

New ways into geometry: Ideas + readily available computer tools = powerful learning

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Our workshop demonstrates some ideas for using readily available computer software and the resources of the Internet to introduce geometry to adult learners. We present some ideas for using Wingeom (Peanut Software freeware, with dynamic geometry features) and Microsoft Word, to teach introductory aspects of geometry. We also indicate some Internet sites we have found valuable in motivating and teaching geometry. The computer tools we use require the students to create their geometry learning as they go, while simultaneously engaging the students in many aspects of the language, logic and history of geometry. Our experience is that this approach enables learners to tailor their geometry learning to their needs and interests, and makes them aware at first hand of the ever-expanding resource which computers and the Internet provide for all learning, mathematics included.

Using Word in geometry

The Drawing tool in MicroSoft Word enables many mathematical symbols and materials to be prepared. For example simple fraction diagrams are easily created. A grid with superimposed shapes can be used for assisting in the development of the concept of area and area formula.

There is a program called **amath96** which enables mathematical typing and provides a wide range of mathematical symbols. It is easy to use. Do a Google search if you require more info.

Wingeom

Wingeom is a freely available program available from the Internet. It is known as a dynamic geometry program as it allows shapes that are created to be easily dragged into new forms of the shape.

In order to use it follow these instructions. Open the **Wingeom** folder and double-click on the **Wingeom** icon to run the program. Click on Window and then 2-dim since we are dabbling in plane geometry.

Wingeom allows the introduction and exploration of a host of geometrical concepts, such as:

- Plotting and dragging points.
- Drawing lines and segments.
- Creating angles.
- Creating triangles, polygons, etc.
- Measuring and calculating with lengths and angles in **Wingeom** figures.

Figures 1, 2 and 3 below are sample screen shots from files developed by us (the workshop presenters) which relate to similar triangles, proportion and right angled triangles, respectively. In each figure a portion of the Wingeom notebook has been pulled down from the menu to indicate the type of assistance it is possible to create for a pre-designed workshop for students.

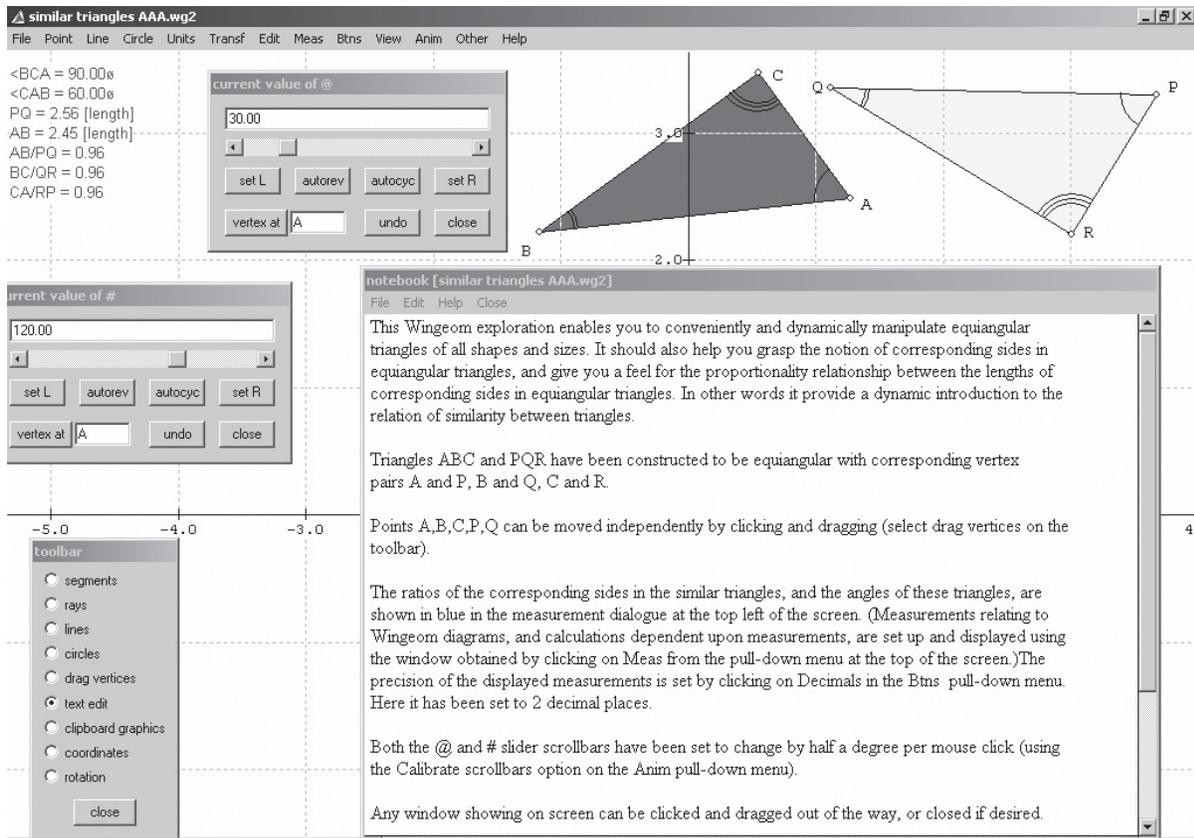


Figure 1. Wingeom "similar triangles" screen shot.

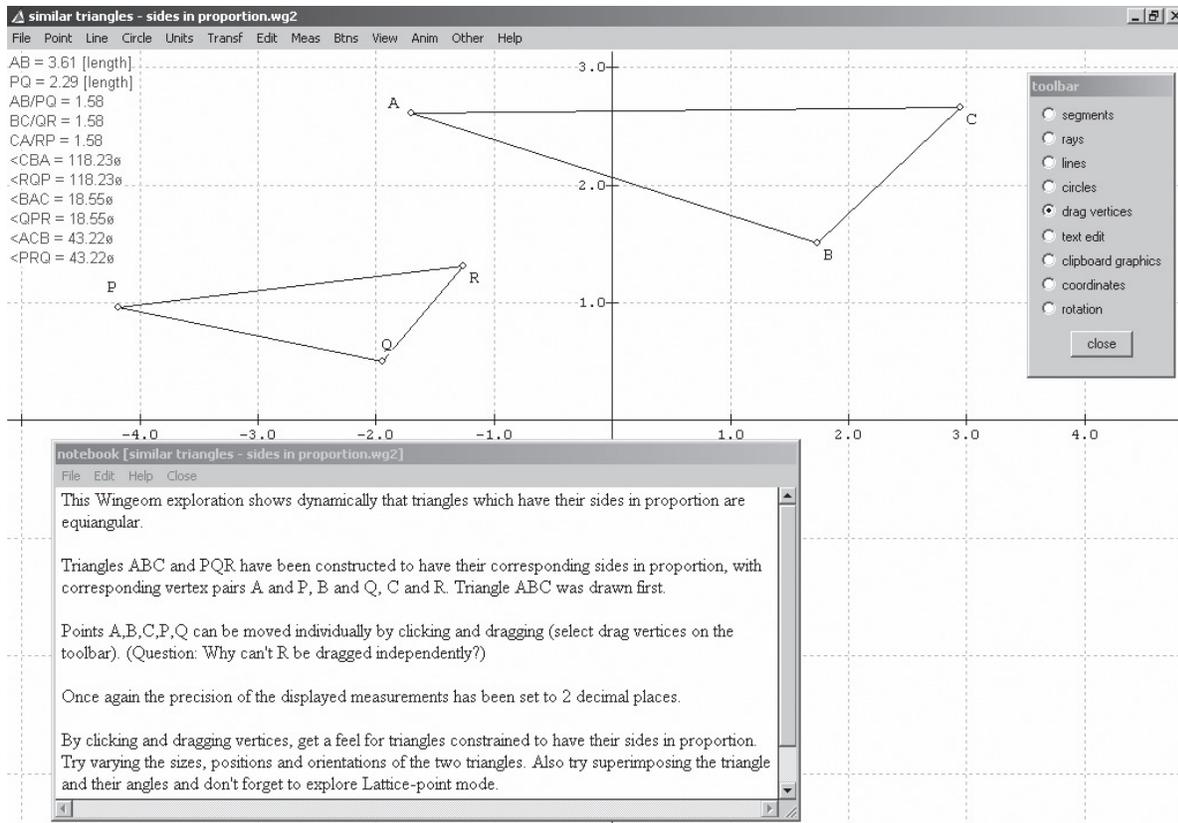


Figure 2. Wingeom "similar triangles – sides in proportion" screen shot.

The power of **Winggeom** resides in its dynamic qualities. As the notebook in Figure 2 says, various points can be clicked and dragged, thus changing triangle side lengths and sizes. While this is happening, the measured quantities shown on the top left hand portion of the screen, change continuously subject to the constraints built in to the construction, and convey in dynamic fashion the nature of similarity.

The exploration pictured in Figure 3 is quite demanding in terms of its information content but I think well worthwhile as far as deepening the user's understanding of the logic of right triangle trigonometry.

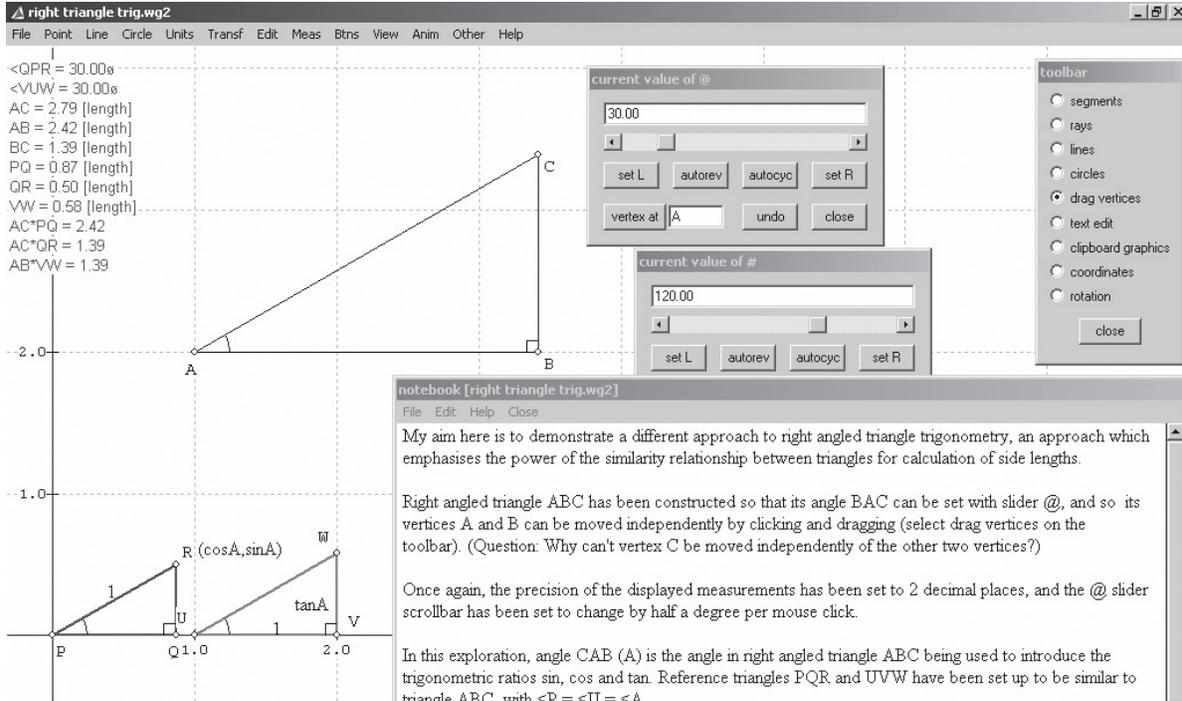


Figure 3. Winggeom “right triangle trigonometry” screen shot.

Web resources for geometry

- Geometry Step by Step from the Land of the Incas <http://agutie.homestead.com/> is an amazing and eclectic ethnomathematical website full of serious geometry, fascinating cultural and historical snippets, quirky music, and breathtaking images. A true wonder of the web!
- The Geometry Junkyard <http://www.ics.uci.edu/~eppstein/junkyard/> is like any rubbish tip a treasure trove for the enthusiast, and in this case a geometry junkie's nirvana.
- The folder **GeoGebra** contains the installation file **geogebra_setup** and pdf help manual for the up-to-the-minute alternative dynamic geometry freeware program **GeoGebra**. To install **GeoGebra** on your computer, double-click on **geogebra_setup**. **GeoGebra** actually combines algebra and some calculus with geometry. Once again, a Google search will provide further information.

Recapitulation, Summary and Taking it Further

Dynamic Geometry software is worth bothering with. We have demonstrated a few of the many ways in which readily available computer packages and tools can enrich every learner's mathematical experience.

Programs, files and further information about any aspect of this workshop can be obtained by emailing either author.

Noeline has set up a **GeometryPlus** blog which all are welcome to join, so that any of us who are interested can stay in touch, and share ideas, knowledge and resources into the future.