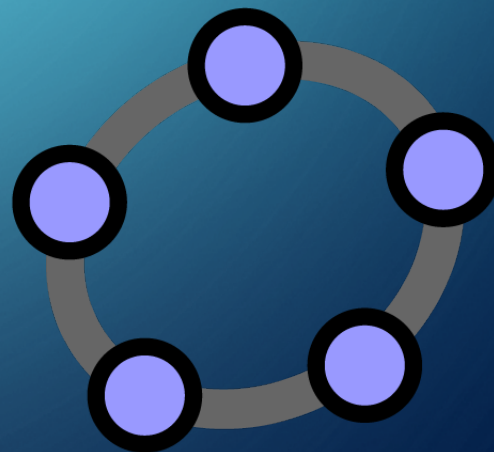


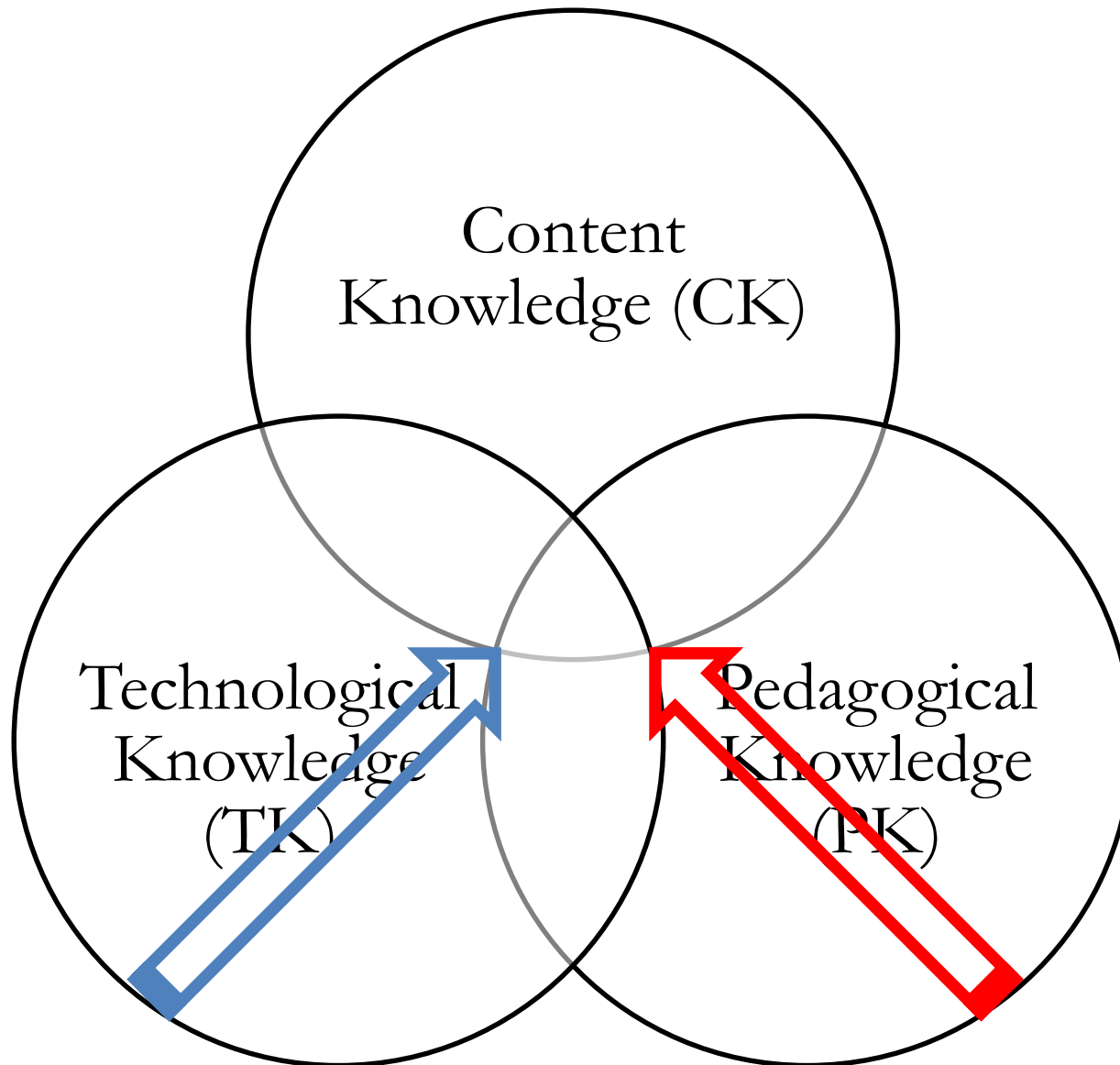
中學數學電子學習系列：(1) 在數學課堂有效運用資訊科技 (基礎程度) (重辦) —— GEOGEBRA 的基本操作

教育局數學教育組

2021年



術 Technology & 道 Pedagogy





GeoGebra 簡介

- GeoGebra 是為了小學到大學的教學而設計的開源 (open source) 動態數學軟體。
- GeoGebra 是一套結合幾何（平面+立體）、代數、統計及微積分等的免費動態幾何軟件，它是在 2001 年由 Markus Hohenwarter 在奧地利的 Salzburg 薩爾茨堡大學所設計。
 - GeoGebra 其實就是他的碩士論文。
 - 目前在奧地利 Linz 的 Johannes Kepler 大學（克卜勒大學）擔任數學教學研究所所長。
- GeoGebra 是由 Java 寫成的，因此可以跨平台使用。
- GeoGebra 的一些學與教用途：
 - 教師用於課堂演示互動幾何圖像；
 - 學生用於探索與發現幾何概念，猜想幾何定理。
- 2011: [38 developers](#) & 200 translators Celebrating 10 years of GeoGebra

*If you want to go fast, go alone.
If you want to go far, go together.*



Stable release 6.0.452.0 (8 April 2018)
Stable release: 6.0.620 (1 December 2020)
<https://en.wikipedia.org/wiki/GeoGebra>

GeoGebra 的特性



- 免費、開放源碼 (Open Source)
- 多平台
- 多語言用戶介面
- 結合動態幾何(平面+立體)、代數、統計及微積分
 - GeoGebra = **Geometry** + **Algebra**
 - 現在已經是
Geometry+Algebra+Analysis (微積分) +Discrete
mathematics.
- 代數符號及圖形表徵的同步調整

GeoGebra

GeoGebra 的特性

• infographic2014



事實與數字

- 遍及全球
各大洲每個國家都在使用
- 為所有學生而設
適合任何年齡和程度
- 完全兼容
可運行於所有操作系統和瀏覽器
- 流動可攜
隨時隨地、在線離線皆可使用
- 100 000+ 免費互動素材
可於 www.geogebra.org 瀏覽下載
- 全天候支援
一年365¼日, 每日24小時
- 今日就加入GEOGEBRA的環球社群
一起創作、一起分享、一起學習

#2 教師喜愛它, 因為...

它讓老師繼續教學

GeoGebra不會取代老師。它只是協助老師做他們最擅長的工作——教學

它讓老師更好地備課和授課

GeoGebra讓老師獨立自主, 創作學生感興趣的課堂內容

今日課堂

它讓老師彼此連繫

That's cool! Wie war's? ありがとう Arigatō
¿Qué opinas? Wazo kubwa!

GeoGebra教師是環球數學社群的一分子

#1 學生喜愛它, 因為...

它令數學觸手可及

GeoGebra把幾何和代數以嶄新的視像方式連繫起來——學生看得見、觸得到, 真正體驗數學

它令數學充滿動感, 更互動、更有趣

GeoGebra走出黑板, 充分利用新媒體, 讓學生以全新及精采的方式學習數學

它令數學唾手可得

不論身處學校還是家中, GeoGebra都可讓學生隨時隨地接觸數學

它令數學更易學

GeoGebra促進互動, 讓學生更易吸收數學概念


看得見 觸得到 感受到 掌握到

GeoGebra


- www.geogebra.org
 - GeoGebra Augmented Reality (iOS Apps)

Download GeoGebra Apps


Free offline GeoGebra apps for iOS, Android, Windows, Mac, Chromebook and Linux

 **Graphing Calculator**
Graph functions, investigate equations, and plot data with our free graphing app


[DOWNLOAD](#) [START](#)

 **3D Graphing**
Graph 3D functions, plot surfaces and do 3D geometry with our free 3D Grapher


[DOWNLOAD](#) [START](#)

 **Geometry**
Construct circles, angles, transformations and more with our free geometry tool


[DOWNLOAD](#) [START](#)

 **GeoGebra Classic 6**
Apps bundle including free tools for geometry, spreadsheet, probability, and CAS

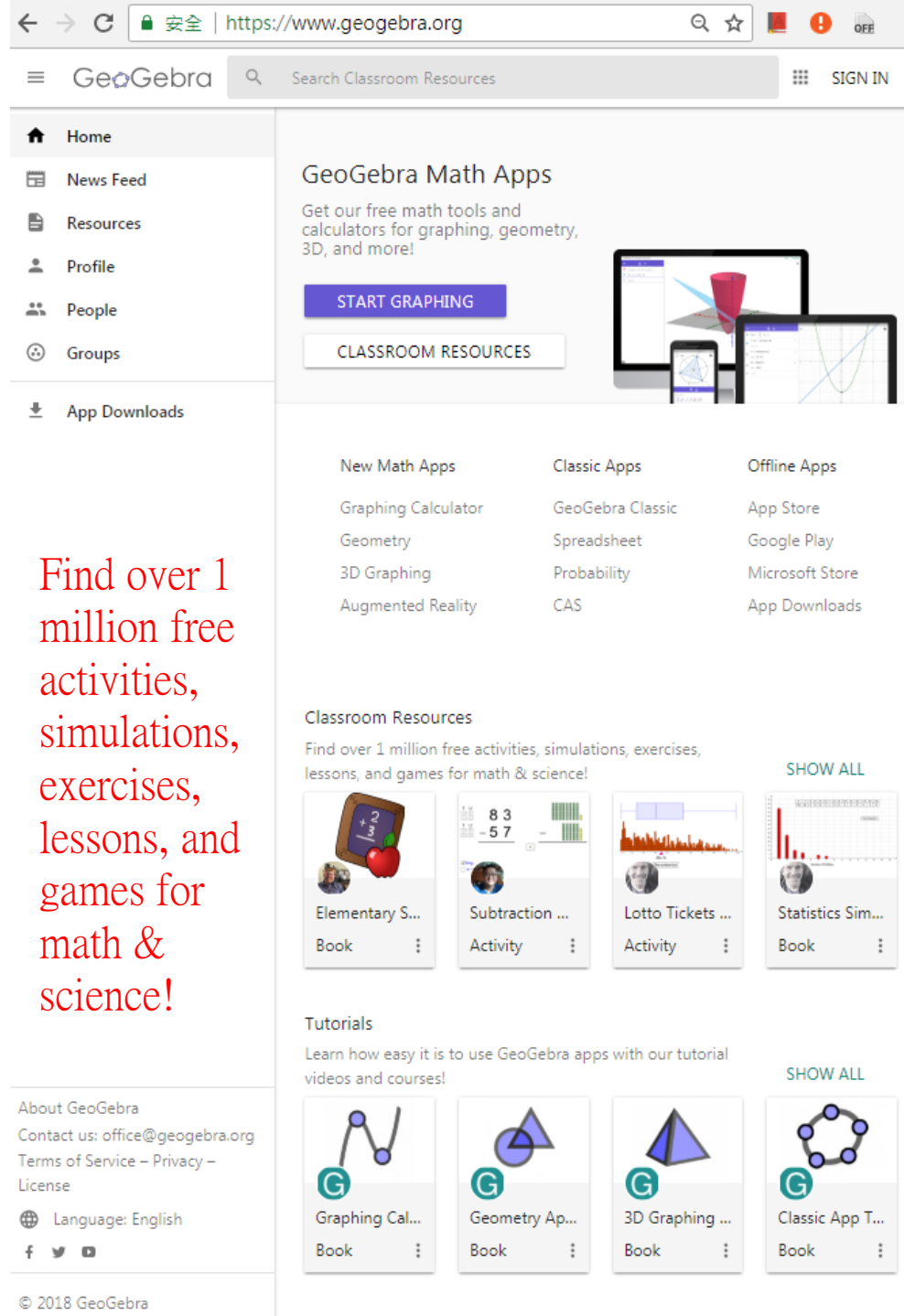
[DOWNLOAD](#) [START](#)

 **Augmented Reality**
Put 3D math into the real world with GeoGebra Augmented Reality!

[DOWNLOAD](#)

 **GeoGebra Classic 5**
Apps bundle including free tools for geometry, spreadsheet, probability, and CAS

[DOWNLOAD](#)



The screenshot shows the GeoGebra website homepage. At the top, there is a navigation bar with the GeoGebra logo, a search bar, and a 'SIGN IN' button. Below the navigation bar is a sidebar menu with options: Home, News Feed, Resources, Profile, People, Groups, and App Downloads. The main content area features a 'GeoGebra Math Apps' section with a 'START GRAPHING' button and a 'CLASSROOM RESOURCES' button. Below this, there are three columns of app categories: 'New Math Apps' (Graphing Calculator, Geometry, 3D Graphing, Augmented Reality), 'Classic Apps' (GeoGebra Classic, Spreadsheet, Probability, CAS), and 'Offline Apps' (App Store, Google Play, Microsoft Store, App Downloads). A 'Classroom Resources' section follows, highlighting over 1 million free activities, simulations, exercises, lessons, and games for math & science. Below this are several resource cards, including 'Elementary S...', 'Subtraction ...', 'Lotto Tickets ...', and 'Statistics Sim...'. A 'Tutorials' section is also present, with a 'SHOW ALL' button and four tutorial cards for 'Graphing Cal...', 'Geometry Ap...', '3D Graphing ...', and 'Classic App T...'. At the bottom, there is an 'About GeoGebra' section with contact information, terms of service, and language options.

Find over 1 million free activities, simulations, exercises, lessons, and games for math & science!

About GeoGebra
Contact us: office@geogebra.org
Terms of Service – Privacy – License

Language: English



GeoGebra Augmented Reality (iOS Apps)

- GeoGebra Augmented Reality

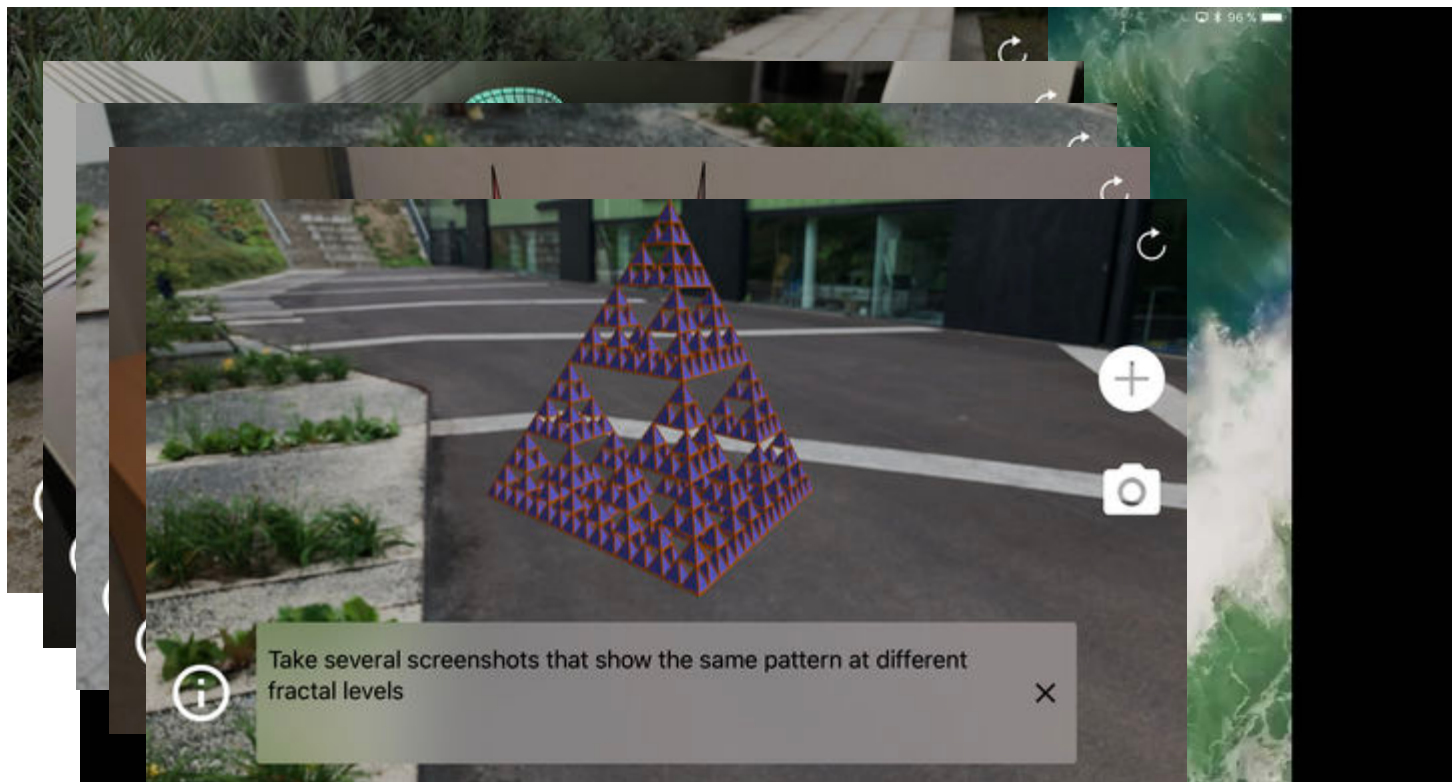
- By International GeoGebra Institute (IGI)
- This app is only available on the App Store for iOS devices.



+ This app is designed for both iPhone and iPad

[Version History](#)

Version 2.03



https://itunes.apple.com/app/geogebra-augmented-reality/id1276964610&utm_source=Download+page&utm_medium=Website&utm_campaign=GeoGebra+Augmented+Reality+for+iOS

GeoGebra Augmented Reality (iOS Apps)

- <https://www.geogebra.org/ar>



This app is designed for both iPhone and iPad

Free

Category: **Education**

Released: Sep 19, 2017

Version: 1.0

Size: 14.1 MB

Languages: English, French, German, Italian, Spanish

Seller: Internationales GeoGebra Institut, "IGI"

© International GeoGebra

Version History

2.03	Jun 28, 2018
Support for ClassKit	
2.02	Jun 24, 2018
Support for ClassKit	
2.01	Apr 18, 2018
Language updates	
2.0	Mar 27, 2018
You can now enter your own functions!	
8	
1.0	Sep 20, 2017

GeoGebra

Augmented Reality: Ideas for Student Exp

Getting Started with AR

Ideas for Student Activities & Explorations

AR Modeling Tips & Hints

Examples & Demos: AR Modeling

Quick Modeling of a Bench Within GeoGebra

GeoGebra Augmented Reality: Modeling i

Modeling a Pringles Potato Chip in GeoGebra

GeoGebra Augmented Reality: Modeling i

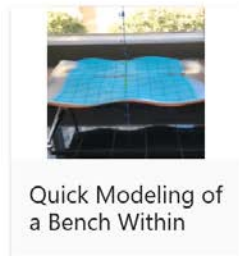
GeoGebra Augmented Reality: Modeling i

GeoGebra Augmented Reality: Egg Model

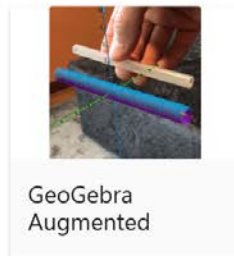
Hershey Kiss Modeling in GeoGebra Augr

Examples & Demos: AR Modeling

With GeoGebra AR, the possibilities are seemingly ENDLESS! Here are a few illustrations of every-day, real-world, 3D objects that can be modeled effectively within GeoGebra AR. Enjoy!



Quick Modeling of a Bench Within



GeoGebra Augmented



Modeling a Pringles Potato



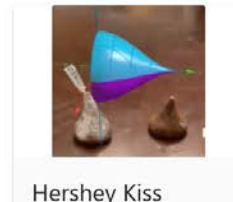
GeoGebra Augmented



GeoGebra



GeoGebra



Hershey Kiss

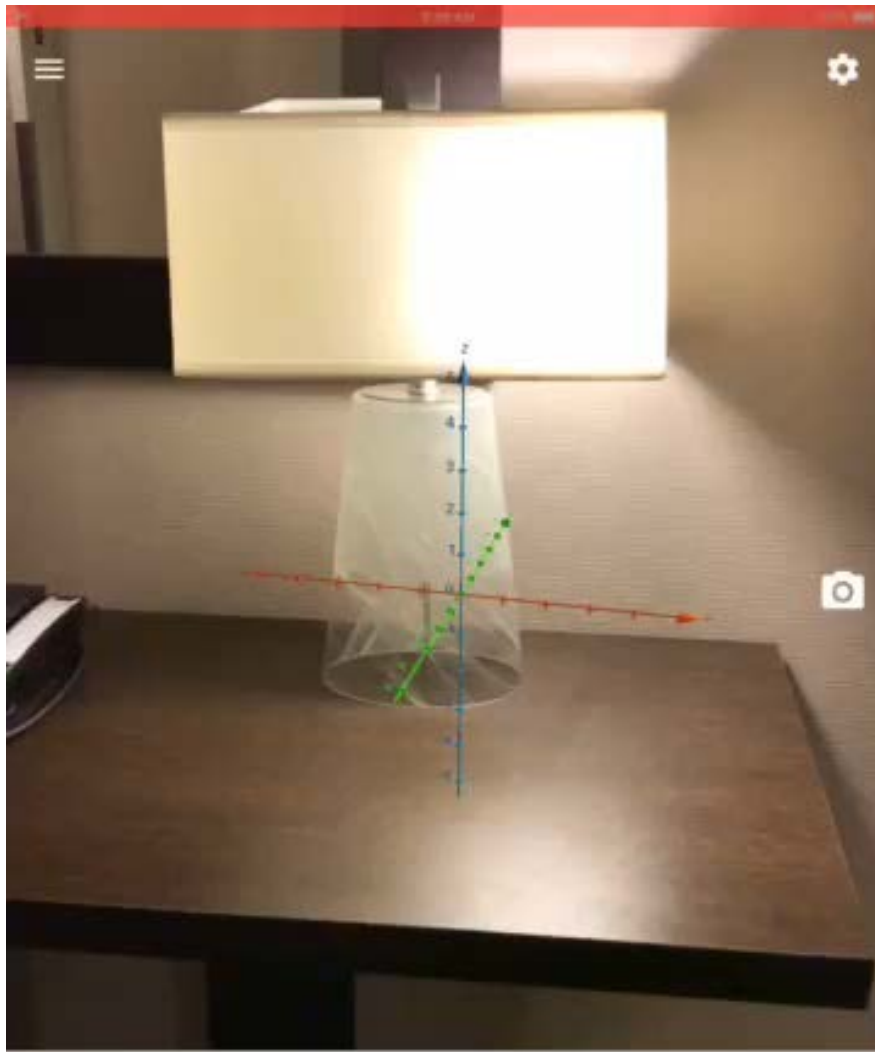


GeoGebra



https://www.uc.pt/en/congressos/cadgme2018/ficheiros/CADGME-2018_paper_61

GeoGebra Augmented Reality (iOS Apps)



[Version History](#)

Version 2.03

+ This app is designed for both iPhone and iPad

Ratings and Reviews

4.6 out of 5

36 Ratings



Editors' Notes

Discover and learn math and science in the real world.



magnusxelsv, 04/19/2018

Useful and intuitive even to the math illiterate
I can barely remember basic trig rules, but simply plugging large constants/ exponents in and dividing the binomial by weird values gave me some really beautiful and strange patterns. [more](#)

×

Waste of time



Nov 3, 2017

Sedwho

What is the purpose of this app????

Developer Response

Nov 8, 2017

Thank you for your feedback. This is an initial version of our idea for an Augmented Reality integration with GeoGebra. This app will be developed in the future to make it more dynamic, and interactive.

特色：

- Mixed Reality (MR)
@Microsoft Store
- <https://www.geogebra.org/3Dprinting>



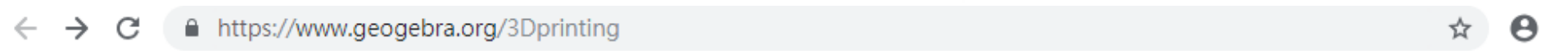
GeoGebra Mixed Reality

Internationales GeoGebra Institut "IGI"

[Education](#) > [Study aids](#)

♥ 追蹤清單

Place math models in virtual reality world and walk around them. Millions of people around the world use GeoGebra to learn mathematics and science. Join us!



GeoGebra

3D Printing with GeoGebra

Print Your Own Shapes

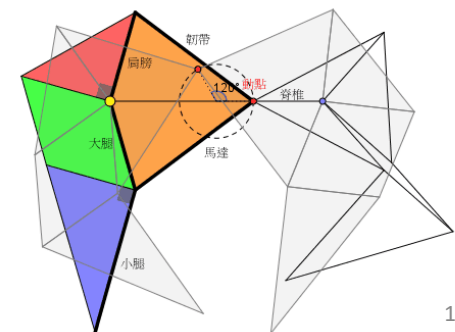
Samples

Technical Notes

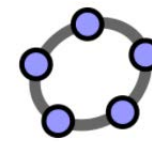
3D Printing with GeoGebra

作者: [Diego Lieban](#)

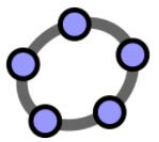
Create your own 3D shapes with GeoGebra and a 3D printer. In this tutorial you will learn how easy it is to export 3D constructions from our [GeoGebra 3D Graphing app](#) to the STL file format which can be printed directly on any 3D printer.



下載與安裝

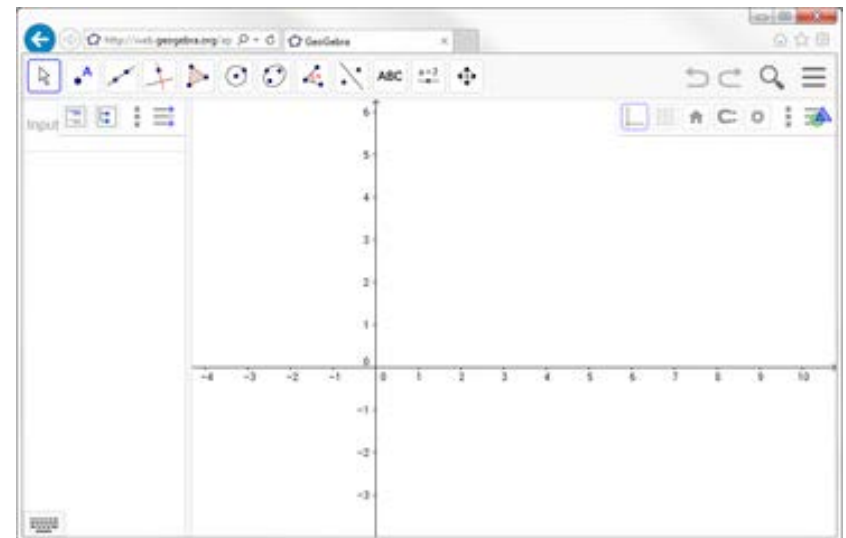
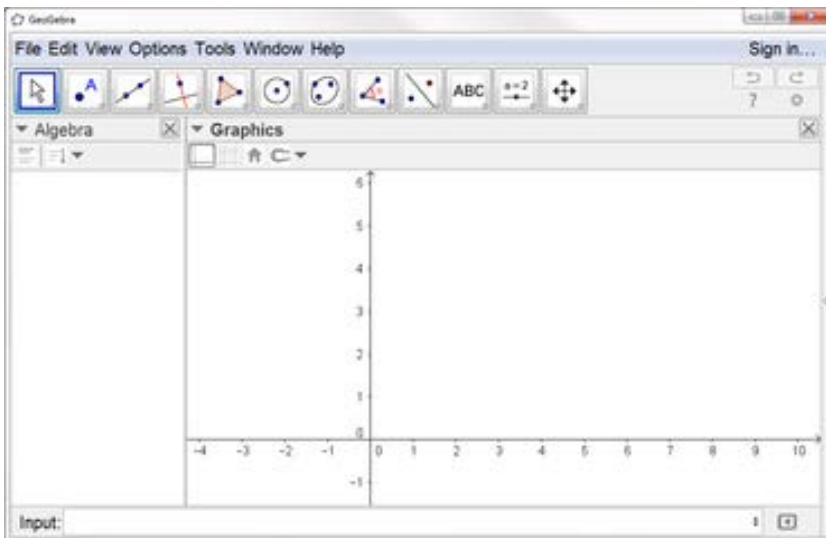
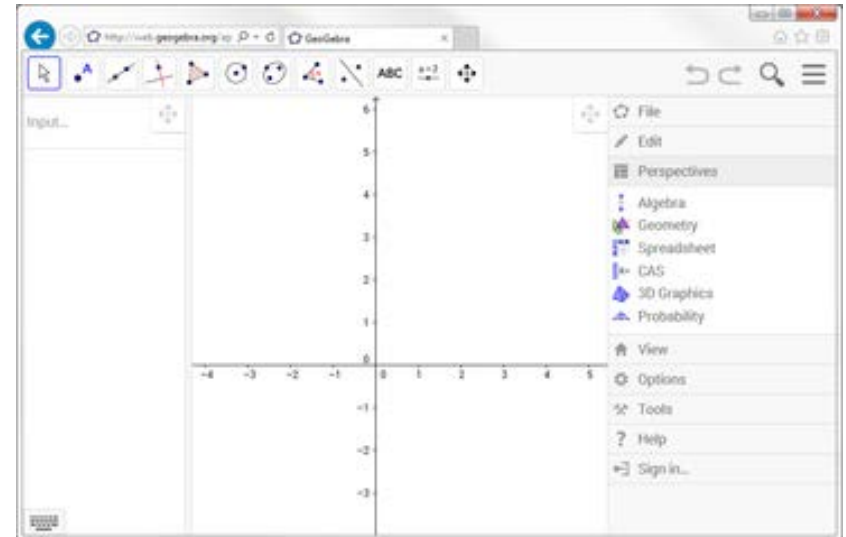
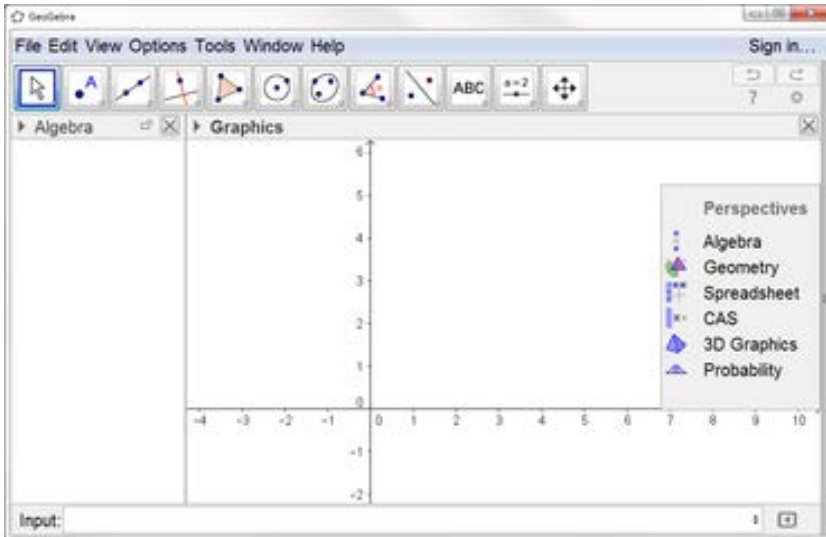


GeoGebra 經典 6



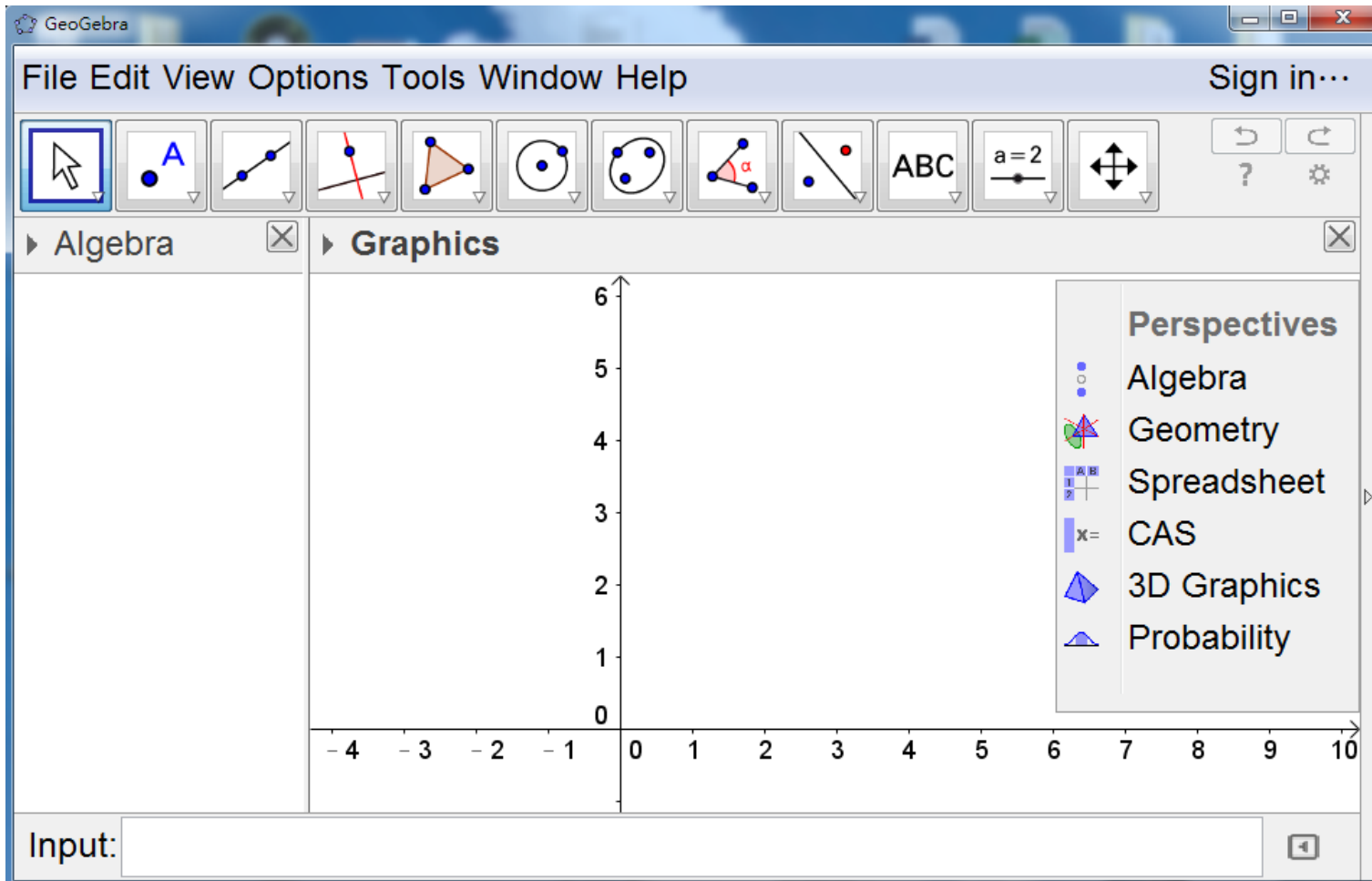
GeoGebra 經典 5

- GeoGebra Desktop 桌機版 vs. Web and Tablet App 線上版或平板版



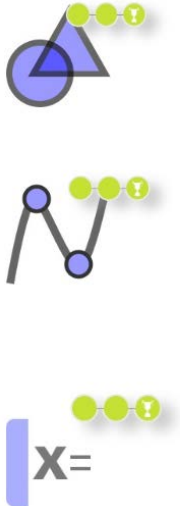
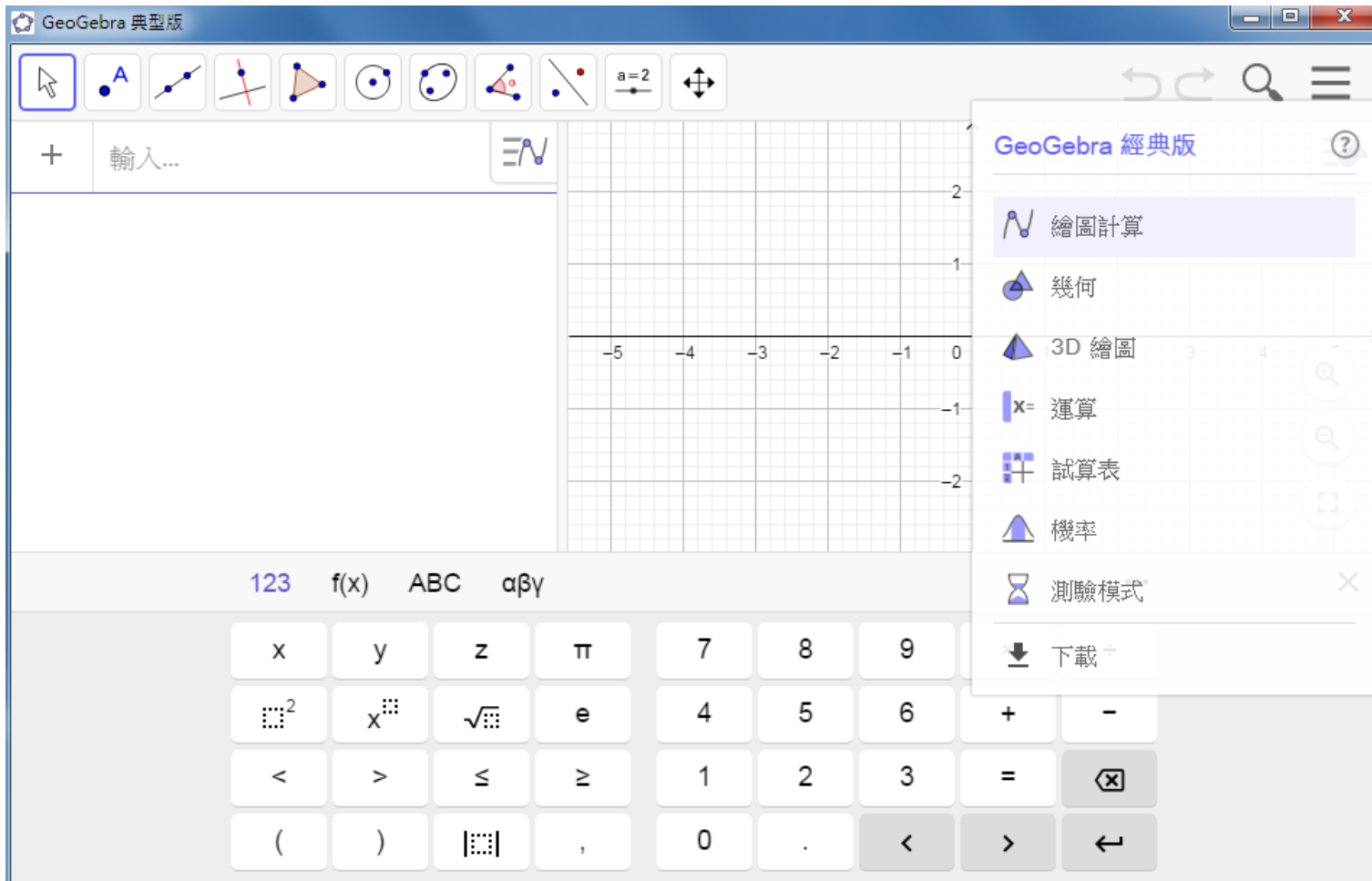
選擇 GeoGebra Classic 5 或 6 ？

- 您可以根據硬件設備與個人偏好，來選擇使用桌機版、線上版或平板版，兩者在介面的設計上，只有少許的差異。










選擇 GeoGebra Classic 5 或 6 ?

- 您可以根據硬件設備與個人偏好，來選擇使用桌機版、線上版或平板版，兩者在介面的設計上，只有少許的差異。



Comparison of GeoGebra Math Apps

apps / features	 Scientific	 Graphing	 Geometry	 Suite	 3D	 CAS	 Classic
Numeric calculations	✓	✓	✓	✓	✓	✓	✓
Function operations	✓	✓	✓	✓	✓	✓	✓
Fraction operations	✓	✓	✓	✓	✓	✓	✓
Graphing		✓	✓	✓	✓	✓	✓
Sliders		✓	✓	✓	✓	✓	✓
Vectors and matrices		✓	✓	✓	✓	✓	✓
Table of values		✓		✓		✓	✓
Geometric constructions			✓	✓	✓		✓
3D graphing				✓*	✓		✓
Symbolic calculations				✓*	✓	✓	✓
Derivatives & integrals				✓	✓	✓	✓
Equation solving				✓	✓	✓	✓

*coming soon

GeoGebra: Books

- Mathematical Modeling: Applications with GeoGebra
 - Hall, J., Lingefjärd T. (2016). *Mathematical Modeling: Applications with GeoGebra*. New York: Wiley. [568 pages]
- GeoGebra - 幾何與代數的美麗邂逅
 - 羅驥韡（2013）。《GeoGebra 幾何與代數的美麗邂逅》。臺北市：五南。

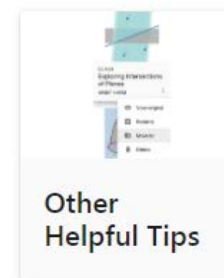
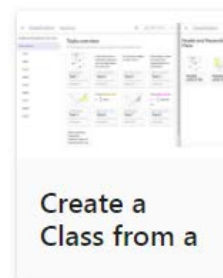
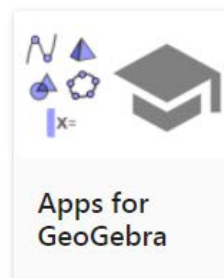
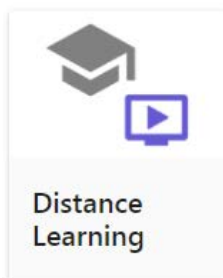
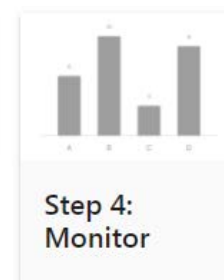
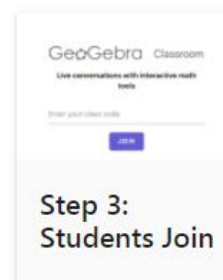
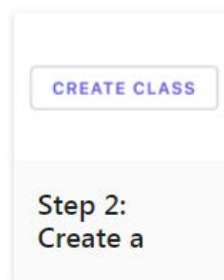
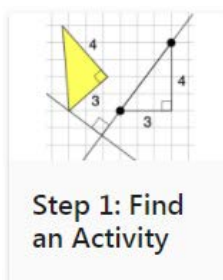
GeoGebra Classroom

GeoGebra Classroom is a virtual platform through which teachers can

- assign **interactive** and engaging tasks for students
- view **live updated progress** of students working on a specific task
- view which tasks students have (or have not) started
- ask the entire class questions and see **all student answers instantly**
- hide student names when displaying student responses to questions
- facilitate rich, interactive discussions among all students, groups of students, and individual students

<https://www.geogebra.org/u/curriculumteam>

<https://www.geogebra.org/m/hncrgruu>



Tools for interactive and engaging instruction

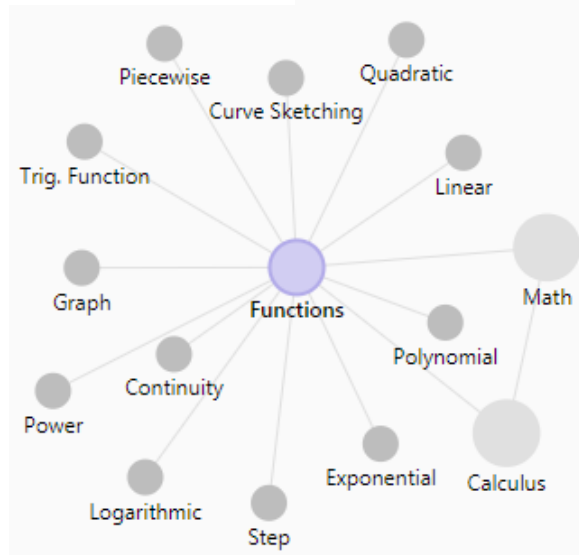
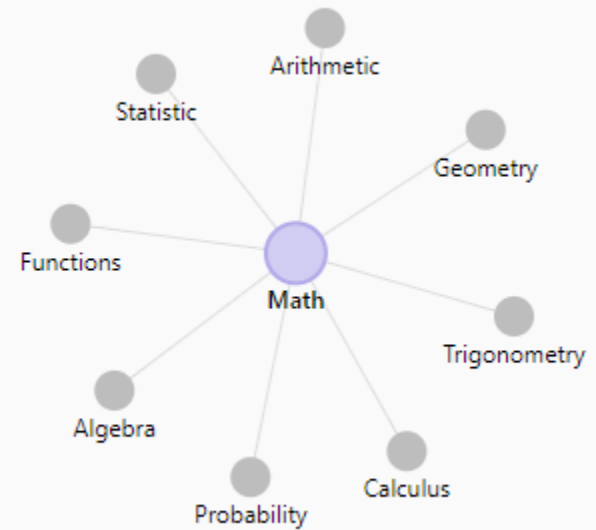
- Monitor progress in real time using GGB Classroom
- Create GGB class
<<https://youtu.be/zs0RnPB9vKI>>
- Use with Google Classroom
- <https://youtu.be/oapG6yIfaqc>
- Virtual Whiteboards for GeoGebra Classroom
- <https://youtu.be/jGFyXc1qRGw>
- Learn Notes
<<https://www.geogebra.org/m/fp7bctpr>>

GeoGebra Classroom Features

- Add a Co-Teacher: <<https://youtu.be/eilzS-xXVOE>>
- New Class Overview Page: can view all work completed by any one student!
- GeoGebra Classroom Features
- https://youtu.be/2RY9_U4Aea0
- Learn GeoGebra Classroom
<<https://www.geogebra.org/m/hncrgruu>>
- <https://youtu.be/Yoo2qhQ1FAw>

GeoGebra: Resources

- Find over 1 million free activities, simulations, exercises, lessons, and games for math & science!
 - <https://www.geogebra.org/materials>
 - <https://www.geogebra.org/t/math>
 - <https://www.geogebra.org/m/bgmn44x5>
- Tutorials:
 - <https://wiki.geogebra.org/en/Tutorials>
 - <https://www.geogebra.org/a/14>



GeoGebra: Resources

- GeoGebra Institutes

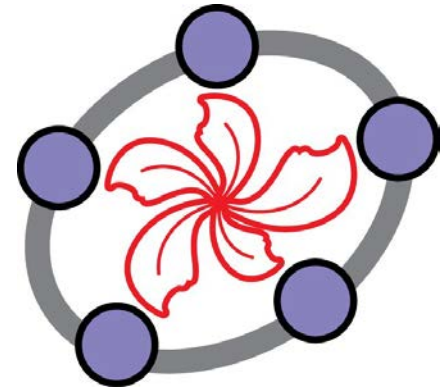
- <https://www.geogebra.org/institutes>

- GeoGebra Institute of Hong Kong (GIHK)

- <http://www.geogebra.org.hk>

- Applets in Tablets: GeoGebra 數學電子教室

- <https://www.gmath.hk/>
- <http://www.geogebra.hk/>
- <http://www.geogebra.hk/reference>
- (Learning GeoGebra from Examples)
<https://www.geogebra.org/m/FZFjhBaa>
- (Graph Plotter 2018)
<https://www.geogebra.org/m/wQtHUaaa>



下載與安裝 GeoGebra

下載與安裝 GeoGebra

- 下載網址：<https://www.geogebra.org/download>
- 選擇平台：Windows, Mac, Chrome OS, Linux 等。
- 下載安裝程式後直接執行。



Windows



Mac



Chrome OS



Linux

Download GeoGebra Apps

Free offline GeoGebra apps for iOS, Android, Windows, Mac, Chromebook and Linux



Graphing Calculator

Graph functions, investigate equations, and plot data with our free graphing app

DOWNLOAD

START



3D Calculator

Graph 3D functions, plot surfaces and do 3D geometry with our free 3D Grapher

DOWNLOAD

START



Geometry

Construct circles, angles, transformations and more with our free geometry tool

DOWNLOAD

START



GeoGebra Classic 6

Apps bundle including free tools for geometry, spreadsheet, probability, and CAS

DOWNLOAD

START



CAS Calculator

Solve equations, expand and factor expressions, find derivatives and integrals

DOWNLOAD

START



GeoGebra Classic 5

Apps bundle including free tools for geometry, spreadsheet, probability, and CAS

DOWNLOAD

下載與安裝

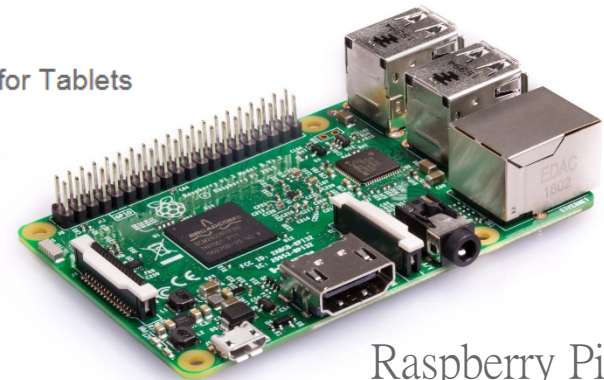
- https://wiki.geogebra.org/en/Reference:GeoGebra_Installation
- 其他選擇：平板電腦 Apps / 攜帶版 / ...

Contents [\[hide\]](#)

- [1 GeoGebra Installation](#)
- [2 GeoGebra Graphing Calculator](#)
- [3 GeoGebra Geometry](#)
- [4 GeoGebra 3D Graphing Calculator](#)
- [5 GeoGebra Augmented Reality](#)
- [6 GeoGebra Classic 6](#)
 - [6.1 Windows](#)
 - [6.2 Mac](#)
 - [6.3 Other GeoGebra Classic 6 versions](#)
- [7 GeoGebra in Exams](#)
 - [7.1 Exam Stick](#)
- [8 GeoGebra Classic 5 for Desktop](#)
- [9 Supported devices and Troubleshooting](#)



GeoGebra for Tablets



Raspberry Pi 3

GeoGebra Installation

- **Installation**
- [Mass Installation](#)
- [FAQ](#)

攜帶版可在電腦上直接執行而無需安裝，方便在一些未裝有 GeoGebra 的電腦上使用。

使用 GeoGebra 的技巧

- 網上說明

- <http://wiki.geogebra.org>

- 使用手冊

- 英文：<http://www.geogebra.org/book/intro-en.pdf>
- 中文：http://www.geogebra.org/help/docuzh_TW.pdf

- GeoGebra's YouTube Channel

- <https://www.youtube.com/user/GeoGebraChannel>

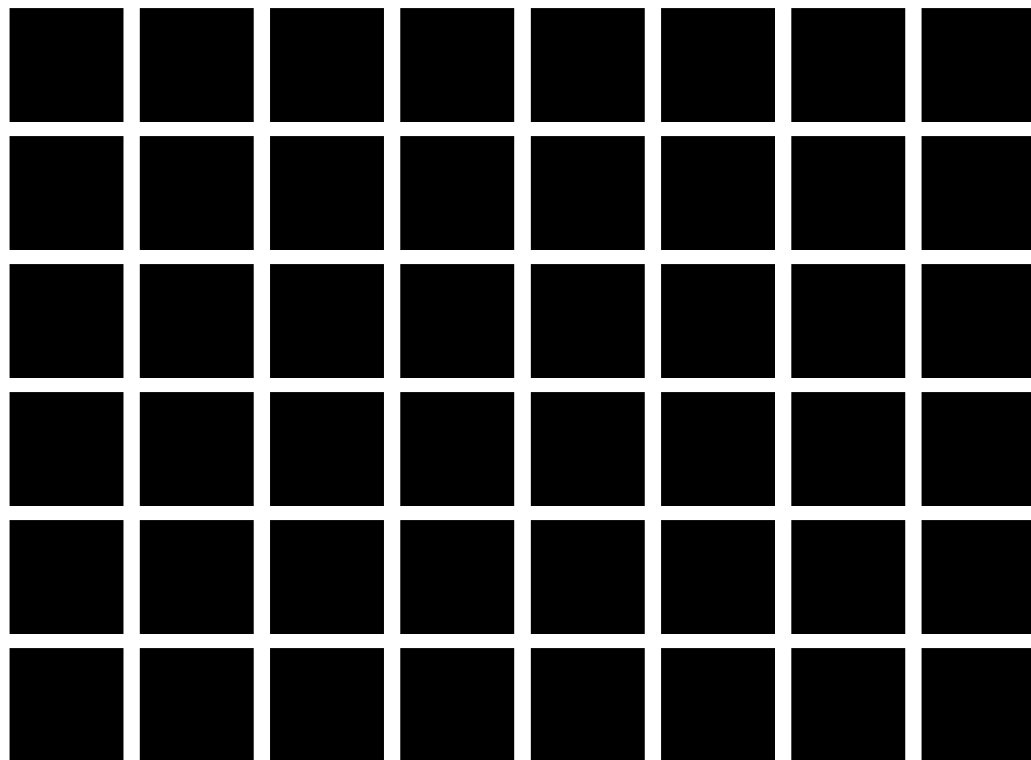
- 其他有用文件

- http://www.geogebra.org/help/geogebraquickstart_en.pdf
- http://school-maths.com/documents/GeoGebra_4.2_nutshell_stols.pdf
- <https://wiki.geogebra.org/zh/手冊>

Thanks!

<https://www.geogebra.org/u/cdoma7>

- Thank you for listening. 多謝聆聽！

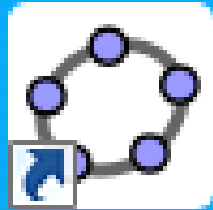


Hermann Grid 赫曼方格

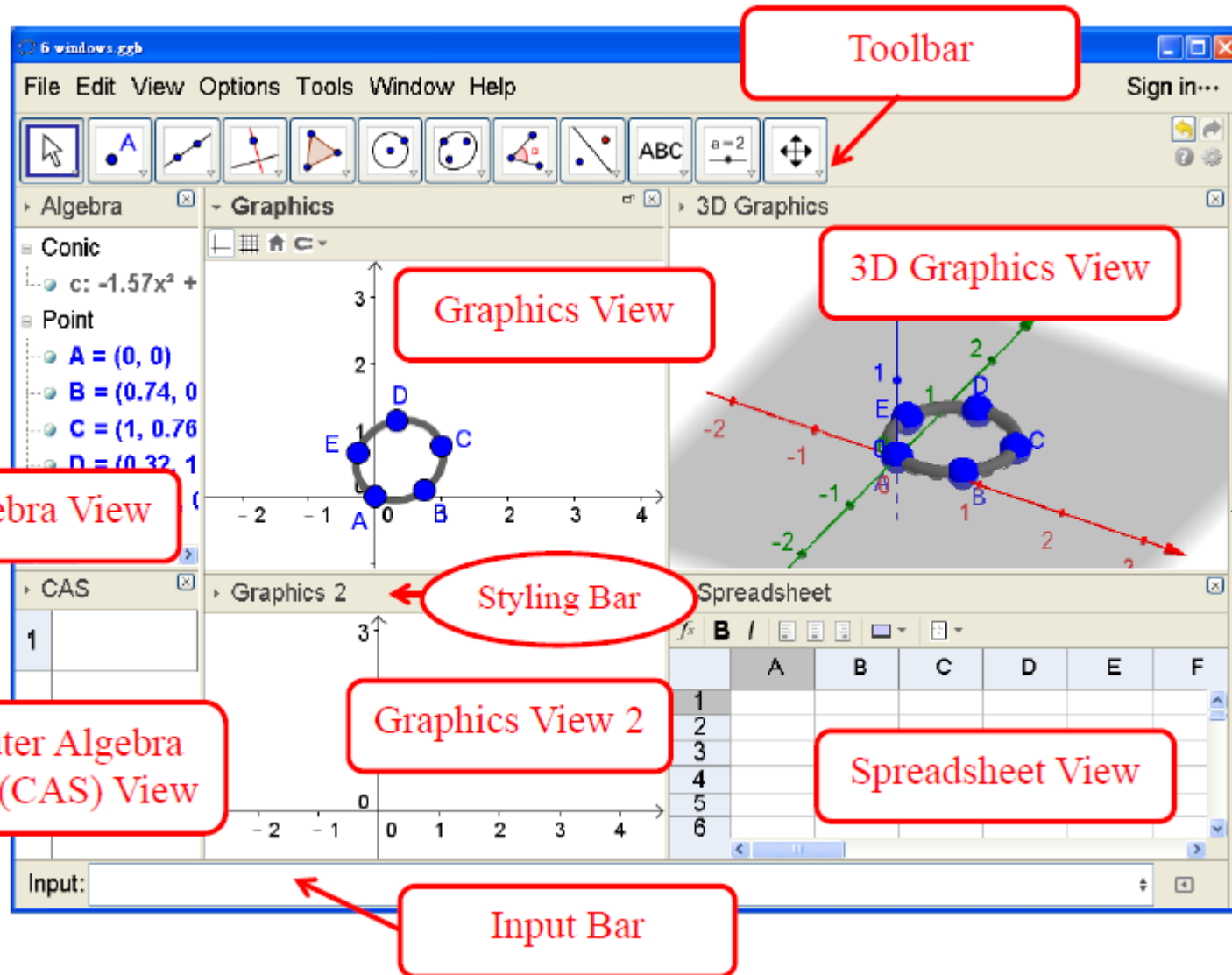


Mr. Hui SL

使用 GeoGebra 的技巧



GeoGebra



使用 GeoGebra 的技巧

- GeoGebra 的三個基本視區：

1. 繪圖區

- 亦稱為幾何視區。
- 可以藉由工具列中所提供的構圖工具，在繪圖區內進行幾何構圖。用滑鼠移動繪圖區的物件時，代數區的代數表徵也會同時動態地更新。

2. 代數區

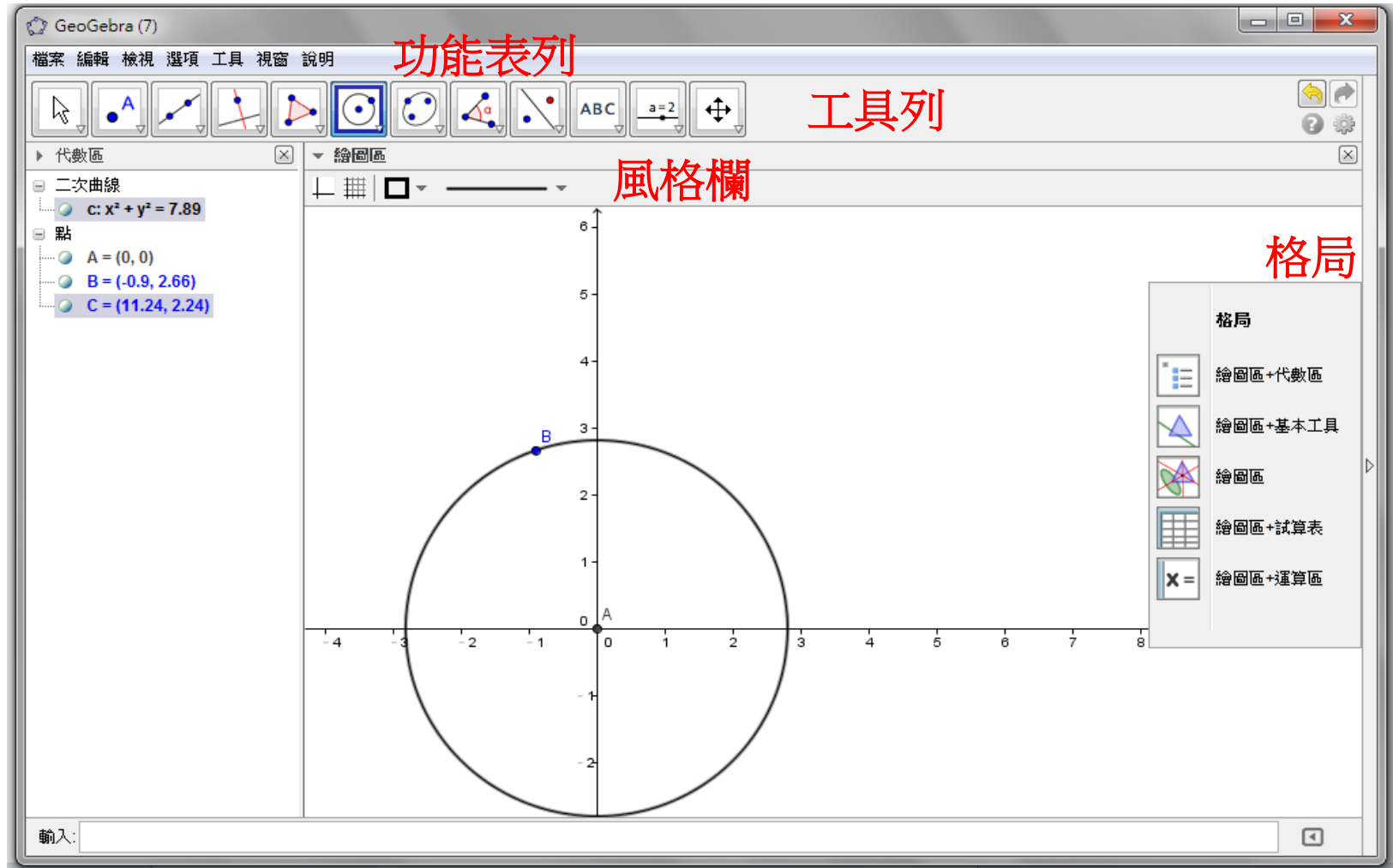
- 可以在『指令列』中直接輸入代數表示式，在按下 Enter 鍵後，所輸入的代數表示式會在代數區出現，同時亦會在繪圖區出現圖形表徵。

3. 試算表區

- 在試算表表格中，可以輸入數值和 GeoGebra 所支援的數學物件（例：點座標、函數、指令）。在試算表中所輸入的數學物件，其圖形表徵亦會顯示於繪圖區。

使用 GeoGebra 的技巧

- 用戶介面



使用 GeoGebra 的技巧

格局 (Perspectives)

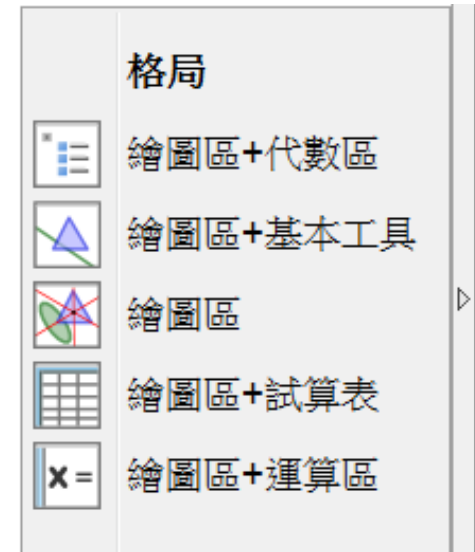
- GeoGebra 提供了五種常用的格局讓使用者選擇。
- 預設為『繪圖區+代數區』格局。
- 點選視窗最右邊的小三角，可快速更換格局。

開新視窗

- 功能表列 > 『檔案』 > 『開新視窗』

儲存檔案

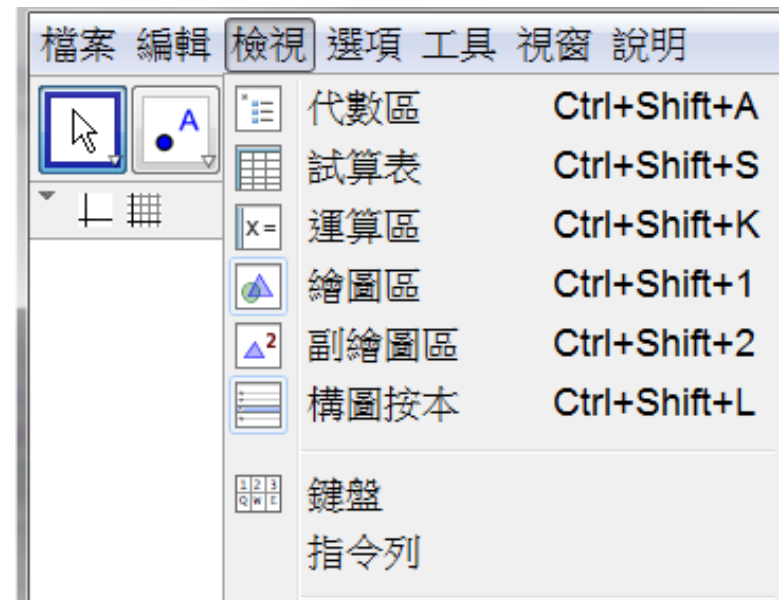
- 功能表列 > 『檔案』 > 『儲存』
- GeoGebra 的檔案格式為 .ggb



使用 GeoGebra 的技巧

自訂使用者介面

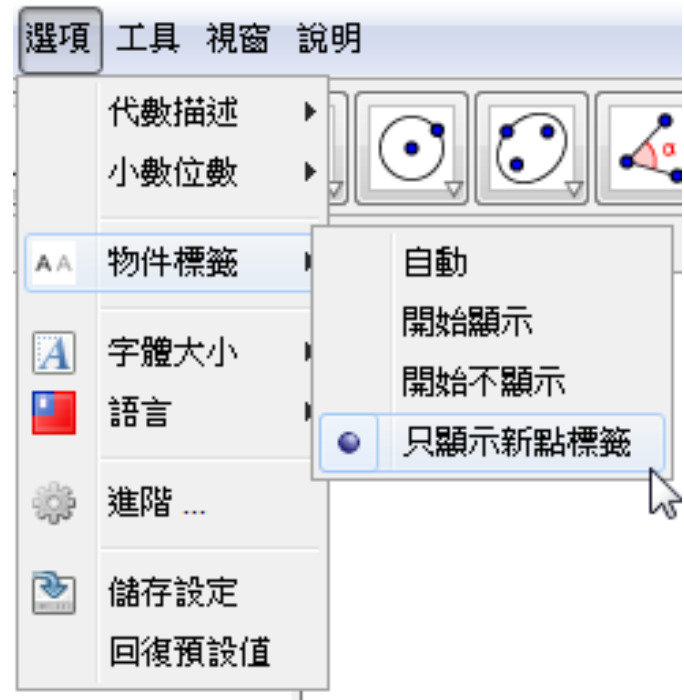
- 使用者亦可透過『檢視』選單來顯示或隱藏各視區和『指令列』。



使用 GeoGebra 的技巧

選擇用戶介面的『物件標籤』

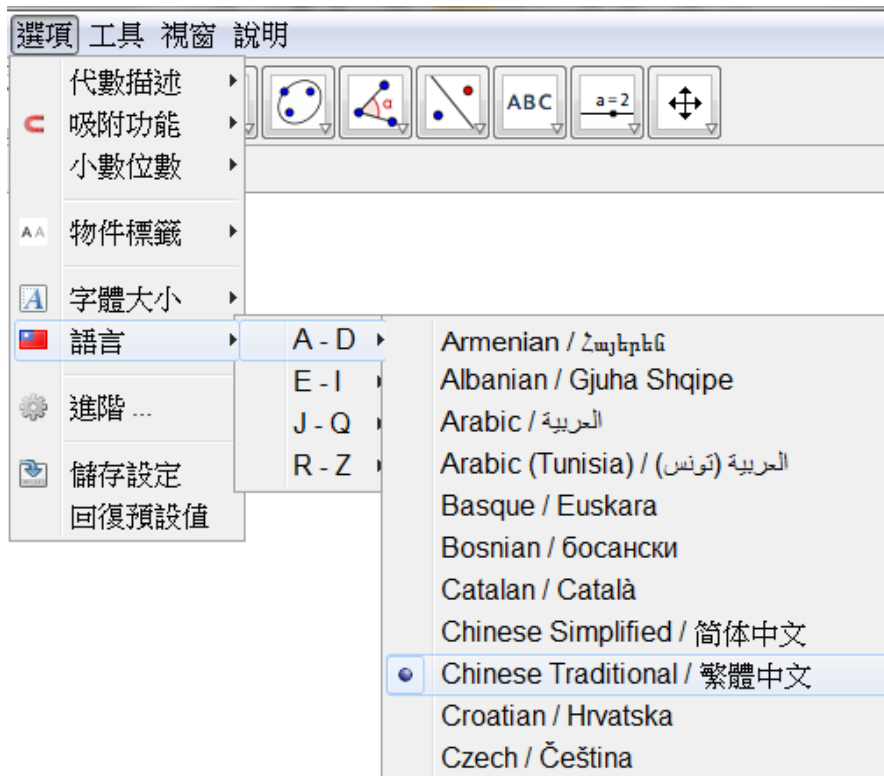
- 選項 > 物件標籤
 - 只顯示新點標籤



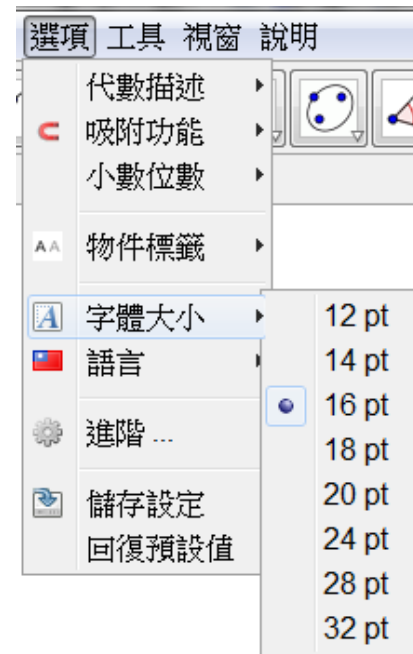
使用 GeoGebra 的技巧

選擇用戶介面的『語言』及『字體大小』

- 選項 > 語言

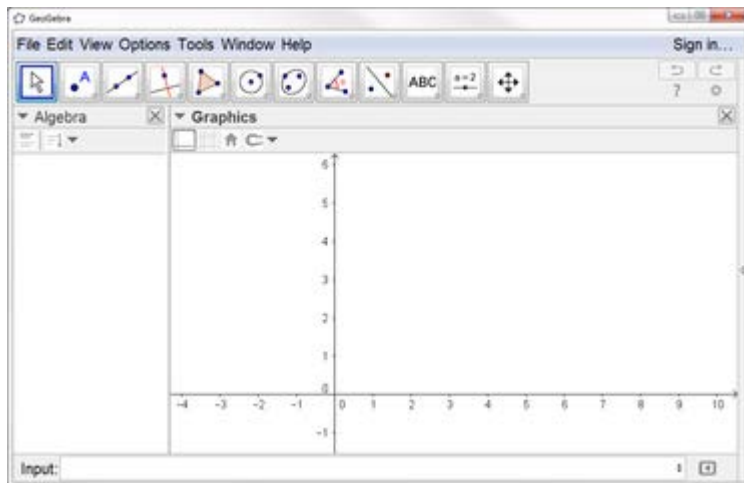
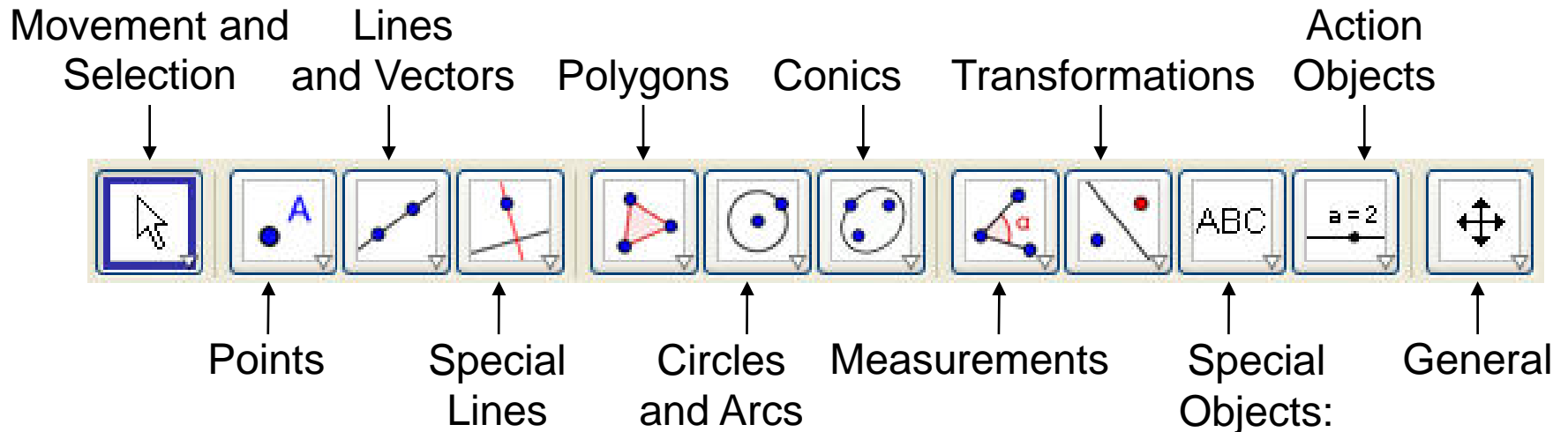


- 選項 > 字體大小



使用 GeoGebra 的技巧

- 工具列 Toolbar



Text, Image,
Probability
Calculator,
Function
Inspector

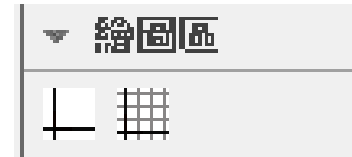
使用 GeoGebra 的技巧

顯示或隱藏繪圖區中的座標軸或格線

- 透過繪圖區的**風格欄 (StyleBar)**，或在繪圖區中按滑鼠右鍵功能表，可顯示或隱藏繪圖區中的座標軸或格線

改變座標軸比例

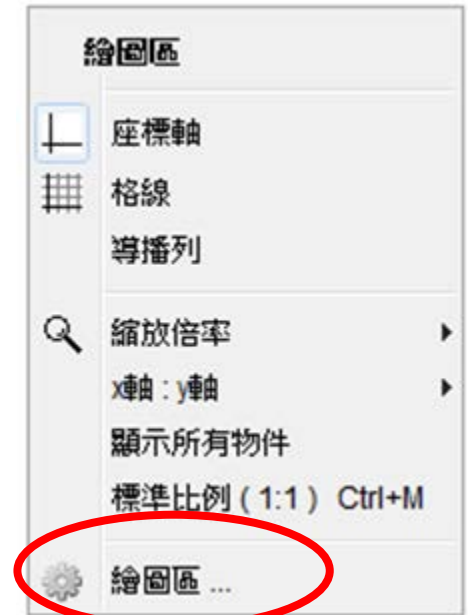
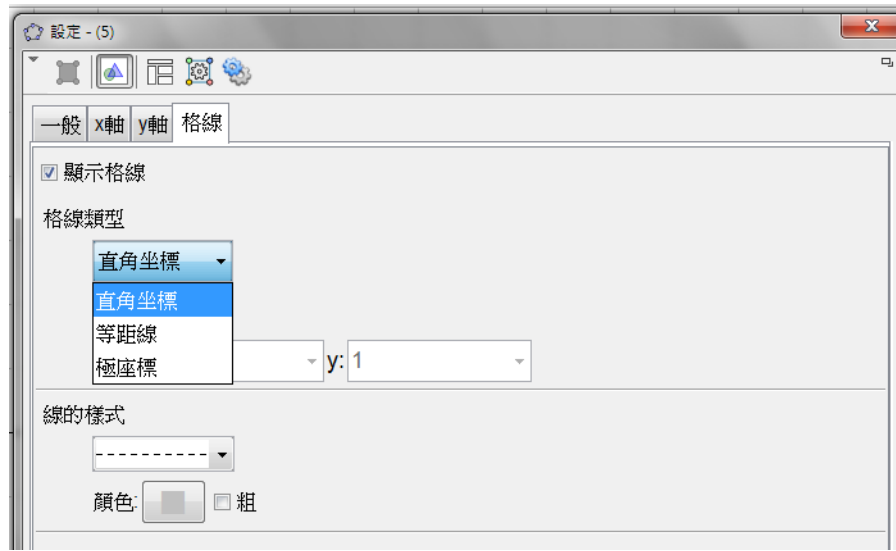
- 在繪圖區中按滑鼠右鍵功能表，選擇 x 軸： y 軸。



使用 GeoGebra 的技巧

其他『繪圖區』的設定

- 在繪圖區中按滑鼠右鍵功能表，點選『繪圖區』。
- 可設定座標軸/格線顏色、 x/y 軸間距、直角/等距/極座標等。



使用 GeoGebra 的技巧

放大或縮小繪圖區、移動繪圖區

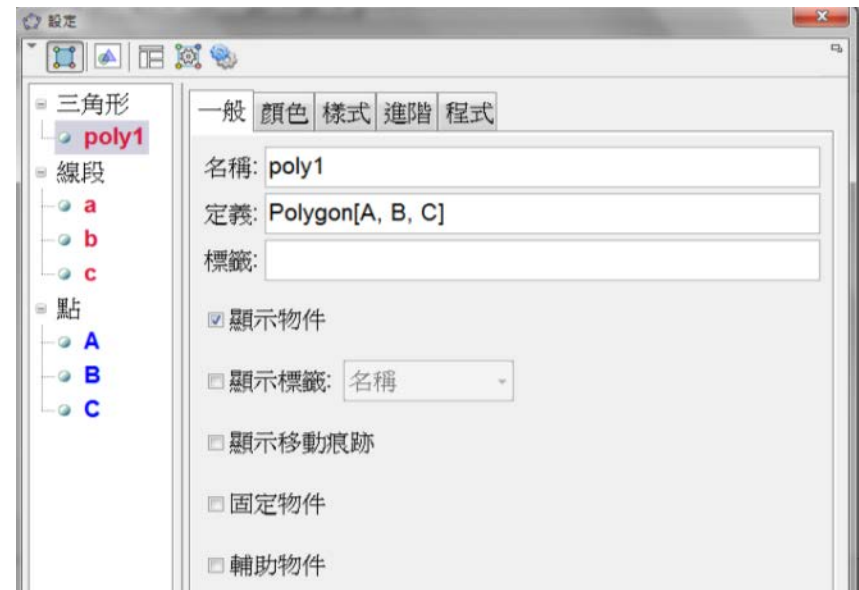
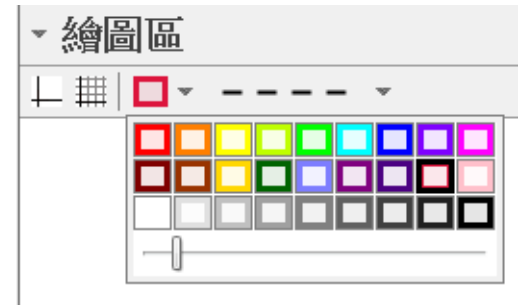
- 透過工具列按鈕，可放大或縮小繪圖區、移動繪圖區。



使用 GeoGebra 的技巧


改變幾何物件屬性

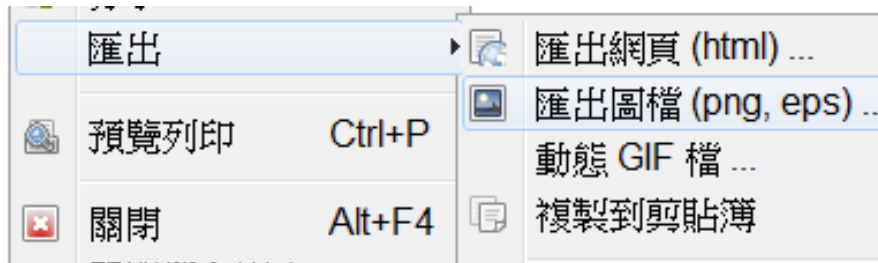
- 於繪圖區內上點選幾何物件，可透過**風格欄**（**StyleBar**）更改幾何物件的基本屬性。
- 點選幾何物件，按**滑鼠右鍵**並選擇屬性。可改變幾何物件的屬性，包括：名稱、顏色、樣式顯示/隱藏物件等。



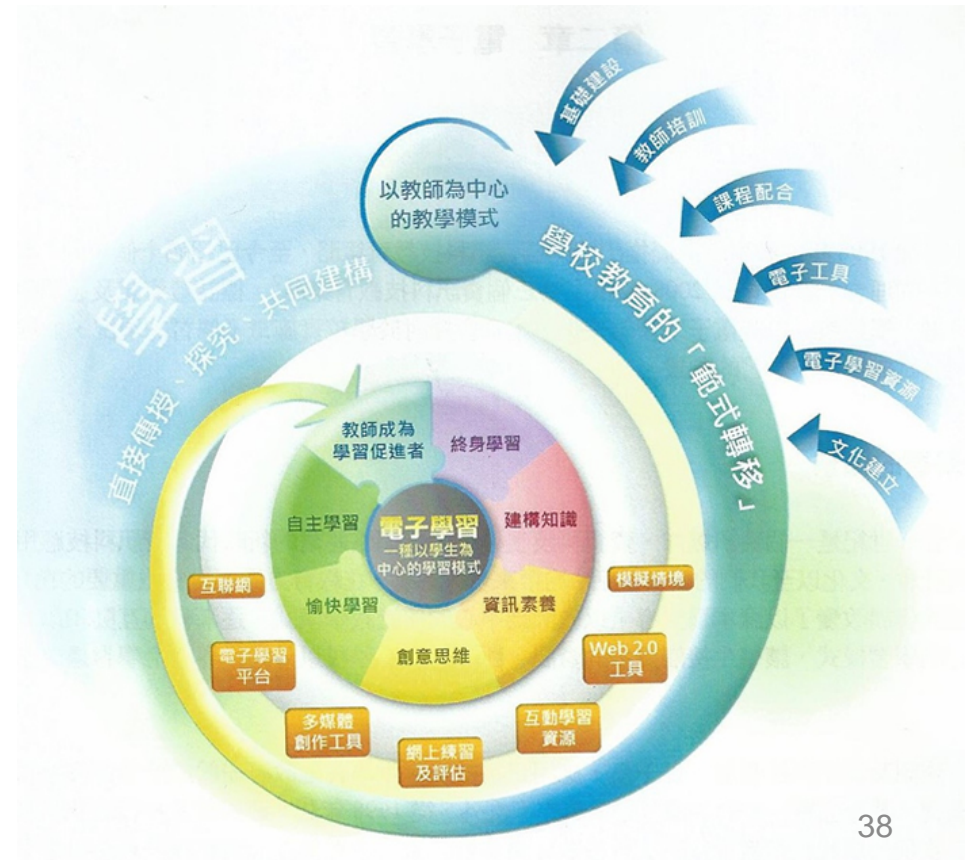
使用 GeoGebra 的技巧

匯出圖形至Word文件

- 可將檢視中的 整個繪圖區或選取  中的圖形，匯出至剪貼簿，再貼上Word文件。
- 『檔案』 > 『匯出』 > 『匯出圖檔』。



To conclude



Technology = TOOL

Right technology at the Right time for the Right task

