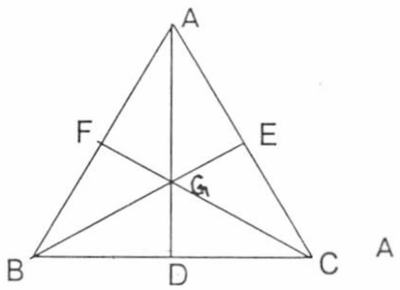
B S P RAJU

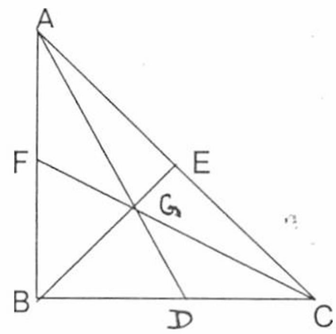
CONTENTS

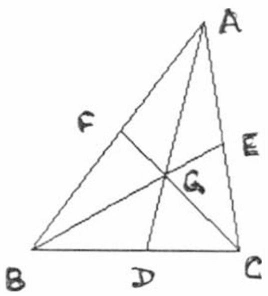
CONCEPT ANALYSIS

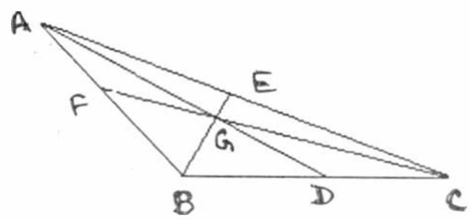
Concept Name	:	Centroid of a Triangle
Concept Definition	:	The centroid of a triangle is the point of intersection of the medians.
Another Definition	:	Centroid of a triangle is a point inside the triangle through which all the medians pass through.

Examples :

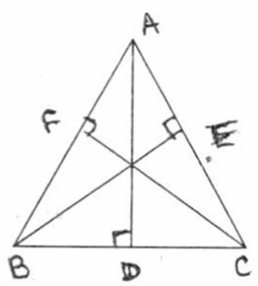


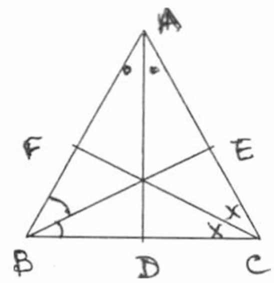


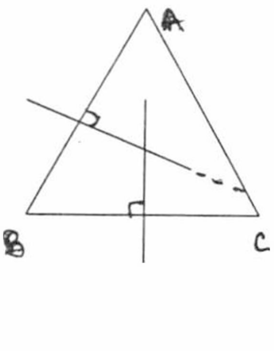




Non-Examples :







Essential Attributes

1. The point of intersection
2. The median

Non-Essential Attributes

1. The length of the sides
2. Types of Triangles

Super-ordinate Concept : A point.

Concept : **Centroid of a Triangle**

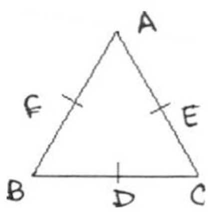
Tr : What is a triangle ?

St : It is a three sided closed figure in a plane.

Tr : What is a median of a triangle ?

St : A median of a triangle is a line joining the midpoint of a side to its opposite vertex.

Tr : Now let us consider a triangle ΔABC and mark the midpoints of the side BC, AC and AB as D, E and F respectively.

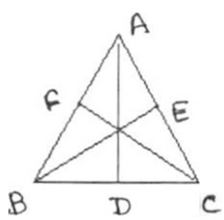


Tell me how many medians can be drawn in this triangle ΔABC?

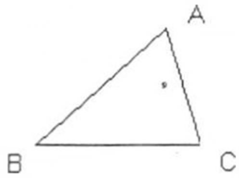
St : 3 Medians.

Tr : That is good. Now draw medians.

St : (Student draws the medians).

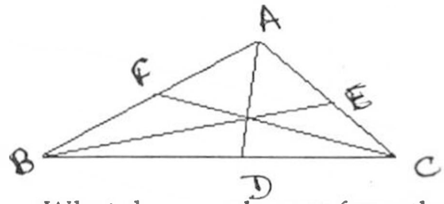


Tr : We see from the diagram that the medians are meeting at a point G. Now consider this triangle Δ ABC. What type of triangle is it?



St : Acute Triangle

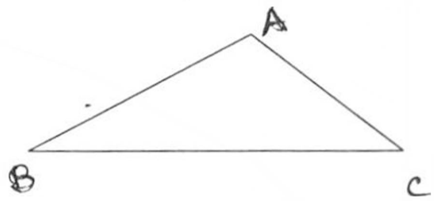
Tr : Good. Let us now draw the medians in this acute triangle ΔABC.



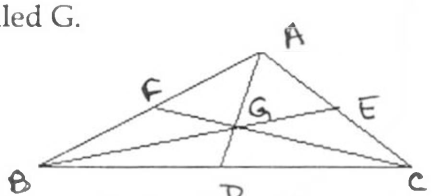
What do you observe from the diagram ?

St : We see that the medians are meeting at a point C.

Tr : That is good. Now let us consider an obtuse triangle ABC.

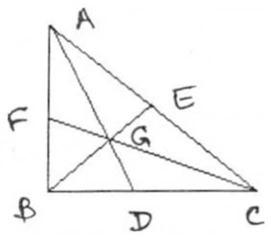


Let us draw the medians. Here also the medians are meeting at a point called G.



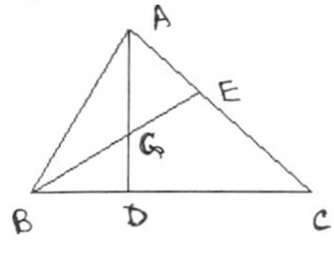
Now find out whether in a right angled triangle the medians meet at a point or not ?

St : (Student draws a right angled triangle and checks the meeting point of medians).



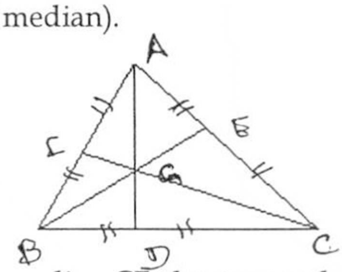
Yes, we see that in a right angled triangle too, the medians are meeting at a point.

Tr : Consider only two medians of a triangle. The median AD and BE are meeting at a point.



Now tell me whether the third median of this triangle ABC will pass through the same point or not?

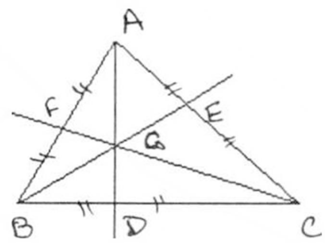
St : (Draw the 3rd median).



Yes, the third median CF also passes through the same point G.

Tr : That is good. Now tell me the meeting point of medians can lie outside the triangle?

St :



The meeting point of median cannot lie outside the triangle.

Tr : Or in other words, all the three medians are meeting at a point which lie inside the circle. Hence the conditions of this intersecting point or meeting point are

(i) It should be inside the triangle.

(ii) Atleast two medians should pass through it.

Are the conditions clear to you ?

St : Yes.

Tr : Now, this intersecting point is called the centroid of a triangle. Now, can any one of you define what a centroid is ?

St : Centroid of a triangle is a point inside a triangle through which atleast two medians pass through it.

Tr : Good.

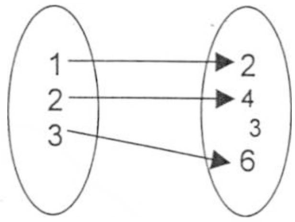
Dr P Annaraja
Ms H Shajahan Begum

Concept Name : **Function**

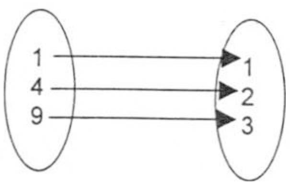
Concept Definition: A function *is a relation* from a non-empty set to another non-empty set in which *every element of the first* set is related to *an element in the second set.*

Examples

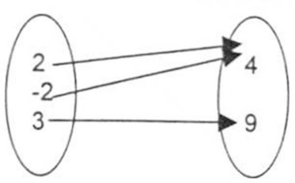
1. $y = 2x$ for $x = 1,2,3$
   The Relation R = { (1,2), (2,4), 3,6) }
   It can be presented in Venn diagram as



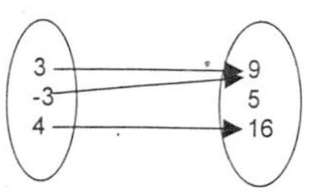
2. $y = \sqrt{x}$ for $x = 1,4,9$
   The Relation R = { (1,1), (4,2), (9,3) }



3. $y = x^2$ for $x = 2, -2, 3$
   The Relation R = { (2,4), (-2, 4), (3,9) }

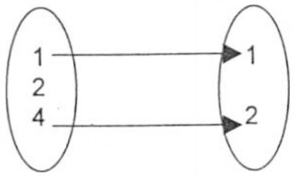


4. $b = a^2$ for $b = 3, -3, 4$
   The Relation R = { (3,9}, (-3, 9), (4, 16) }



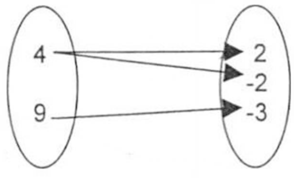
Non-Examples

1. $y = \sqrt{x}$ $x, y \in$ **N**
   The Relation R = { (1,1), (2,), (4,2) }



2. $x = y^2 \quad x, y \in \mathbf{Z}$

The Relation R = { (4,2), (4, -2), (9, -3) }



Essential Attributes

1. The two sets should be non-empty.
2. An element in the first set must be related to only one element in the second set.
3. Every element in the first set must be related to some element in the second set.

Non-Essential Attributes

Superordinate Concept : Relation

1. Number of elements in the non-empty sets.

Which of the following are functions? Why ?

1. $y = x + 2 \quad x, y \in \mathbf{N}$
2. $y = x - 2 \quad x, y \in \mathbf{N}$
3. $y = x^3 \quad x, y \in \mathbf{Z}$
4. $a^2 = b \quad a, b \in \mathbf{Z}$

TEACHING THE CONCEPT - "FUNCTION"

Tr : You have already learnt about set, types of sets and relations. Can you define a set ?

St : Set is a well defined collection of objects.

Tr : Good. Give an example of a set.

St : Set of Natural Numbers

Tr : Good. What is a relation ?

St : Relation is the correspondence between the elements of two sets.

Tr : V.Good. Suppose A = { 1,2,3,4,....} and B = { 2,4,6,8,...}. Is there any relation between these two sets ?

St : Yes.

Tr : Can you represent the relation in the form of an equation ?

St : $y = 2x$.

Tr : Very good. x and y belong to what ?

St : x and y belong to N.

Tr : Can you represent the relation properly ?

St : $y = 2x$ where $x, y \in N$.

Tr : Here every element in A is related with an element in B. Can you give another example where every element in one set is related with an element in some other set?

St : $y = x^2$ where $x,y \in N$.

Tr : Good. Is it possible to have this relation with all the different types of sets ?

St : No

Tr : For what type of set it is not possible ?

St : In the case of empty set, it is not possible.

Tr : Very good. Is it necessary to have both the sets non-empty?

St : Yes.

Tr : So in order to talk about the relation between any two sets we require both the sets to the non-empty. A function is a relation between any two non-empty sets in which every element in the first set is related with an element in the second set.

Tr : $y = x - 3$ where $x,y \in N$. Is this a function ? Why ?

St : This is not a function because there is no y value when x = 1,2 and 3 in natural numbers.

Tr : $y = \sqrt{x}$ where x, y $\in$ R. Is this a function?

St : No.

Tr : Good. Do you find any difference between this non-example and the non-example we have seen earlier. If so, what is the difference?

St : Yes. Here every element in the first set is related with two elements in the second set.

Tr : Good. a = $\sqrt{b}$, x, y $\in$ R. Is this a function ?

St : Yes.

Tr : Good. Do you find any difference between this example and the examples we have seen already. If so, what is the difference ?

St : Yes, here two elements in the first set are related with one element in the second set.

Tr : Very good. Can you give one example for a function ?

St : y = 2x + 5 where x,y $\in$ N.

Tr : Can you give one non-example for a function ?

St : y = -x where x,y $\in$ W.

Tr : Good. Can you define a function ?

St : A function is a relation between any two non-empty sets in which every element in the first set is related with an element in the second set.

Tr : Good.

Dr A Mary Lily Pushpam
Mrs Josephine Saleth Mary

Concept Name : **Identities**

Concept Definition : An identity is a *statement of equality* which is *true for all values of the variables involved in it.*

Examples

$4x + 3x = 7x$ (1)

$4z - 2z = 2z$ (2)

$a^2 - 4 = (a + 2)(a - 2)$ (3)

$(y + 3) = y^2 + 6y + 9$ (4)

$\frac{5x^2 + 10x}{5} = x^2 + 2x$ (5)

Explanation

Here each of these is an equality

Giving values for the variables in the above example.

		LHS	RHS	Result
Example 1	$x = 0$	0	0	Equal (True)
	$x = 1$	7	7	True
	$x = -1$	-7	-7	True
Example 2	$z = 0$	0	0	True
	$z = 5$	$20 - 10$	10	True
	$z = -3$	$-12 + 6$	-6	True
Example 3	$a = 0$	-4	-4	True
	$a = -2$	$4 - 4$	0	True
Example 4	$y = 0$	3^2	$0 + 0 + 9$	Equal (true)
	$y = 3$	$(3+3)^2$	$3^2 + 18 + 9$	Equal
Example 5	$x = 0$	0	0	True
	$x = 2$	40/5	8	True
	$x = \frac{1}{2}$	$\frac{5.\frac{1}{4} + 10..\frac{1}{2}}{5}$	$\frac{1}{4} + 2 . \frac{1}{2}$	True

$\therefore$ The above given examples are true for all values of the variable.

Essential Attributes

1. It should be an equation.
2. Same variables on both sides.
3. Degree of the variables on both sides of the equation should be equal.
4. The equation should be true for all values of the variables involved in it.

Non-Essential Attributes

1. Degree of the Variables
2. Number of Variables

Non-Example

1.	$5x + 4x$	(It is not an equation).
2.	$5x + 4x = 9$	(It is true only for one value of the variable i.e. $x = 1$)
3.	$a^2 = 2a$	(It is true only for $x = 0$ and $x = 2$)
4.	$y = 4x + 3$	(Not satisfying conditions (2) and (4))

Exemplars

1. $x^2 + y^2 + 2xy = (x + y)^2$
2. $x^2 - y^2 + 2xy = (x - y)^2$
3. $3y + 9y = 10y$
4. $4 + x^2 + 4x (x + 2)^2$
5. $x^2 + 7x - 18 = (x + 9) (x - 2)$
6. $x + y = z$

THE

Teaching ~~a~~ Concept OF

Identities

Tr : In the previous class, you had studied polynomial expression. Can you give an example for polynomial expression?

St : Yes, $x + y$.

Tr : What are the variables involved in this?

St : x and y.

Tr : Can you find the value of polynomial expressions?

St : Yes.

Tr : How can you find ?

St : By substituting the values for the variables involved and simplifying.

Tr : Can you *solve* the polynomial expression.

St : …………

Tr : Can you find the values of the variables involved in the expression.

St : No.

Tr : Why ?

St : We can have only values for polynomial expressions but we can solve if they are equations.

Tr : Yes, when we have equations, we can solve and find the values of the variables. Now consider the equation
$4x = 8$ (1)
What is the solution for this equation ?

St : $x = 2$.

Tr : Yes, good. Now consider $4x + 3x = 7x$ (2)
What about the solution for this equation?

St : ……………

Tr : How will you find the value of the variable x, satisfying this equation ?

St : When $x = 0, 1, -1, \ldots$ yes, for every value of x, LHS value is equal to RHS value i.e. the equation is true for all values of x.

Tr : Consider another equation $a^2 - 4 = (a + 2)(a - 2)$ …….(3)
What are the roots or values of 'a' satisfying this equation?

St : $a = 0, a = -1, a = 1, 2, \ldots$
i.e. L.H.S. value = RHS value $\forall$ a.

Tr : So, what do you observe in equations (2) and (3).

St : The equation is true for all the values of the variables in it.

Tr : How about this property with equation (1).

St : Equation (1) is $4x = 8$ is true only for one value of the variable viz. $x = 2$.

Tr : So, what are the conditions satisfied by equation (2) and (3) ?

St :
(i) They are equalities.
(ii) They are true for all the values of the variables involved in it.

Tr : Hence, equations which satisfy condition (ii) are called identities. Now can you define an identity or give the definition of an identity.

St : An *identity* is an *equality* which satisfies or which is true for *all values of variables* involved in it.

Tr : Now consider $(a + b)^2 = a^2 + 2ab + b^2$........(4)
Is it an identity ?

St : Yes. It is true for all values of variables 'a' and 'b'.

Tr : Observe that there are more than one variable. So, now can you define an identity ?

St : An *identity* is an *equality* which is *true for all values of variables* involved in it.

Tr : Very good. Can you give an example for an identity ?

St : $4z - 2z = 2z$.

Tr : Observe that the expressions on both sides of the identity are related. Can you see the relationship ?

St : Yes. Expression on one side is written in another form on the other side.

Tr : Good. What else do you observe ?

St : The variables involved are the same on both sides. (iii)

Tr : Yes. How about their degrees ?

St : Yes. The degree of the expression on both sides are equal.

Tr : So what are the properties you observe in an identity.

St : a) The variables on both sides are same.
b) The degree of expressions on both sides are equal. (iv)

Tr : Good. These two properties help you to easily find out if the given relation or statement is an identity. Now check if the following statements are identities.

1. $x^2 + y^2 + 2xy = (x + y)^2$
2. $x + y = z$
3. $a^2 + 2ab - b^2 = (a - b)^2$
4. $a^2 + 2 = 2a$
5. $9x + 5y$
6. $\dfrac{5x^2 + 10x}{5} = x^2 + 2x$

St : (1) and (6) are identities.

Tr : So what are the necessary conditions for an identity ?

St : Conditions (i) and (ii)

Tr : Can you give an example where conditions (i) and (ii) are satisfied, but not (iii) or (iv).

St : ....

Tr : Can you give such a counter example.

St : No.

Tr : Good. The conditions (i) and (ii) together is sufficient for an identity and each is a necessary condition. Properties (iii) and (iv) help you to easily decide initially if they are identities.

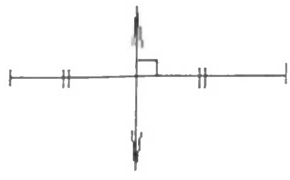
Dr (Mrs) Rachel Jebaraj
Mrs Parimala Paul

Concept Name : Perpendicular Bisector

Concept Definition: Perpendicular Bisector of a line segment is a line that divides the line segment at right angles into two equal parts.

Examples :

1.



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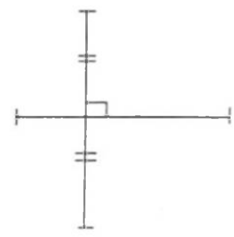

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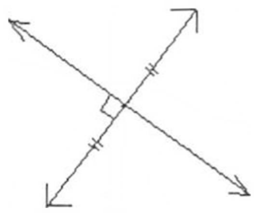
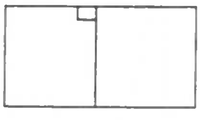
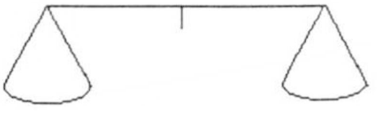


4. T

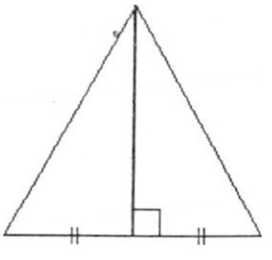
5. Vertical bar in a two pan window.



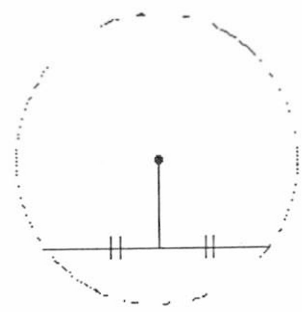
6. Simple balance at rest



7. CD is perpendicular bisector of AB in an Isosceles Triangle in the figure.

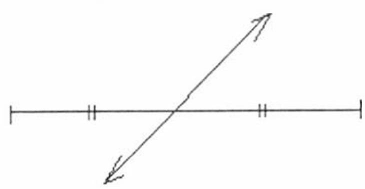


8. Perpendicular bisector of a chord passes through the centre of the circle.



Non-Examples

1.



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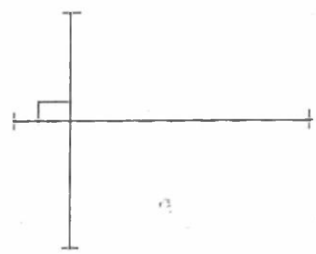

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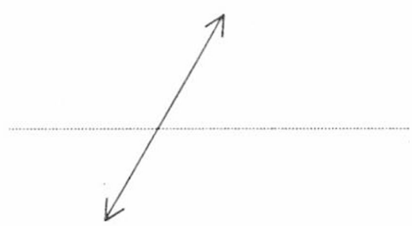
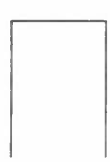


4. Vertical post of a football goal.

5. Vertical post in a door



6. Radius of a circle is perpendicular to the tangent.

Essential Attributes

1. The line intersects the given line segment at right angles.
2. The line divides the given line segment into two equal parts.

Non-Essential Attributes

1. The length of the line segment.
2. Configuration of the line segment.

Superordinate Concept : Line

Co-ordinate Concept : Transversal

Note: Perpendicular bisectors shown in the figures are line segments contained in the respective lines.

Concept Name : Equivalence Relation

Concept Definition: **Equivalence Relation in a set is a binary relation which possesses (satisfies) Reflexive Property, Symmetric Property and Transitive Property.**

Essential Attributes:

Well defined set, a binary relation, Reflexive property, Symmetric property and Transitive property.

Non-Essential Attributes :

Type of set is non essential and type of relation is non essential.

Examples :

1. The relation "equal to =" in a set R is an equivalence relation.
2. A binary relation R in the set of all triangles 'T' is an equivalence relation, where R stands for
   a) 'is congruent to'
   b) 'is similar to'
   c) 'has same area as'
   d) 'has same perimeter as'
3. A binary relation 'is parallel to' in the set of lines in a plane is an equivalence relation.

Non-Examples

1. A binary relation 'is a subset of' in a set of sets.
2. 'is less than' in the set of all rational numbers.
3. 'is a factor of' in the set of all natural numbers.
4. 'is perpendicular to' in the set of all lines in a plane.
5. '>, greater than' in the set of all the integers.

Conceptual Hierarchy

1. Superordinate Concepts - Binary relation, relation
2. Subordinate Concepts - Reflexive relation, Symmetric relation, Transitive relation.
3. Coordinate Concepts - Anti-symmetric relation, inverse relation, function.

Dr B S P Raju

Moves in the Expository Strategy of Teaching a Generalisation [The Remainder Theorem]

1. **Introduction Move**

T : Good morning students. In the previous class, we learnt the division of polynomials by polynomials. I had given you some problems on the same to be worked out at home. Has everyone done it?
Good.

Focusing :

T Today we shall learn a method for finding the remainder without actually performing the process of division, when a polynomial with any degree greater than one is divided by a binomial of the form (x - a).

The Objective Move:

T : In the process, we would learn a theorem called "The Remainder Theorem".

The Motivation Move:

In the previous class, we performed many divisions. We say that bigger the polynomial, longer is the process of division.
By learning the Remainder theorem, the division of polynomial of degree > 1 by a binomial of the form (x - a) can be done by a short cut method, without going through the lengthy process of division.

2. **Assertion Move**

T : The remainder Theorem which we are going to learn is stated as (on the blackboard)
Let p(x) be any polynomial of degree $\geq$ 1 and 'a' any real number. If p(x) is divided by (x - a) then the remainder is p(a).

3. **Instantiation Move**

T : In the second problem of the yesterday's home work, the dividend is the polynomial.
$x^4 + 2x^3 - 3x^2 + x - 1$
The divisor was x - 2.
You see that both the polynomials satisfy the condition specified in the theorem.
What are they?.....S_1

S_1	:	The dividend is a polynomial of degree ≥ 1. The divisor is of the form $(x - a)$.
T	:	Good. S_1...What is the remainder of this division ?
S_1	:	21
T	:	Have you all got the same answer ?
S	:	Yes.
T	:	Okay. Now, we will try to find the remainder by the remainder theorem. As per the remainder theorem, the remainder is p(2). Let us evaluate p(2) [on the blackboard] $P(2) = 2^4 + 2(2)^3 - 3(2^2) + 2 - 1$ $= 16 + 16 - 12 + 2 - 1$ $= 21$ Thus in this case we see that p(2) is equal to the remainder, you got by the division method. Now, let us consider another problem – the 5th one. The polynomial to be divided is $y^3 + y^2 - 2y + 1$, the polynomial (binomial) with which you are going to divide is $y - 3$. S_2, you have done the problem. What is the remainder you have got?
S_2	:	31
T	:	Okay. Let us try to find the remainder, using the remainder theorem. The divisor polynomial is $y - 3$. The real number a in this case is 3. Therefore, the remainder is given by p(3). $p(3) = 3^3 + 3^2 - 2.3 + 1$ $= 27 + 9 - 6 + 1 = 31$ So even in this case we have found that the remainder found by the division method and the one found by using the remainder theorem are equal.

Application Move :

Now take down this problem.

Divide the polynomial $y^3 - 2y^2 + 3y - 18 = 0$ by $(y - 3)$ and find the remainder. Verify its value using the remainder theorem.

.......[Pauses for the students to work out].

Have you all solved the problem ?

S_1 work it out on the board.

$$
\begin{array}{r|llll}
 & y^2 & + y & + 6 & \\
\hline
y - 3 & y^3 & - 2y^2 & + 3y & - 18 \\
 & -(y^3 & - 3y^2) & & \\
\hline
 & & y^2 & + 3y & - 18 \\
 & & -(y^2 & - 3y) & \\
\hline
 & & & 6y & - 18 \\
 & & & -(6y & - 18) \\
\hline
 & & & & 0
\end{array}
$$

By the remainder theorem

$$
\begin{aligned}
p(3) &= 3^3 - 2(3)^2 + 3(3) - 18 \\
&= 27 - 18 + 9 - 18 \\
&= 36 - 36 \\
&= 0
\end{aligned}
$$

T : So you see in this case that the remainder is zero and you have also verified one thing through it. What is it ? .....S_7.

S_7 : ....

T : If the remainder is zero, what can you say about (y - 3)...S_7?

S_7 : (y - 3) is a factor of the given polynomial.

T : Very good.

So by using the remainder theorem, you can also verify whether the given binomial is a factor of the polynomial.

Take down this problem. Divide $y^3 + y^2 - 2y + 1 = 0$ by $(y - a)$ and find the remainder. Verify if you get the same remainder through the remainder theorem.

Interpretation Move :

The generalization can be paraphrased as :

T : When a polynomial of degree ≥ 1 is divided by a binomial containing difference between a term whose power and the coefficient is one and a real number, the remainder is the value of the polynomial function for the real number.

Analysis Move :

T : So in the above theorem, you see that there are specific characteristics for the polynomial. What is the characteristic of the dividend....S_1.

S_1 : It is a polynomial of degree ≥ 1.

What is the characteristic of the divisor....S_2.

S_2 : It is a binomial of the form (x - a), where x is any variable and a is a real number.

T : Given the characteristic polynomials, how do you find the remainder using the remainder theorem?.....S_3

S_3 : The remainder is found by substituting the real number in the binomial, i.e. a in the given polynomial which is the dividend.

Justification Move :

T : Though we have seen that the theorem holds good for the problems we considered, for it is to be accepted universally for all divisions of the kind mentioned, we should prove the theorem.
So, let p(x) be the polynomial, q(x) be the quotient, r(x) be the remainder.
What are the possibilities for r(x)....S_1?

S_1 : It can be zero.

T : Good. If the binomial is a factor r(x) will be zero. What else...S_2?

S_2 : It can be any number.

T : Yes, i.e. you see that the degree of r(x) is then less than the degree of (x - a) in the divisor i.e. zero which means that r(x) is a CONSTANT. So let us call it r.
In division, if D is the dividend, d is the divisor and r the remainder and q is the quotient, what is the relationship between them?

S_3 : No answer....
If you are given all the four values, how will you find D?...S_2.

S_2 : D = d . q + r.

T : Very good.
So in this case we can say that for all values of x,
p(x) =(x - a) . q(x) + r.
What is it that we find using the theorem....S_1.

S_1 : p(a).

T : Good.
$\therefore$ p(a) = 0 . q(a) + r = 0 + r = r.
i.e. p(a) = r and this proves the theorem.

Application (in a generalization)

T : We know that if p(a) = 0, then (x – a) is a factor of p(x).
We would use this in a theorem which we would learn in the next class i.e. the Factor Theorem.

A *problem situation* for an expository strategy using the above moves would be :

T : You all know the method to divide a polynomial by a polynomial. If I tell you that the dividend which is a polynomial of degree ≥ 1 and the divisor is a binomial of the form (x – a). Can you find the remainder without actually dividing them?

Dr B S P Raju

REGIONAL INSTITUTE OF EDUCATION, MYSORE – 6

Evaluation Profile

Teaching Competence Scale

Student Teacher :
Co-operating School :
Name of Observer :
Standard :

Subject :
Topic :
Period & Time :
Date :

	COMPONENTS (Criteria / Teacher Behaviours)	OBSERVED Yes/No	RATING SCALE Excellent	Very good	Good	Average	Poor	Very Poor	Extremely Poor
I.	**LESSON PLAN**								
1.	*Instructional Objectives* - Stated in terms of pupils observable behaviours. - Relevant to the content - Adequacy w.r.t. learners' abilities and time.		7	6	5	4	3	2	1
2.	*Content (Teaching points and prerequisites)* - Accuracy and Clarity of content - Adequacy w.r.t. instructional time and objectives. - Organization – logical according to content and psychological w.r.t. learners.		7	6	5	4	3	2	1
3.	*Learning Activities* - Appropriateness w.r.t. content and objectives. - Adequacy w.r.t. objectives - Effectiveness to attain objectives - Variety and originality		7	6	5	4	3	2	1
4.	*Evaluation : Formative and Summative* - Clarity, overall coverage, appropriateness w.r.t. objectives. - Distributed over the entire lesson. - Review to check overall achievement. - Assignment provides scope to practice and apply knowledge and skills.		7	6	5	4	3	2	1

Comments :

	COMPONENTS (Criteria / Teacher Behaviours)	OBSERVED Yes/No	RATING SCALE						
			Excellent	Very good	Good	Average	Poor	Very Poor	Extremely Poor
II.	**TEACHING LEARNING SITUATION**								
1.	*Lesson Introduction* Introduces effectively using one or more of the following : - Focuses on the topic. - Outlines the major points or tasks to be covered. - States explicitly the aim of the lesson. - Uses analogous situation - Traces historical development - Reviews prerequisites - States the utility of studying the topic - Presents a problem situation		7	6	5	4	3	2	1
2.	*Development of the Lesson* - Uses appropriate teaching strategies - Presents or generalizes content with accuracy and clarity. - Organises in logical and psychological order - Provides opportunities for applying acquired knowledge. - Budgets time according to task and importance of objectives.		7	6	5	4	3	2	1
3.	*Explaining* - Interprets by giving examples or instances/ Paraphrasing/Reviewing prerequisites. - Describes the process and structure through demonstration. - Establishes truth value of the knowledge using deductive arguments/counter example/ experimentation. - Speaks with clarity and fluency. - Uses appropriate vocabulary. - Uses link words and phrases. - Uses appropriate media and material. - Uses emphasis and interest through stimulus variation.		7	6	5	4	3	2	1

Comments :

	COMPONENTS (Criteria / Teacher Behaviours)	OBSERVED Yes/No	RATING SCALE Excellent	Very good	Good	Average	Poor	Very Poor	Extremely Poor
4.	*Questioning* - Clear, precise, relevant and grammatically correct. - Delivers with appropriate speed, proper intonation and pitch. - Provides desired pause for thinking. - Distributes among volunteers and non-volunteers. - Handles pupils' response using prompting, seeking further information, refocusing and asking critical awareness questions. - Avoids mass responses.		7	6	5	4	3	2	1
5.	*Use of Blackboard* - Writes new points or pupils' responses. - Draws neat diagrams/sketches and labels. - Writes legibly, neatly and systematically with adequate space and size. - Gives sufficient time to take down. - Maintains continuity in communication while writing.		7	6	5	4	3	2	1
6.	*Pupils' Participation* - Secures and sustains pupils' attention through varied stimuli. - Increases pupils' participation (responding and initiating) through asking questions and creating climate; and using verbal and non-verbal cues and reinforcers.		7	6	5	4	3	2	1
7.	*Closure of the Lesson* - Recollects/reviews major points of the lesson. - Develops learning structures by relating present learning with previous and future learning. - Creates sense of accomplishment in pupils - Makes effective conclusion		7	6	5	4	3	2	1

Comments :

	COMPONENTS (Criteria / Teacher Behaviours)	OBSERVED Yes/No	RATING SCALE						
			Excellent	Very good	Good	Average	Poor	Very Poor	Extremely Poor
8.	*Classroom Management* - Reinforces attending behaviour - Reacts to misbehaviour - Responds to appropriate targets - Uses non-verbal behaviour to inhibit the development of a potential problem. - Avoids arguments to discourage antagonism between teacher and students. - Takes punitive measures appropriate to the misdeeds.		7	6	5	4	3	2	1
III.	**EVALUATION** - Checks understanding at the end of the development of each teaching point. - Ascertains the realization of overall objectives. - Identifies learning difficulties. - Provides feedback by reinforcing the correct answers and correcting wrong answers. - Provides follow-up to his teaching by giving assignment.		7	6	5	4	3	2	1
IV.	**TEACHER** - Appearance, manners, enthusiasm, confidence, interaction with pupils.		7	6	5	4	3	2	1

Overall Rating (Percentage of marks)..............................

Comments :

Signature of the Supervisor

Training Programme in Mathematics

10th March to 14th March 2003

	College Address	Residence Address
1,	Dr P Annaraja Reader in Mathematics St. Xavier's College of Edn. Palayamkottai Tirunelveli 627 002 Phone : (0462) 2577630	Dr P Annaraja 7, Xavier Colony Melapalayam Tirunelveli 627 005 Phone: (0462) 2352454
2.	Dr(Mrs) Rachel Jebaraj Reader in Maths Education St. Christopher's College of Education 63, EVK Sampath Road Vepery, Chennai 600 007 Phone : 25385877	Dr(Mrs) Rachel Jebaraj 67/12, Thiyagappa Street Kilpauk Chennai 600 010 Phone : 26479626
3.	Mrs Parimala Paul Lecturer in Education St. Christopher's College of Education 63, EVK Sampath Road Vepery, Chennai 600 007 Phone: 25385877	Mrs Parimala Paul 47, Kuttiappan II Street Kilpauk Chennai 600 010 Phone : 26400740
4.	Mr M Anbu Chezhian Lecturer (Senior Scale) Govt. College of Education Pudukkottai 622001 Pudukottai Dist, Tamil Nadu Phone: 04322-221559	Mr M Anbu Chezhian No.2, Professors' Quarters Govt. College of Education Pudukkottai 622 001 Pudukkottai (Dist), Tamil Nadu
5.	Dr A Mary Lily Pushpam Reader Govt. College of Education for Women Coimbatore 641 001 Phone : 2397616	Dr A Mary Lily Pushpam 10 A, Park Town Ramanathapuram Coimbatore 641 045 Phone : 2311382

	College Address	Residence Address
6.	Ms J. Josephine Saleth Mary S.G. Lecturer in Mathematics V O C College of Education Tuticorin 628 008 Phone: 0461 - 2390492	Ms J. Josephine Saleth Mary 9D/6, P.C. Road West Pathinatharpuram Tuticorin 628 008 Phone: 0461 – 2310897
7.	Ms H Shajahan Begum Lecturer in Mathematics Annammal College of Education for Women Tiruchendur Road Tuticorin 628 003 Phone: 0461-2332101, 2332102 Fax : 0461-2332103	Ms H Shajahan Begum 70/77, Second Street Nehruji Nagar Dindigul 624 001 Phone : 0451-2430629 E-mail: hsbm@rediff.com
8.	Mr V Piramanayakam Arts and Crafts Instructor V O C College of Education Tuticorin 628 008 Phone: 0461-2390492	V Piramanayakam 5/100, Devi Arts Building Opp. SPIC Nagar Tuticorin 628 005 Phone: 0461-2355193 2357339

Training Programme for Teacher Educators of Tamil Nadu And Kerala on the Content-Cum-Methodology of Teaching Mathematics at Secondary Level

10.3.2003 to 14.3.2003

Day/Date	9.00 am– 11.00 am	11.00 am – 11.30 am	11.30 am– 1.00 pm	1.00 pm– 2.00 pm	2.00 pm– 3.30 pm	3.30 pm– 4.00 pm	4.00 pm– 5.30 pm
Monday 10.3.2003	Registration and Inauguration	TEA BREAK	Nature of Mathematics **(B S P Raju)**	LUNCH BREAK	Present Scenario of Teaching Maths **(B S P Raju)**	TEA BREAK	Concept Analysis **(B S P Raju)**
Tuesday 11.3.2003	Concept analysis **(B S P Raju)**		Role of Examples and Non-Examples in Teaching a Concept **(B S P Raju)**		Group work – writing concept analysis on selected concepts		Discussion on the material prepared
Wednesday 12.3.2003	Strategies of Teaching a Concept – Concept Attainment **(B S P Raju)**		Simulated Teaching by B.Ed. students – An Observation		Discussion on the Lessons and suggestions for improvement		Lesson Plan **(B S P Raju)**
Thursday 13.3.2003	Strategies of teaching a Concept – Concept Assimilation **(B S P Raju)**		Lesson by a participant to the B.Ed. students		Visit to Mathematics Laboratory		Discussion on the Lesson Plan
Friday 14.3.2003	Teaching of a Generalisation **(B S P Raju)**		Group Work – Preparation of Plan for teaching-learning activities		Discussion on the prepared material		Valedictory and Payment of TA/DA to participants