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## Teaching notes

### How to use this resource

This resource, *Geometry gems*, is intended to promote student understanding of various geometric properties and the importance of reasoning in proofs. Students work mathematically and build their capacity to use a variety of information and communications technologies.

### Explore

In this section students visit the resource [Geometer’s warehouse](http://lrrpublic.cli.det.nsw.edu.au/lrrSecure/Cli/Download.aspx?resID=6939&v=1&preview=true) to explore the properties of various 2-D shapes.

### Your tasks

1. Students should click on either the icons or the hyperlinked text to view each particular task in a pop-up window. Links have been provided if additional resources are required to complete the task.
2. Brief student instructions for using particular software programs are provided with each task. Other tutorials offering additional assistance are also available online.

| Task | Description |
| --- | --- |
| **Task 1: Quirky Quadrilaterals** | Students design a flowchart, summarise the properties of, and construct a Venn diagram for the quirky quadrilaterals in this task.   1. You may like to set up a class blog before you begin. A great place to start is [blogED](https://online.det.nsw.edu.au/blog). 2. Remind students to save their work for use in the e-portfolio. |
| **Task 2: Constructing kites** | Students consider geometric properties by constructing a kite in various ways. They consider conditions to make the kite non-convex.  Consider expanding the activity to construct other quadrilaterals.  *Conditions that ensure that the kite is non-convex are:*  K1: The centres of the circles are on the same side of the segment that connects their points of intersection.  K2: The two points on the perpendicular bisector are on the same side of the segment.  K3: The two isosceles triangles share a common base, but one lies inside the other.  K4: The parallel line intersects the extensions of the sides of the rectangle and not the sides themselves.  K5: The altitude to the reflection side crosses an extension of the side of the triangle and not the side itself. |
| **Task 3: The Euler segment** | Students construct an Euler segment in GeoGebra and investigate some of its features. They can then design an applet for *incentre*.  *Responses for the investigation are*:   1. Both can appear outside the triangle. Note that the circumcentre only *leaves* via a vertex and the orthocentre through the midpoints. As a pair, they are either on the inside or outside together. 2. When equilateral. 3. When isosceles. 4. 1:2 or 1/3: 2/3. 5. Yes.   *Extension task:*  Students could use the ‘*circle with centre through point’* to show the **incircle.** *Consider who needs to know* – eg Hang gliders, etc |
| **Task 4: Create an e-portfolio** | Students construct an e-portfolio using Acrobat Pro 9 to collate their work and demonstrate their understanding of geometric properties. |

### Quality Teaching Framework

This resource has been developed to support pedagogy and improve student outcomes based around the NSW Quality Teaching Framework, with particular focus on the following elements:

| Intellectual quality | Quality learning environment | Significance |
| --- | --- | --- |
| 1.4 – Higher-order thinking  1.5 – Metalanguage  1.6 – Substantive communication | 2.1 – Explicit quality criteria  2.3 – High expectations  2.5 – Students’ self-regulation | 3.6 – Narrative |