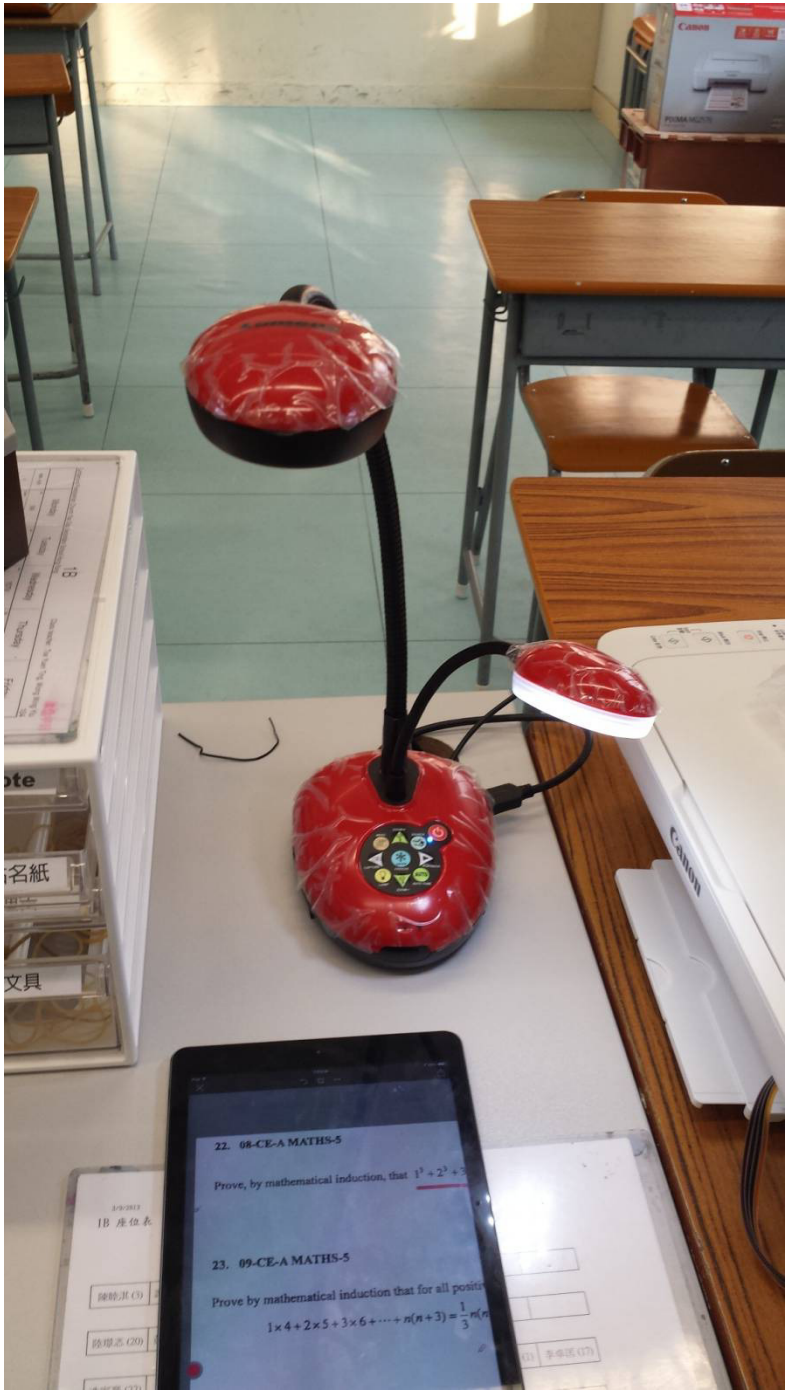
Use of ICT/ teaching aids in mathematics education

Use of ICT/ (virtual) teaching aids in mathematics education

- A brief introduction

IT in classroom


22. 08-CE-A MATHS-5
Prove, by mathematical induction, that
23. 09-CE-A MATHS-5
Prove by mathematical induction that for all positi
$1\times4+2\times5+3\times6+\cdots+n(n+3)=\frac{1}{3}n($
Canon


22. 08-CE-A MATHS-5
Prove, by mathematical induction, that
23. 09-CE-A MATHS-5
Prove by mathematical induction that for all
曾玉儀 (28)
VISUALIZER
APPLE TV

Why ICT?

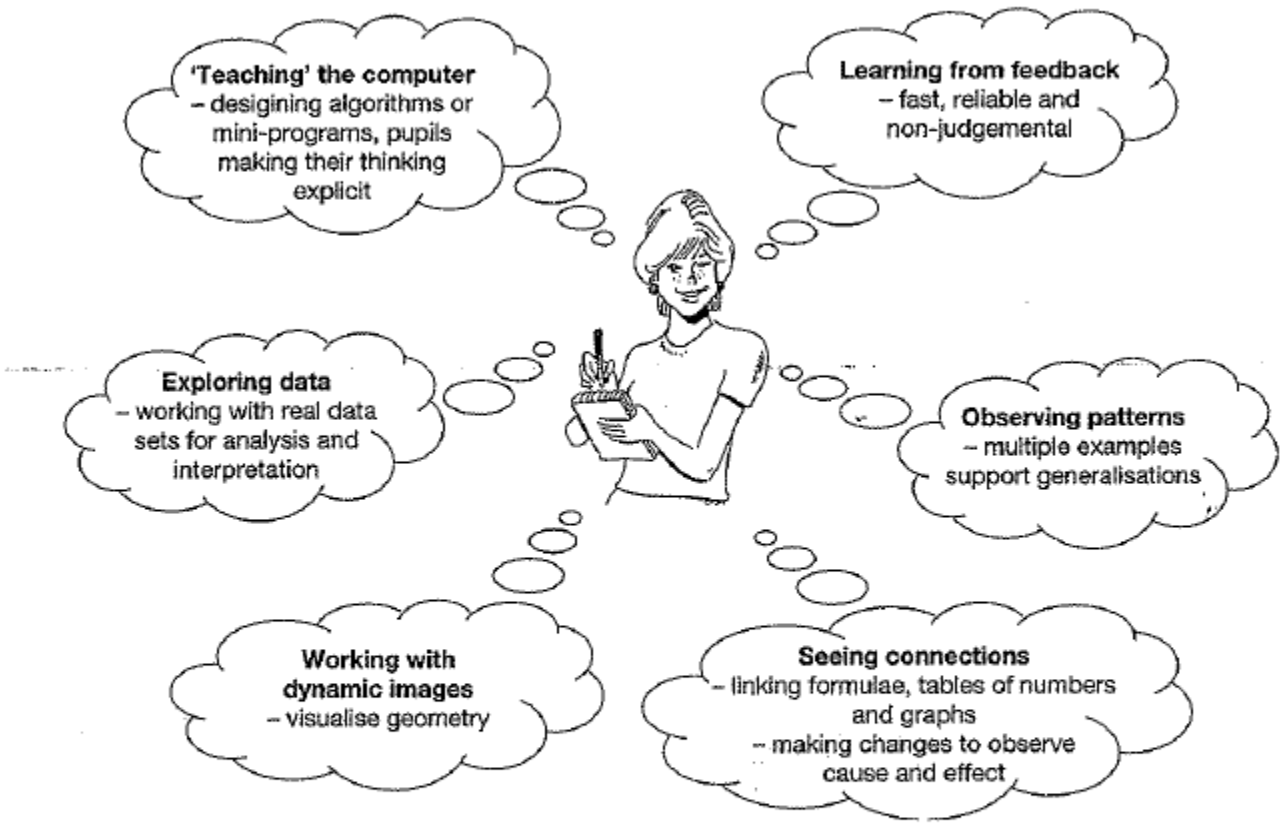


Figure 8.1 The role of ICT in enhancing the learning of mathematics

Source: Cowan, P. (2006). Teaching Mathematics : a handbook for Primary and Secondary Teachers. London : Routledge.

Identification of the needs to use ICT

1. Does the use of ICT support good practice in teaching the subject?
2. Is the use of ICT directly related to the teaching and learning objectives present in the lesson plan/scheme of work?
3. By using ICT, will you or your pupils achieve something that could not otherwise be achieved? Or will using ICT allow you to teach or the pupils to learn something more effectively or efficiently than could otherwise be achieved?

(Cowan, 2006, p.100)

PGDE
SCT-Math

Using dynamic geometry software (GeoGebra) to enhance mathematics learning and teaching

What is dynamic geometry software (DGS)?

‘Dynamic’, in its own literal interpretation, means the power that produces movements. When it is applied to describe an interactive geometry software, it symbolizes the capacity of the software to create interactive geometric figures. The literal meaning of “dynamic” can be interpreted as geometric figures being produced and animated on the screen. It also illustrates the change of the graphics when one of the components is altered and the capacity to carry out measurements at a fast speed. Popular dynamic geometry software available in the market include Cabri Geometry II and Geometer’s Sketchpad.

(Education Department, 2001, p.3)

動態幾何軟件
(Dynamic Geometry Software)

- 「動態」(Dynamic)一詞的意思是指一種能產生活動的動力。當這個名詞應用在互動幾何軟件上時，它象徵軟件能夠創造互動圖形的能力。「動態」亦可理解為數學圖像的產生和動感。它能顯示當圖形的其中一個組件轉變時，圖形的其他部分亦隨著改變，而量度的計算亦在瞬息間完成。在市面較為流行的動態幾何軟件有*Cabri Geometry II*及*Geometer's Sketchpad*。

香港教育署數學組（2001）。《中一至中五數學科教學資源套（一）：運用資訊科技》。香港：教育署。

Dynamic geometry software
動態幾何軟件

- Sketchpad (http://www.keypress.com/sketchpad)
- Cabri (http://www.cabri.com/)
- C.a.R. (http://www.z-u-l.de)
- Cinderella (http://www.cinderella.de/)
- Geogebra (http://www.geogebra.org)


GeoGebra
4

GeoGebra Institute of Hong Kong
香港GeoGebra學院

- http://www.geogebra.org.hk/
- https://www.facebook.com/hkggb/

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www.geogebra.org.hk

- http://www.geogebra.org/webstart
- http://www.geogebra.org/book/intro-en.pdf
- http://www.geogebra.org/book/intro-en.zip

- Options → Language
- 選項 →語言

Ladybug walks the width (By: Linda Fahlberg-Stojanovska)

- Screencast Demo:

http://www.mathcasts.org/gg/student/measure/len0/ladybug/index.html

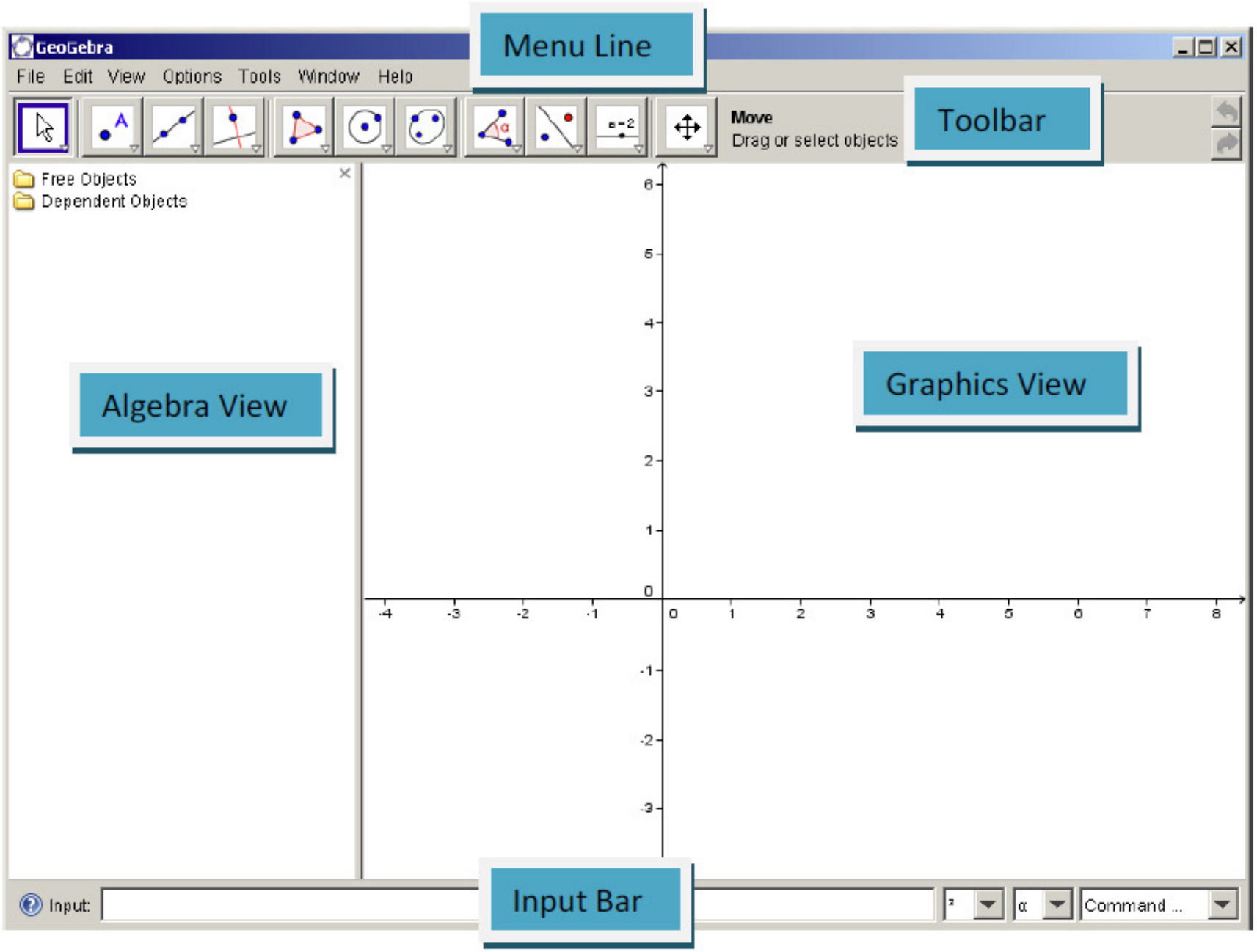
Link:

- http://www.mathcasts.org/gg/student/measure/len0/index.html

- http://120.101.70.8/longlife/GeoGebra/index.htm
- http://www.geogebratube.org

Reference book

- Hohenwarter, M. et al (Nov 2013). *Introduction to GeoGebra Version 4.4.* Austria: International GeoGebra Institute. (http://www.geogebra.org)


GeoGebra
File Edit View Options Tools Window Help
Move
Drag or select objects
Free Objects
Dependent Objects
Input:
Command ...
Menu Line
Toolbar
Algebra View
Graphics View
Input Bar

認識Geogebra介面及基本按鍵

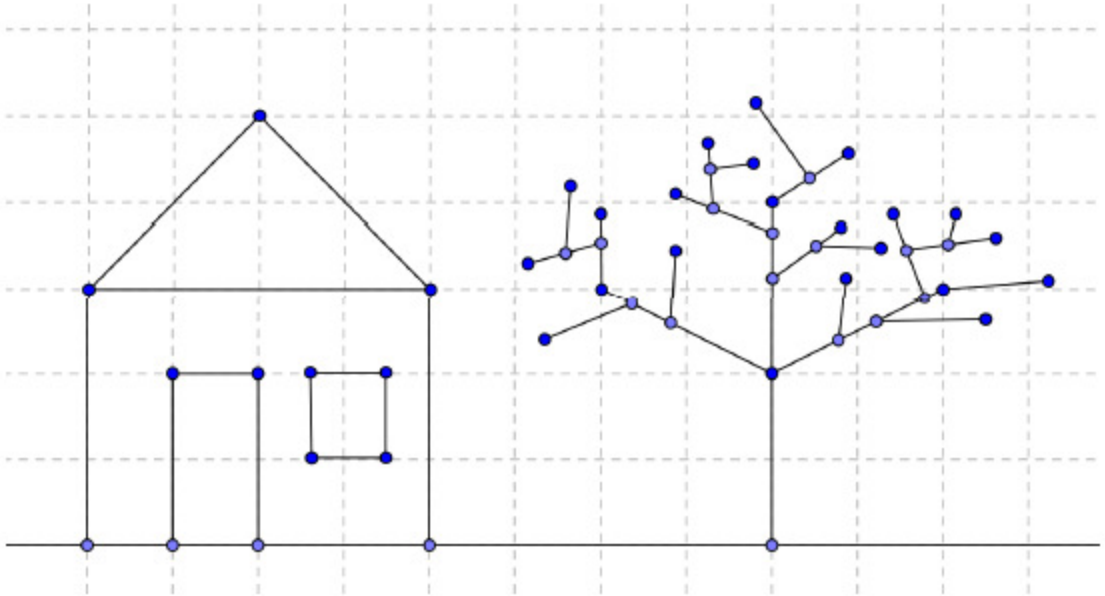
	New point	New!
	Move	New!
	Line through two points	New!
	Segment between two points	New!
	Delete object	New!
	Undo / Redo buttons	New!
	Move drawing pad	New!
	Zoom in / Zoom out	New!

Activity 3 (p. 12)

Activity 3: Drawing Geometric Figures and Other Objects

Preparations

- Hide the *algebra window* and *coordinate axes* (*View* menu).
- Show the *coordinate grid* (*View* menu).



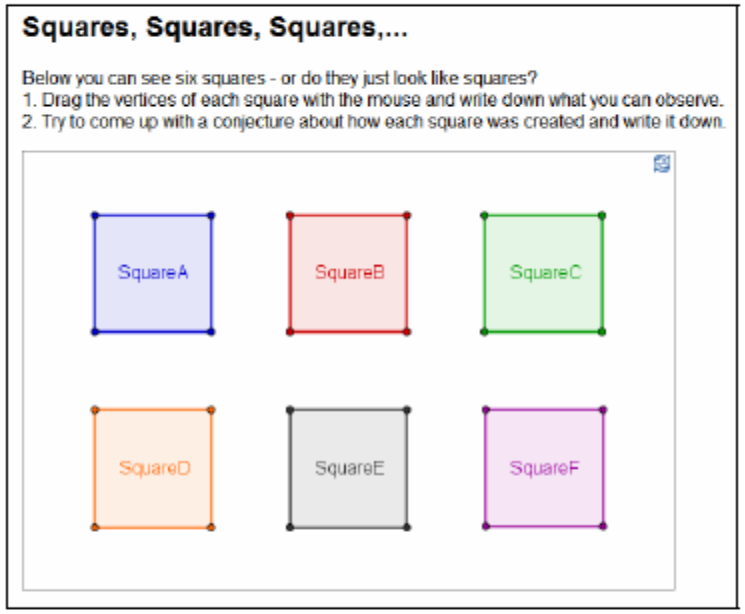
檔案儲存

- 檔案 →儲存 (Ref: p.10)
  File → Save
- 檔案 →輸出 →匯出網頁 (p.69-70)
  File → Export → Dynamic Worksheet as Webpage (html)

Activity 4 (p.13)

Activity 5: Drawings, Constructions, and Drag Test

Open the dynamic worksheet *A05_Drawing_Construction_Squares.html*.



The dynamic figure shows several squares constructed in different ways.

- Examine the squares by dragging ALL their vertices with the mouse.
- Find out which of the quadrilaterals are real squares and which ones just happen to look like squares.
- Try to come up with a conjecture about how each square was created.
- Write down your conjectures on paper.

Discussion

- What is the difference between a drawing and a construction?
- What is the “drag test” and why is it important?
- Why is it important to construct figures instead of just drawing them in interactive geometry software?
- What do we have to know about the geometric figure before we are able to construct it using dynamic mathematics software?

Basic geometric constructions

- Demonstration: rectangle (p. 14-15)
- Demonstration: equilateral triangle (p. 16-17)

Classwork

Construct the following geometric figures:

- Square (p.21)
- Parallelogram
- Isosceles triangle
- Trapezium

- 檢視 → 構圖按本

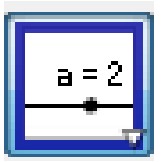
  View → Construction Protocol

Regular polygon

- Short-cut bottom
- (Please try other special line tools at home.)

構作指定邊長的正方形

- 構作一個邊長為4cm的正方形，並量度它的面積。

Slider 數值滑桿 

- (ref: p.30)
- 構作一個正方形，量度它的面積；並利用slider改變它的邊長。

Basic algebraic input, commands and functions

Export pictures

- 利用Geogerba 輔助製作(紙筆) 教材
- (Ref: p. 40-41)
- 把剛才製作的Geogebra檔案變成圖檔複製到文書處理檔(text processing document)。
- Move graphics view /Zoom in, Zoom out
  移動繪圖區 /放大,縮小 
- File → Export → Graphics View to Clipboard
  檔案 →輸出 →複製到剪貼簿

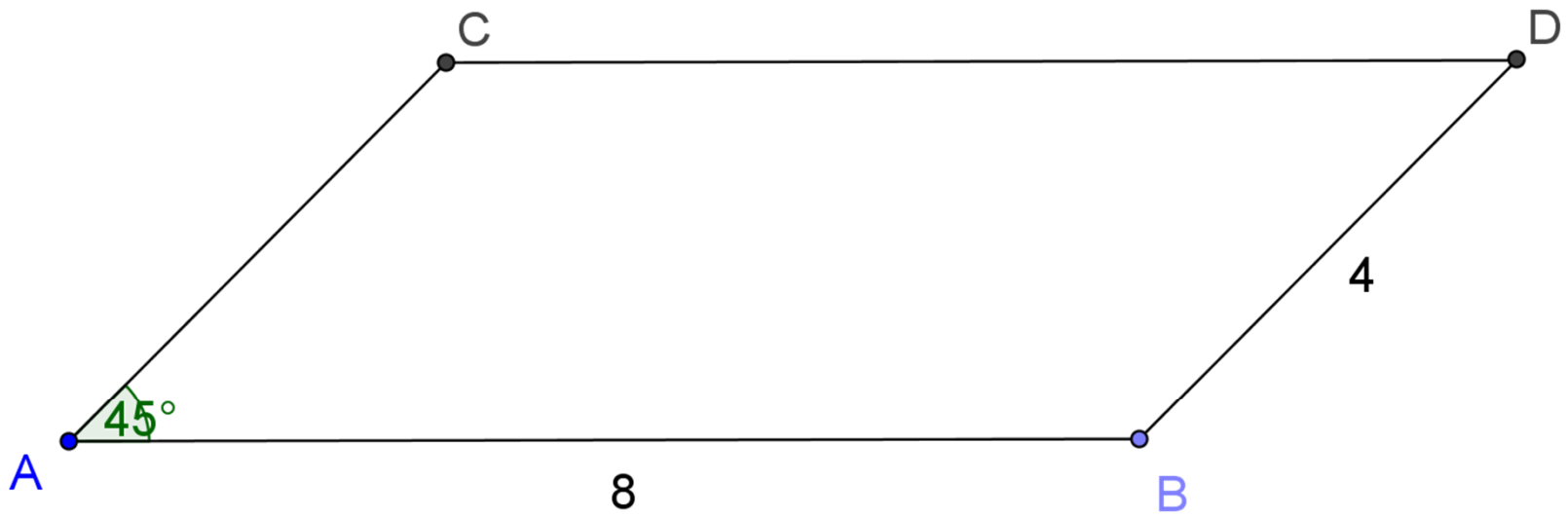
Saving pictures as files

- Move graphics view  /Zoom in, Zoom out 

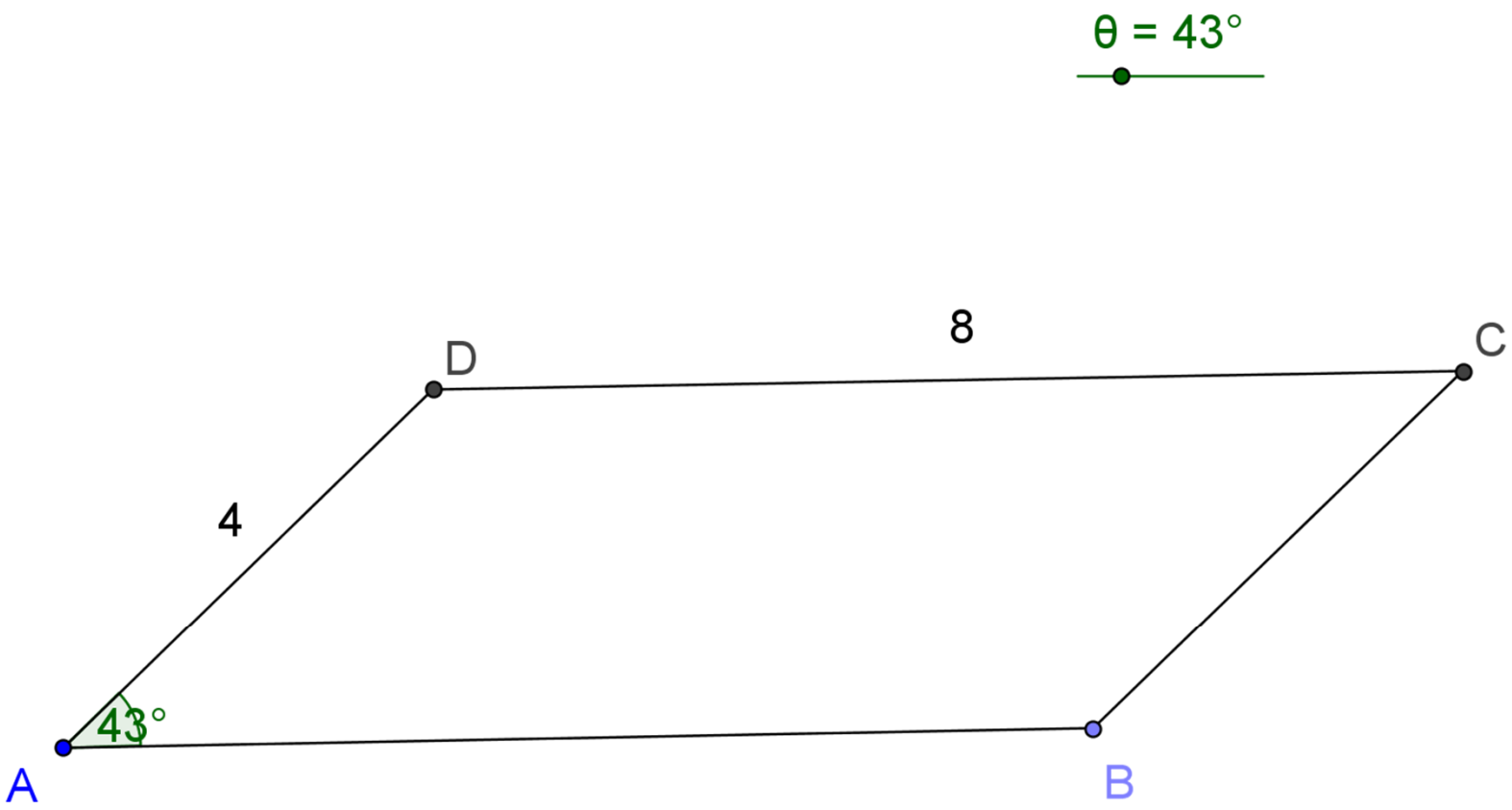
  移動繪圖區 /放大,縮小
- File → Export → Graphics View as picture

  檔案 →輸出 →匯出圖檔

試試看



試試看



Insert Pictures into Graphic Window

- Insert pictures
- Reflect反射, rotate施轉, translate平移…
- P. 48 - 56

Want to learn more…..??

Geogebra (official help)

- Geogebra Quick start

http://www.geogebra.org/help/geogebraquickstart_zh.pdf

- Introduction to Geogebra

http://www.geogebra.org/book/intro-en.pdf

- Geogebra wiki

  http://www.geogebra.org/wiki

- Geogebra online help document

  http://www.geogebra.org/help/docuen/

- Geogebra forum

  http://www.geogebra.org/forum/

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Geogebra at internet (1)

- http://140.122.140.4/~cyc/_private/geogebra/
- http://math247.pbworks.com/GeoGebra
- http://math4allages.wordpress.com/geogebra/
- http://geogebrawiki.wikispaces.com/Home
- http://www.geogebra.org/en/wiki/index.php/English

Geogebra at internet (2)

- http://www.geogebra.org/en/wiki/index.php/%E4%B8%AD%E6%96%87
- http://learn.jhsh.tpc.edu.tw/~smath/link1.html
- http://enjoy.phy.ntnu.edu.tw/course/index.php?category=3

Some samples (showcase)

- http://ggbtu.be/b312929

  Primary Math Contest
- http://www.geogebratube.org/user/profile/id/6211

  http://www.geogebra.org.hk

  GeoGebra Institute of Hong Kong
- http://www.geogebra.hk

  譚李麗芬紀念中學 QEF project

Round up of ICT sessions

Question for you to think

- 1. what is the advantage (potentiality) of using ICT in mathematics learning/teaching?
- 2. what is the disadvantage (limitation / ‘pitfall’) of using ICT in mathematics learning/teaching?

Well…..

- Everything has its potentiality and limitation!
- The point is: how YOU (as a teacher) USE it…….
- And, aware the potentiality and limitation!

- Music is not in the piano.

  - *Alan Kay* (1991, p. 138)

- 教學並不是在科技中，科技本身並不是一種教學法，但科技可以輔助各種教學。