Using GeoGebra© technology in primary mathematics classrooms to extend creative thinking

Roger Wander

MELBOURNE GRADUATE SCHOOL OF EDUCATION
Shaping minds, shaping the world

MAVMEG Primary Mathematics Education Conference 2018
Session D1 Rm Q409
1.45-2.45pm
Friday 22nd June

A bit of background for you…

Secondary Mathematics teacher – USA, VIC, SA (1975-2007)
Footscray HS, Kilbreda College (Mentone), Thomas More College (Adelaide)

Research Project Officer – NTTM (Nspire), TSL – (2008-2013)
MGSE – Mathematics Education Group

Lecturer and Clinical Specialist (2010 – present)
MGSE – SEB (Undergraduate) and MTeach (Primary/Secondary)

National Presenter – (2010-present)
Texas Instruments – Nspire CAS

Mathematics Consultant – (2009-present)
Technology in the Mathematics classroom; mathematical and statistical literacy; curriculum planning and use of real data, hands-on and e-resources; numeracy across the curriculum; building teachers' pedagogical content knowledge.

Grandfather – (2010-present)
6+

“Half as big” – What do we mean?

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“Half as big” – Area or Perimeter?

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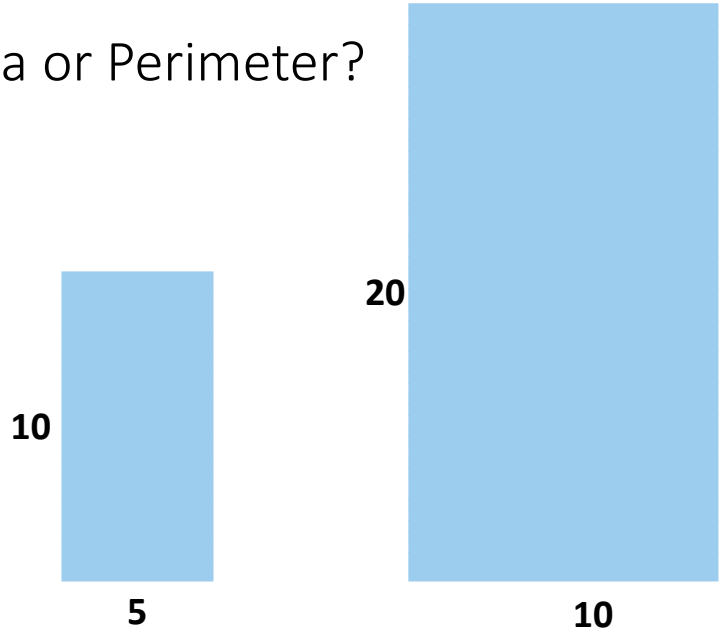
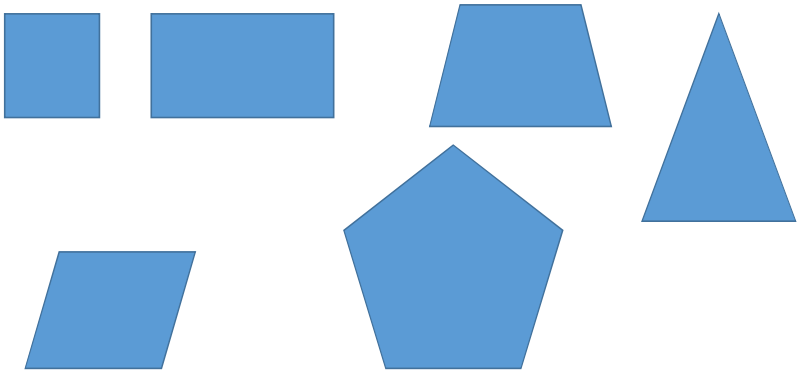


Halving shapes – three types:

Type I – Standard symmetric polygons



Activity 1 – Folding to halve a Type I shape:

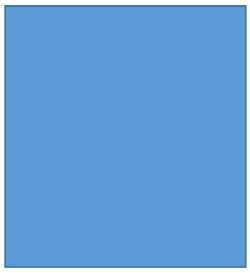
Materials: 1 square, 3 rectangles, 2 isosceles triangles

Objective: Fold each shape "in half"; how many ways can this be done for each shape? How do you know?

In describing the folds distinguish between

- A true line of symmetry (LOS), where the line acts as a reflective mirror and no cutting is required; *and*
- A non-symmetrical halving line (NSHL) where cutting and a rotation or "flip" are needed to confirm halving.

Activity 1 – Folding to halve a Type I shape (square):



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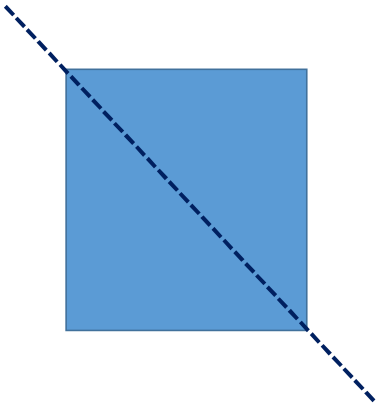

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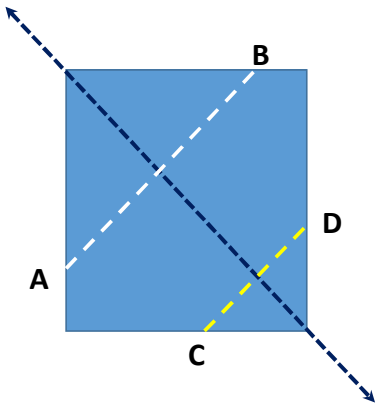

This is an example of an LOS, as every point on one side of the line (like A and C) has a mirror-image point on the other side of the line, at the same distance (like B and D, resp)

How many LOS are there for the square?

Activity 1 – Folding to halve a Type I shape (rectangle):

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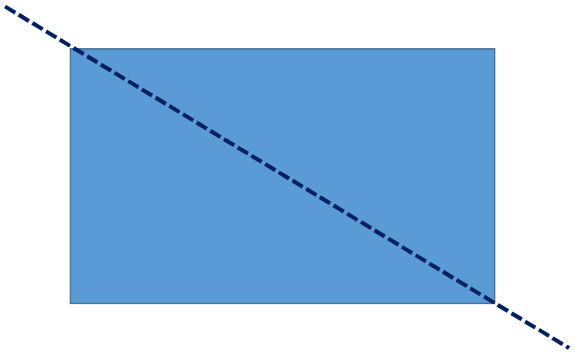

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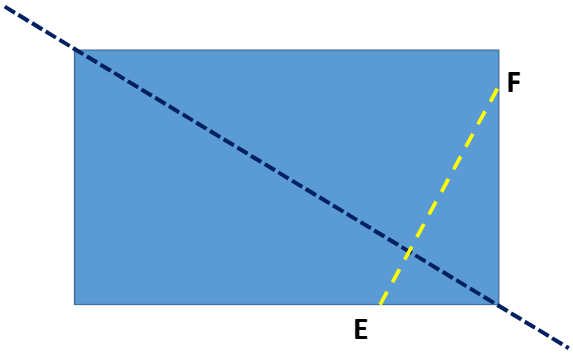
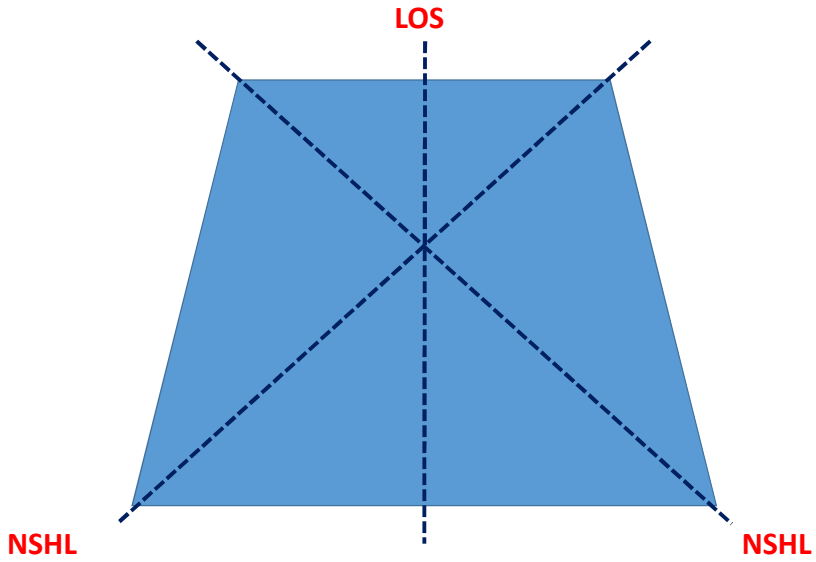


This is an example of an NSHL, as not every point on one side of the line has a mirror-image point on the other side of the line, at the same distance (like E and F, resp).

Yet, cutting along the NSHL then flipping and rotating one triangle can show halving.

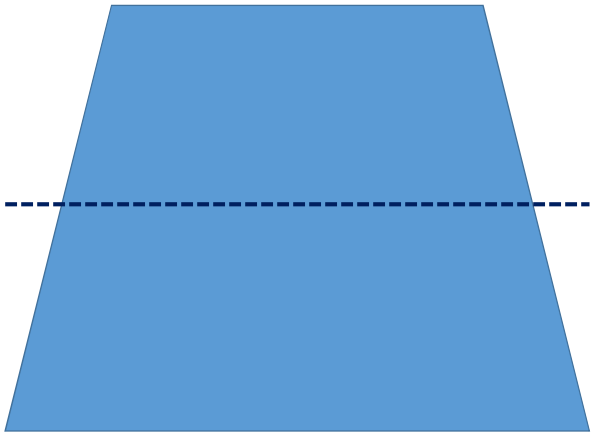
Activity 1 – Folding to halve a Type I shape (regular trapezium):



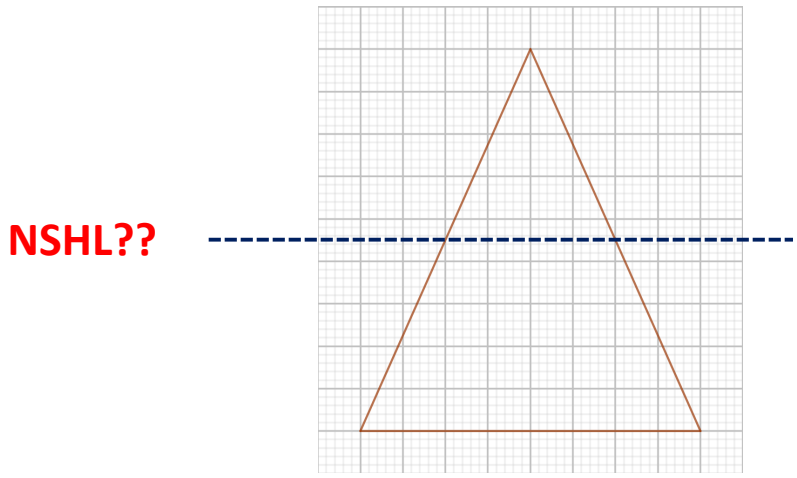
Activity 1 – Folding to halve a Type I shape (regular trapezium):

Explore – *Does an NSHL have to contain vertices/corners? Can we "cut this in half" horizontally? If so, where?*

NSHL??

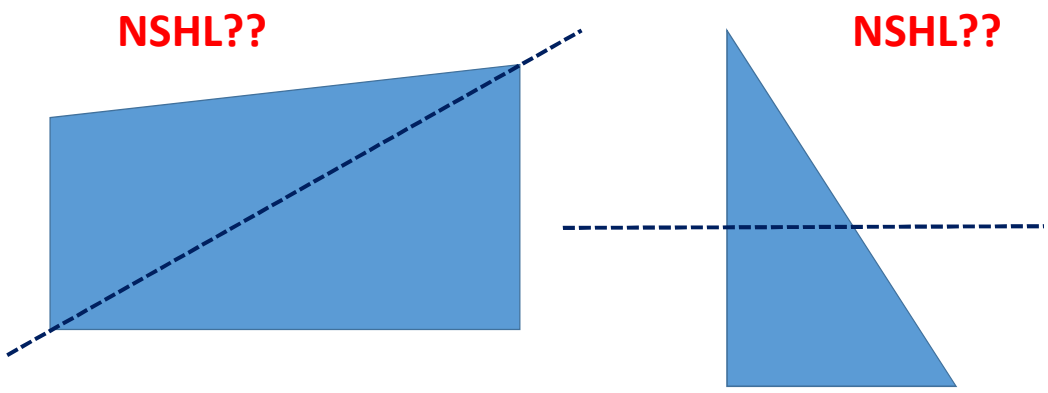


Activity 1 – Folding to halve a Type I shape (isosceles triangle):
Explore – *How can a grid help us find an NSHL when two vertices can't be used?*



Halving shapes – three types:

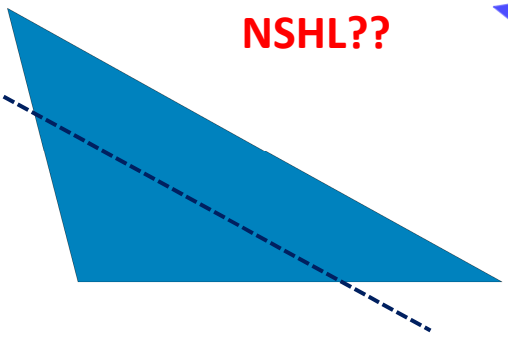
Type II – Standard non-symmetric polygons



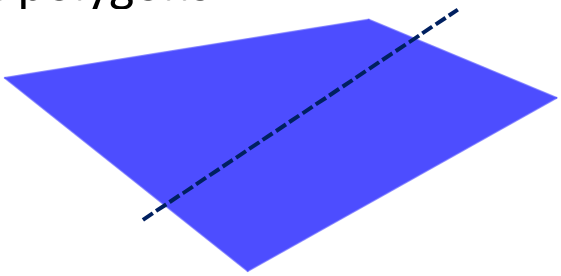
Halving shapes – three types:

Type III – Non-standard polygons

NSHL??

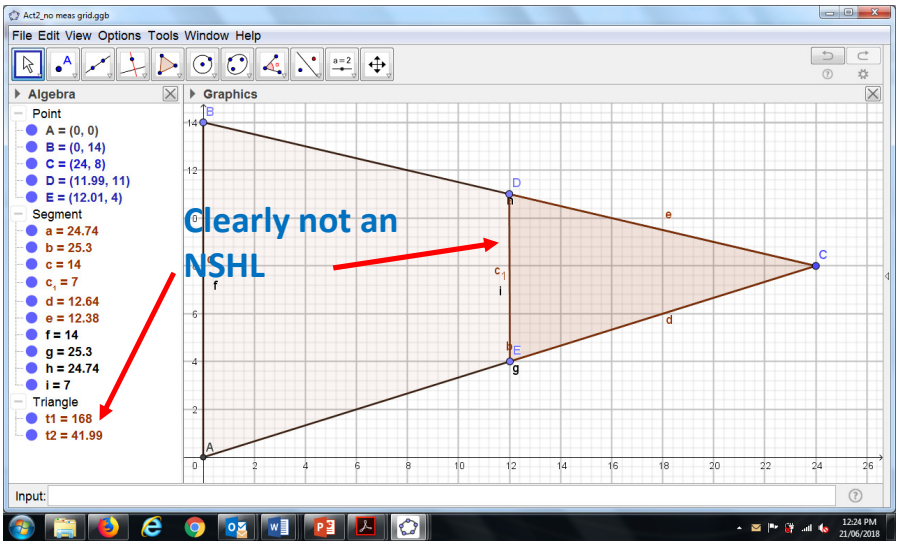


NSHL??



We'll look at how GeoGebra technology can support our students' estimation and measuring skills…

Activity 2 – Using an existing Geogebra document to explore halving…



Activity 3 – Building a new Geogebra document to explore halving non-symmetrical shapes…

You decide:

- Grid or no grid
- Axes or no axes
- Type II (irregular trapezium, right angled triangle) OR
- Type III (irregular quadrilateral, scalene & obtuse triangle

Activity 3 – Building a new Geogebra document to explore halving non-symmetrical shapes…

Exploratory questions to pose to students:

Can you cut the shape in half…

- From a vertex?
- Horizontally?
- Vertically?
- Containing its centre?

Is your solution unique? If not, are there patterns in the solutions?

Thank you…

roger.wander@optusnet.com.au
rdwander@unimelb.edu.au