ICT & MATHS

Module 3

GeoGebra for Trigonometry

It is envisaged that this module will also include a session where the participants share resources they themselves have developed using GeoGebra with the other participants.





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GeoGebra for Trigonometry

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Please note

- Screenshots used in this manual may appear different from those on computer screens used by participants; variations in versions of the software and differing operating systems may be in use.
- The World Wide Web is constantly evolving and content and URLs (Universal Resource Locators website addresses) change over time. It is possible that the content located at some of the URLs listed throughout this manual may change over time.
- Screenshots and software titles used throughout the manual are from a PC using Windows Vista©.
- Participants using other operating systems may encounter some differences in screen presentation and layout.

Throughout this module reference may be made to software titles and suppliers of Internet services. These references are made purely to illustrate or expound course content. Any such reference does not imply any endorsement by the NCTE of a product or company. The reader should be aware that typically there are many products and companies providing similar services in areas related to ICT. Participants should be as informed as possible before making decisions on purchases of ICT products or services.





GeoGebra for Trigonometry

Duration

2.5 hours

Objectives

This module aims to enable the participant to:

- plot trigonometric functions
- vary the units on the axes of graphs
- use sliders when plotting functions such as asinbx
- create a dynamic web page from a GeoGebra file

















Plotting Trigonometric functions



- 1. In the **Input bar** type in f(x) = sin(x). **Press Enter**.
- The x-values will be in radians. Right click on the Drawing pad. Select Drawing Pad and with the xAxis tab open click on the arrow beside unit and select π. Click Close. The radian measure will now be given in terms of π. If you wish to have the x- values shown in degrees see next section.

Drawing Pad 📧
Background Color:
Axes Grid
✓ Axes Color: Line Style: → ▼
xAxis yAxis
Show Ticks:
✓ Numbers ✓ Distance: π
Unit:
Label:
min: -0.56 • max: 25.04 •
xAxis : yAxis = 1 : 1
Close

3. **Right click** on the **Drawing pad**. Select **Drawing Pad** and the **yAxis tab**. Then change the max and min values so that the sine curve is positioned about the middle of the Drawing pad. **Click Close**.





- Right click on the graph of y = sin(x). Select Object Properties and selecting the Basic tab choose Name and Value to label the graph with its equation. Then select the Color and Style tabs to change the colour of the curve and its thickness. Click Close. (If we select the graph and drag it, its equation will change as it is phase shifted).
- 5. **Right click** on the **Drawing Pad**. Select **Drawing Pad**. Select **Background Color**, and choose a suitable background colour. **Click Close**.
- 6. With the above method of labelling it is not possible to change the size of the text in the label. If we select the **Insert Text tool** and **click** on the screen where we wish the text to appear, and type in f(x) = and then **click** on the equation f(x) = sin(x) in the **Algebra View**, "f(x) ="+f appears in the text box. **Click OK**.

Text "f(x)=" + f	2
	[α •]
🗆 LaTeX formula 🗸 🔹	
	OK Cancel

- If we now right click this Text box and choose Object Properties we can change its size and colour, as shown below on the left hand side, by selecting the Text tab and Color tab respectively. Click Close.
- Hide the Algebra View, by selecting View from the menu bar and then clicking on Algebra View – the result is shown on the right hand side below.





To show the x – values in degree measure rather than in radian measure.

Select File, New window

Type in $y = sin(x^0)$ in the **Input bar**. Press Enter.

Input y = sin(x*)	Command 👻
Click on the degree symbol here.	

Click on Options, Drawing Pad, and insert the following values or similar.

Drawing Pad	X
Background Color:	
☑ Axes Color: ▲ ▲	
xAxis yAxis	
Show Ticks:	
Vumbers Distance: 30	
Unit: °	
Label:	
min: -90 • max: 670 •	
xAxis:yAxis = 50 : 1	
Clos	e







To plot a graph of y = asinbx, using sliders for a and b.



- 1. Click on File, New.
- 2. Select the **Slider tool** and **click** on the **Drawing pad**.
- 3. Select the max and min values and Increment values for a (e.g. -5, 5, 0.1). Slider a is displayed on the **Drawing pad**, and its value is given in the **Algebra View**.
- 4. Change the slider colour to red and increase the line thickness.
- 5. Repeat this process to create slider b. Change its colour to green and increase its line thickness.
- 6. Type in f(x) = a sin(b x) in the **Input bar**. There must be a space between "a" and the word sin and between "b "and "x".

Repeat steps 1 to 6 in the previous "**Plotting Trigonometric functions**" section to produce a drawing similar to that shown above.





How to create a dynamic worksheet of the above GeoGebra file.

Create a new folder called "Dynamic Worksheets Folder for GeoGebra" in **My Documents** or a location of your choice.

- Save the GeoGebra file in this folder.
- Click on File, Export Dynamic Worksheet as a Webpage (or Ctrl –Shift –W.)
- Fill in the title of the worksheet, name of the author, date and any instructions into the **Text above the construction** box and into **Text after the construction** box.

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uthor: Draft 01 (c) Project Maths Development Team	Date: 11 January 2010
Seneral Advanced	
Fext above the construction:	1855
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Dynamic worksheet O Button to open application window rext below the construction:	
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Dynamic worksheet O Button to open application window Text below the construction:	[2 [2

Click on the Advance tab and select the option "Show icon to reset the construction". This will cause a reset icon to be displayed in the upper right hand corner of the interactive applet so that it can be reset to its original state after manipulation.

uthor: Draft 01 (c) Project Maths Development Tea	am Date: 11 January 2010
Seneral Advanced	
Functionality Enable right click features Enable dragging of labels Show icon to reset construction Double click opens application window	User Interface Show menubar Show toolbar Show toolbar help Show input bar Width: 884 Height 512
Java Applet	

• Insert values for width and height. Try 1100 for width and 500 for height or experiment with different values.





• Click on Export and save the dynamic worksheet in the Dynamic worksheets folder created as instructed above. Some versions of Geogebra will create several Executable Jar Files known as .jar files which need to stay in the same folder as the dynamic worksheet and the corresponding GeoGebra file to ensure it will always work. Hence it is a good idea to create a "Dynamic Worksheets Folder for GeoGebra" prior to saving the dynamic worksheet.

Note: some versions of GeoGebra do not produce these **.jar** files and if this is the case with your version ignore them, but the dynamic worksheet and the corresponding GeoGebra file will still need to be stored in the same folder.

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Favorite	Name	Date modified	Туре	Size	Tags	
 D S P P Folders D ^ J 	 asinbx_degrees_geoge asinbx_degrees_geoge geogebra geogebra_cas geogebra_export geogebra_gui geogebra_main geogebra_properties 	11/09/2009 13:00 11/09/2009 13:00 11/09/2009 13:00 10/09/2009 21:23 10/09/2009 21:23 10/09/2009 21:23 10/09/2009 21:23 11/09/2009 13:00	HTML Document GeoGebra File Executable Jar File Executable Jar File Executable Jar File Executable Jar File Executable Jar File Executable Jar File	2 KB 2 KB 1,045 KB 413 KB 328 KB 516 KB 719 KB 415 KB		

• As soon as it is saved the dynamic worksheet is opened in the web browser.

testrun - Geodebra Dynamic Worksheet - Windows Internet Exp	lorer	
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🗈 🕶 🔁 🛱 reason day 👻 🔍 🗸 Search the Web	Go 🕂 🎨 🔻 🥥 Record 🔹 Stop 🕕 Pause 🕑 Play 🕐 Settings 🔗 Record ANY Video & Audi	0
Google 🖸 - 🖸 - 🖸 - 🖓 Go 🕫 😴 💆 -	🏠 Bookmarks+ 🔁 Popups okay) 💖 Check + 🐁 AutoLink + 🐚 AutoFill 🍺 Send to+ 🖉	
AVG - DOMETED by TAHOO! SEARCH - Search - +	Active Surf-Shield 🔒 Search-Shield 🚽 AVG Info 🕶	
😭 🛷 🌈 testrun - GeoGebra Dynamic Worksheet		
To help protect your security, Internet Explorer has restricted this	webpage from running scription of the state	tions
100.00.00	Allow Blocked Content What's the Pick?	
testrun	What's the roak	
	More information	
Drag sliders a and b to see the effect of chang	ng a and b in y = asin(bx).	
Sorry, the GeoGebra Applet could not be starte active in your browser (Click here to install Java	ed. Please make sure that Java 1.4.2 (or later) is installed and a now)	
project maths , 15 January 2009, Created with	GeoGebra	

• Next, right click on the bar which says "Click here for options". Select "Allow Blocked Content" and select "Yes".



f(x) = asin(bx)

Sorry, the GeoGebra Applet could not be started. Please make sure that Java 1.4.2 (or later) is installed and active in your browser (Click r project maths, Created with GeoGebra

• The dynamic worksheet will now open up as a Java applet and the student can interact with the material.

Check out if the applet is working as required. If you want to change it, go back to the original Geogebra file and make the changes. **Export** again as a dynamic worksheet and if you use the same filename the new file will overwrite the old one.

The applet should fit on one page of the browser without students having to scroll up or down between the tasks or instructions and the figure. If there are too many tasks on one worksheet consider splitting it between two or more worksheets.

Several dynamic worksheets can be saved in the same folder. The .jar files will only be created once in this folder. If you wish to give someone a copy of a particular dynamic worksheet you must copy the .jar files along with the .ggb and .html files.

Exercise: Create a GeoGebra file showing the effect of varying variables a and b in the equation of $y = a \cos(b x)$. Export this file as a dynamic worksheet.