

IT ENABLED EDUCATION

MATHEMATICS

TRAINING MODULE FOR TEACHERS ***2009-2010***

Dr. Geo
Kig

Preface

Kerala has been witnessing widespread developments in IT Education. Moving ahead with the ever changing world, there has been changes in the learning processes which are facilitated by IT. The importance of learning science subjects with the aid of IT is on a high.

Learning processes which are undertaken through hands-on experiments increases the learning productivity of the students. But at times, it may be difficult to execute certain experiments which might be happening very fast or which might require dangerous resources. Normally, it is the average of the multiple results that is taken as the correct value. But the same experiments could be undertaken correctly with the help of a computer using certain sensors.

Normally, it might be difficult for a group of students to undertake an experiment altogether. But with the help of simulators and softwares, the same experiment could be done in an effective manner and hence would result in making the learning processes for the students, interesting, effective and interactive.

For making use of the ever changing benefits of Information Technology in Education field, the whole hearted support of all teachers is expected.

Thiruvananthapuram

25.04.2009

Director of Public Instruction

Thiruvananthapuram

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DAY – 1

9.30am – 10.30pm Registration

10.00am -10.30am Introduction of the training programme

IT ENABLED EDUCATION - DISCUSSION

Kerala has excelled in the process of educational renovation, than any other state. Our state is a model for the modification of educational outlook in national level and this has been made possible by the innovative teaching methods. It is in this scenario that we are exploring the relative importance of Information Technology and I.T enabled education. Rapid advancement in Science and technology has an impact on all the realms. Thus IT skill sets have become one among the important life skills in this modern era.

Audio visual aids played an important role in classroom teaching and learning. But in the present context of constructivist learning by the students learning using interactive software has been gaining more importance.

I.T Vision 2010, the report submitted by the committee under the leadership of Prof. U R Rao, has stated that the main objective of IT education should be the empowerment of teachers, effective curriculum transaction and the creation of opportunities for acquisition of IT Skills. The Kerala Governor in his Policy Declaration also specified that the present IT education should be changed to IT enabled Education.

In the changing society, knowledge has become one of the important factors among the resources. The role of IT is becoming more important thereby making the process of knowledge productivity and interaction easier. So the upcoming generation should be able to claim the monopoly of Information & Communication Technology.

Thus the IT enabled education needs more explanation on the basis of the following aspects such as useful and interactive curriculum, empowerment of teachers, making teachers and pupils efficient in knowledge acquisition by means of ICT and by using softwares which help in teaching learning process.

As the traditional method of teaching and learning questions the very existence of the learner in the society, it is necessary that the students should keep abreast with the innovative technology based teaching methodology as well as the highly informative multimedia techniques.

Thus we cannot nullify or neglect the importance of Information Technology in the present educational context. The child should be able to use the computer based learning activities by himself. Thus IT education could play an eminent role in the construction as well as the re-organisation of knowledge by each child and thereby creating changes in educational field.

10.00am - 10.30 Introduction to Drawing Geometry

Drawing Geometry – A help for learning geometry

Learning Mathematics is very difficult at least for a small group of children. The unawareness of the concepts like point, line, plane etc. becomes a hindrance to the learner in Maths. To overcome this, pictures, shapes cut out of cardboard etc. can be used. But here we can make use of IT enabled methods for the formation of idea. Dr. Geo (Drawing Geometry) is a good example for software, which helps us in learning Geometry. It is a free software, which functions in GNU Linux Operating System.

How to open Dr. Geo

Application → Education → Dr.Geo

Window of Dr. Geo is shown in Picture.1. We can see a tool bar above the drawing canvas and another one on the left side of the canvas. All the tools are available in the main tool bar, which is seen above the canvas. The tool bar on the left side contains the tools we use frequently. We can accomplish almost all the activities using these tools and the pop up menu available when we right click on the Drawing canvas. Few tabs are seen at the bottom portion of the window. Each tab indicates a diagram, which can be displayed on clicking the corresponding tab.

When we click on any tool in the main tool bar we get the different options of this tool. For example, to mark a point, there is a tool named ' free point '. Dr.Geo also has tools to mark co-ordinates of the midpoint of a line segment.

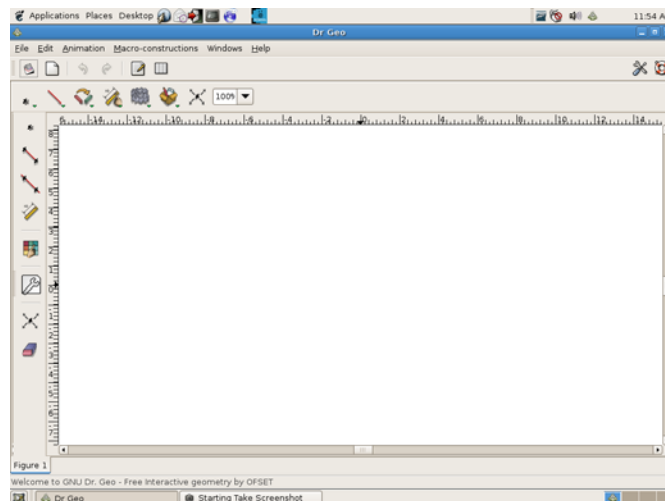






Diagram.1

Now let us see how we can draw geometric shapes in Dr.Geo. The common steps used is : Mark the points first. Then draw figures using these points.









For example, we can draw a line after marking any two points on the line. So first we select the tool to mark points and using it mark two points on the canvas. Then select the tool for line and draw a line passing through these two points. Same procedure is used in all the activities.

10.30am - 11.00am Familiarizing the tools





1. Point Tool




- 1.1  → Point
- 1.2  → Mid Point
- 1.3  → Point of Intersection
- 1.4  → Cordinates of Point

2. Curve Tool





- 2.1  → Line defined by two points
- 2.2  → Half line defined by points
- 2.3  → Segment defined by two points
- 2.4  → Vector defined by two points
- 2.5  → Circle defined by centre and point
- 2.6  → Arc defined by three points
- 2.7  → Locus
- 2.8  → Polygon

3. Transformation Tools




- 3.1  → Line passing through a point and parelled to a line
- 3.2  → Line passing through a point and perpendicular to a line
- 3.3  → Axial symmetry of an object
- 3.4  → Central symmetry of an object

- 3.5  → Translation of an object
- 3.6  → Rotation of an object
- 3.7  → Scale of an object


4. Numeric tools

- 4.1  → Distance or Length
- 4.2  → Angle defined by 3 points or two vectors
- 4.3  → Point co-ordinates
- 4.4  → Guide scripts

5. Other Tools

- 5.1  → Delete an object
- 5.2  → Change the style of an object
- 5.3  → Change the property of an object

6. Move Tool

- 6.1  → Select and move an object

11.00am - 12.00 noon Practising Dr.Geo

Activity - 1

Select suitable tools from the tool bar and draw the following figures

1. Mark a point
2. Construct a line
3. Construct a circle
4. Construct a triangle

Activity – 2

We have learned how we can construct a triangle. Draw triangle ABC and mark the length of its sides and measure of its angles. Now we can give titles. Select 'Style ' tool (Tool 5.2) and click on the point which has to be labeled.

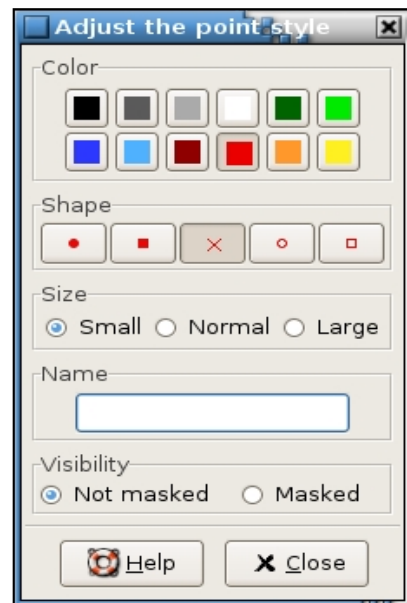
A window (picture.2) opens, then type the name in the text box and click on 'close' button. Using the same tool we can alter the colour, style and nature of any object (point, line etc.) and also hide an object.

4. Measurement of a line segment

Draw line segment. Select the 'Distance or Length' tool (Tool 4.1) from the Numeric tool bar. Now click on the line segment.

5. Let us draw an Angle and measure

To draw an angle, select the 'Angle tool' (Tool 4.2) and click on the points which make the arms of the angle



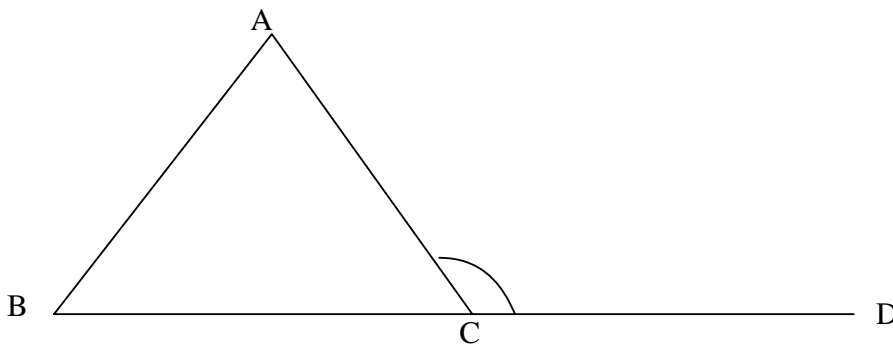
Picture.2

Activity – 3

Draw the quadrilateral PQRS and measure the sides and angles of it.

Activity – 4

Draw Triangle ABC such with exterior angle ACD. Measure the angles. Select 'Move' tool (Tool 6.1), change the position of its vertices and verify Exterior angle theorem.



12.00 - 01.00 Introduction to Kig

KDE Interactive Geometry - KIG is an interactive program which helps us to practice the construction of geometric shapes and teach the principles of Geometry.

A lot of options to draw geometric shapes are arranged in the Object menu in the Menu bar. More than 40 objects like Points, Lines, Segments, Vectors, Circles, Arcs, Conics, Angles, Bisector, Polygons etc. in this menu help in the construction of geometric shapes. More than 10 options for transformation like Translate, reflect, rotate, scale etc provide facility to experiment on the geometric shapes.

Facility for verification (for example - Whether the given lines are perpendicular ? , Whether a point is the midpoint ? etc.) is a peculiarity of KIG. Python script, Locus, Macro facility etc. may provide us more interesting learning experiences.

Tool bars are also arranged conveniently, so that the objects can be easily selected. Files of similar applications like Dr.Geo, Kgeo, Kseg, cabri etc. can also be opened in this software.

Toolbars

Main Toolbar



Point Toolbar



View Toolbar



Line Toolbar



Vectors & Segments Toolbar



Circles & Arc Toolbar



Conics Toolbar



Angles Toolbar



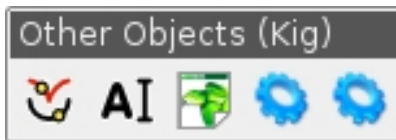
Transformations Toolbar



Tests Toolbar



Others



When we right click on an object, options to modify or hide an object (point, line etc.)

Practice the activities done in Dr.Geo, in KIG, also.

2.00pm - 3.30pm

Text Book Activities

Class 8 : Chapter 2 Congruent shapes

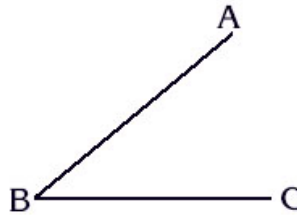
Activity – 1

Construct equilateral ABCD. Change the position of vertices and sides using Move tool and verify the following.

- Opposite angles are equal
- Diagonals intersect each other.

To construct a parallelogram

1. Draw angle ABC



2. Draw two lines through the points A and C parallel to BC and AB respectively.

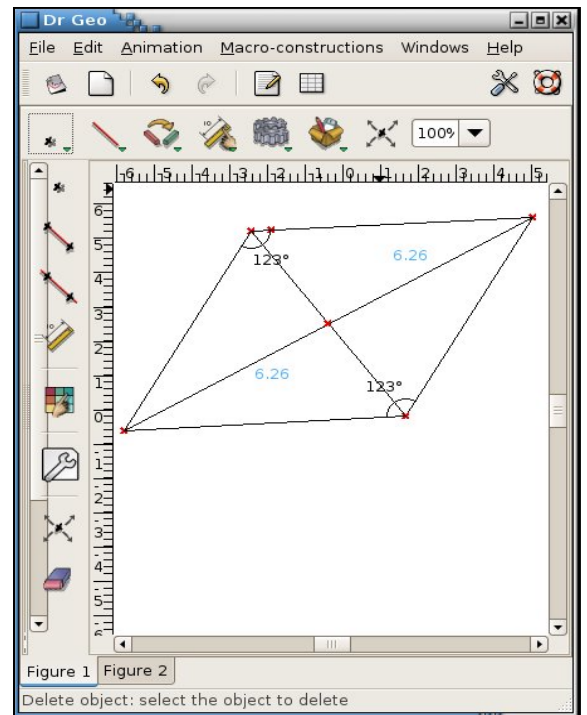
3. Mark the point of intersection of these lines as D(using Tool 1.3).

4. Mask the parallel lines (drawn in step 2) using Tool 5.2

5. Join CD and AD.

6. Draw the diagonals

7. Mark the measurements of angles and the length of the diagonals.



Activity - 2

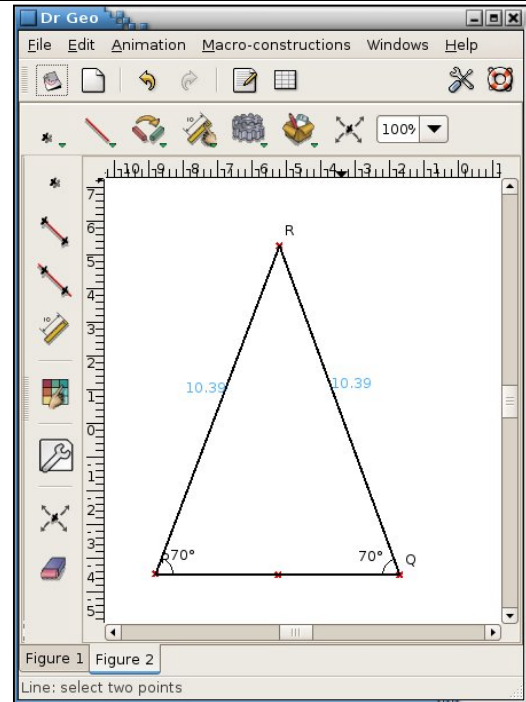
Draw isosceles triangle PQR. Measure angles and the length of the sides and verify that the measurements of base angles are equal.

To construct an Isosceles triangle:

1. Construct line segment PQ

2. Mark the midpoint of PQ

3. Select the Perpendicular tool from the transformation tools and draw the perpendicular through the midpoint (by clicking on the midpoint of the line segment)
4. Mark the point R on the perpendicular drawn.
5. Mask the perpendicular and then join the points P,Q and R.



Activity

1. Construct a triangle ABC with $AB = 6\text{cm}$, angle $A = 60^\circ$, angle $B = 80^\circ$ and triangle PQR with $PQ = 6\text{cm}$, angle $P = 60^\circ$, angle $Q = 80^\circ$. Find the measures of other equivalent angles and sides of these two triangles and formulate the common rules for congruence.
2. Construct two triangles in such a way that two sides and the angle including these two is congruent to the corresponding angle and sides of another triangle. Then formulate the general rules of congruence.

3.30pm to 4.30pm

Introduction to Macro

Macro is a facility to apply many instructions with a single instruction. Macro can be used to prepare learning activities in softwares like Drawing Geometry, KIG etc.

Macro in Dr. Geo

Prepare a Macro to create a triangle while giving its vertices.

1. Mark three points in the Canvas of Dr.Geo
2. Join the points and construct a triangle.
3. Select 'Construct a Macro' tool from the Macro tools.
4. Press the forward button in the window opened.
5. The window opened is to enter input parameters. Here the input parameters are the vertices of the triangle. To give input click on these points and click on the forward button.
6. Now we get the window to enter Output parameters. Here output parameters are the sides of the triangle. Click on these sides and then on forward button.
7. In the next window, give a name (eg: Triangle) to the Macro and then click Apply button.
8. After this, select the Macro created (Triangle) in the Macro- constructions menu

How to use Macro

Use the Macro created now, to construct a triangle.

1. Mark three points in the drawing canvas of Dr. Geo.
2. Select the Macro (Triangle) from the menu Macro-constructions

3. Click on these points in order, then a triangle is formed.

Activity

1. Create a Macro for the construction of a quadrilateral .

How to use Macro in Kig

Method to create a macro for the construction of tangent through a point on the circle.

1. Draw circle and label its radius.
2. Draw perpendicular to the radius through the point which is the tangent at that point.
3. Click on 'Define a new Macro' tool
4. Click on the Input parameters (Centre of the circle and the point marked on it).
5. Click 'Next' button
6. Click on the output parameters.
7. Click 'Next'
8. Give a name for Macro. Click 'Finish' button.

How to use Macro

To construct a circle and its tangent using the created Macro, select the new Macro appeared on the left side of the Kig window. Click and drag on the drawing canva

DAY – 2

9.30am to 10.00am

Review of the activities of Day 1

10.00am to 11.30am

Familiarization of Browser

We can make use of a browser to use the files prepared in Dr.Geo and Kig effectively. The folder 'Geometry Browser' contains files named Dr.Geo Browser, Kig Browser and some folders. Click on 'RUN' button in the window opens when click on the ' Dr.Geo Browser' and 'Kig Browser'. Now a window appears with some folders and Dr.Geo/Kig files on left side. On the right side, the instructions to run these files are seen.

How to include a new file into the Browser

Create a new folder in the folder 'Geometry browser', and keep the Dr.Geo files with extension .fgeo in this folder. Now we can see the new folder and the files in the browser when we open it.

If we want to show the explanation/ a note about a file(diagram) while we click on the file, then type the details in a text file and save it in the same folder.

11.30 am– 1.00pm

Text book activities

Class : 9 Chapter – 4 CIRCLES

Activity - 1

Diameter is the longest chord in a circle. Verify this.

- a. Draw a circle and a chord in it. Move the chord and check the length at each position
- b. Draw a circle and a chord in it. Animate one end point of the chord using 'Animation' Tool. Verify the lengths.

Activity – 2

Construct a circle and a chord in it. Mark the radius and distance from the centre of the circle to the chord. Verify the relation between the length of the chord, the radius of the circle and the distance between the centre and the chord.

Activity – 3

Circumcircle

Construct triangle ABC with $AB = 7\text{cm}$, angle $A = 60^\circ$. Draw its circumcircle using Kig.

Steps (Kig)

1. Construct AB
2. Fix the length of AB as 6 using 'Set length' option.
3. Draw AC and fix its length as 7.
4. Fix the measure of angle A as 60° and label it.
5. Join AC
6. Construct Perpendicular bisectors of both these sides.
7. Mark the point of intersection of the perpendicular bisectors of sides. Draw a circle through the point A with this point as the centre.

Activity – 4

Equal chords will be equidistant from the centre of the circle.

Draw a circle and equal chords. Verify the peculiarities of these chords.

Chapter : 8 Proportion

Activity

Theorem: The line joining the midpoints of any two sides of a triangle will be half the length of the third side.

Construct a triangle and join the midpoints of its two sides. Verify whether the line drawn is half the length of the third side.

Activity

Theorem : The perpendicular bisector of any side other than the hypotenuse of a right triangle will bisect the hypotenuse.

Construct a right triangle and verify the theorem.

2.00pm – 3.00pm

Text Book Activities

Class 10, Unit – Circles

Activity 1

Find the relation between the angles of and Arc and angle subtended by it

Method : Draw a circle. Mark the arcs. Measure the central angles and the angle subtended by the arc and note down them. Now alter the length of the arc and verify the measurements.

Activities - 1

- a) Prepare an activity to show that the angles formed by same arc will have same measures.
- b) Prepare an activity to show that the measure of the central angle of an arc is double the measure of the angle subtended by it.
- c) Prepare an activity to show the properties of opposite angles of a cyclic quadrilateral.

Activities – 2

Construction of tangents

Draw a circle with radius 5units and mark a point P on it. Draw a tangent through the point P.

Steps :

Draw the circle.

Mark the point P on it.

Join the centre of the circle and the point P.

Draw a perpendicular to the radius through P.

Activity – 3

Draw the tangents to the circle from an exterior point of the Circle.

Steps

Draw the Circle.

Mark an exterior point.

Join the centre of the circle and the exterior point, mark the midpoint of the line thus formed.

Draw circle through the exterior point with the midpoint of the line as centre.

Join the points of intersection of the circle.

Hide the second circle if necessary.

Activities

1. Prepare an activity to show that the tangents drawn to a circle from an exterior point will be equal in length.
2. Prepare an activity to draw a circle and its tangents from an exterior point . Show that the radius of the circle and the tangent are perpendicular to each other.

3.00pm - 3.30pm

Installation of the softwares - Dr.Geo/KIG Softwares

ITSchool GNU/Linux CD -1 contains Dr.Geo and the CD – 2 contains the application KIG. Insert the concerned CD in the CD drive and then open Synaptic Package Manager. (Desktop --> Administration --> Synaptic Package Manager). Click the option ' Add CD Rom' from the 'Edit' menu. Click the 'OK' button in the next window. Then an another window would appear asking, whether another CD to be included. Click 'No' button.

Find the software Dr.Geo/KIG from the packages listed in the window. Then Dr.Geo/KIG can be installed through the steps Right click --> Mark for Installation --> Apply

3.30pm – 4.00pm

Conclusion