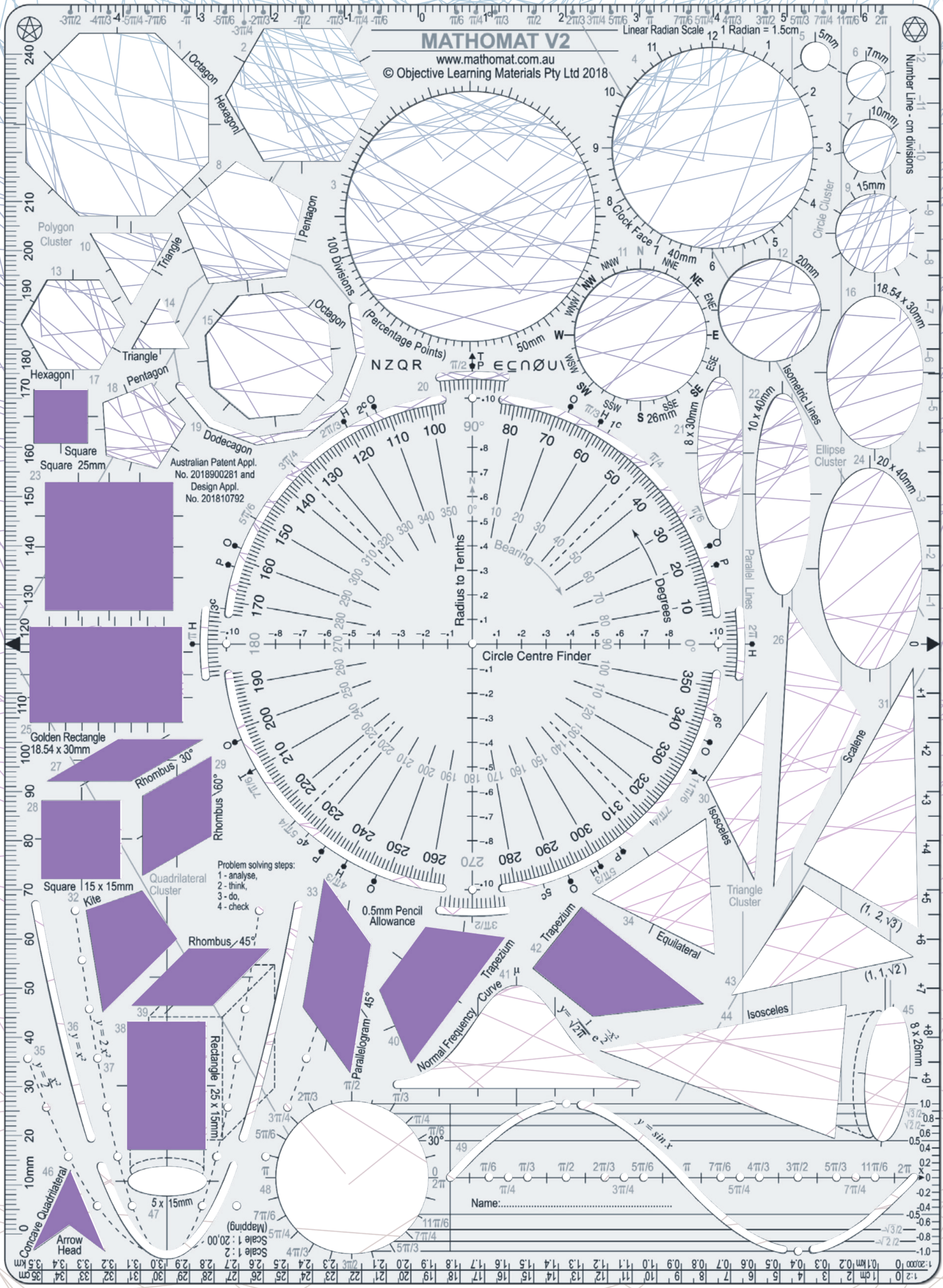
The Quadrilaterals

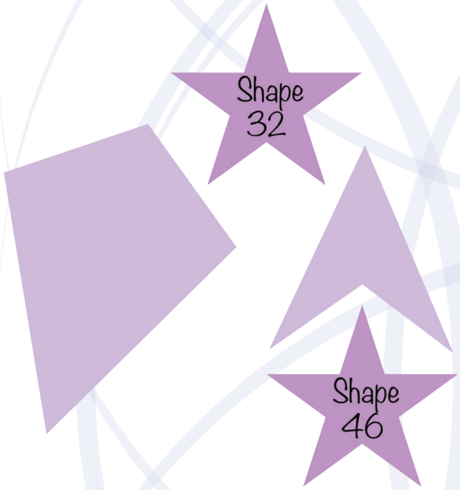
These quadrilaterals include some of the irregular shapes



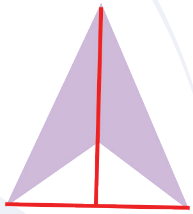
Quadrilaterals Examples

Exploring Irregular Quadrilaterals, Properties and Rotation

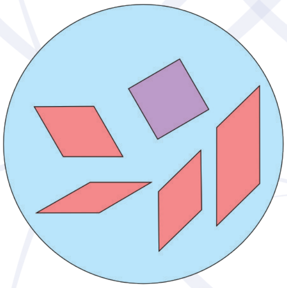
Ask your students to group the quadrilaterals.
Use the protractor to draw a full circle for each group.
However they choose to group them, they must be able to state why they grouped those specific shapes together.
This is a fun exercise for students and provides the teacher with much needed insight into their reasoning and observation skills.

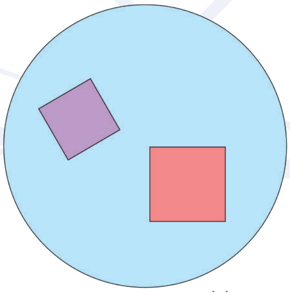


Being able to label these two shapes as kites draws on the student's knowledge on quadrilateral properties.
In this instance the concave kite presents a problem because the short diagonal is not inside the shape - it falls on the outside. That, however does not matter because properties of a kite can still be used to define it as a diagonal.



In order to explore the effect that rotation has on a shape we can draw any shape on the template while the template is perpendicular to the edge of the paper.
Rotate the template and draw the same shape again.
Did the properties of the shape change?
Rotation does not influence the size or properties of a shape.





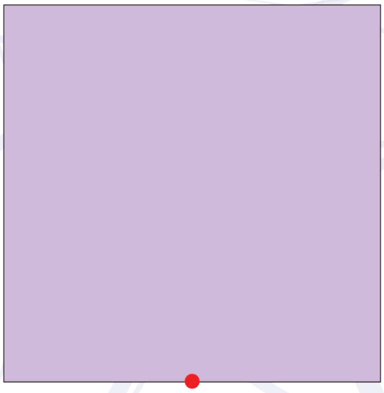
Most of the time it is perception that causes groupings like the circle on the left, where the square, after rotation, is mistaken for a rhombus.
The square has been rotated, but the properties of the shape did not change because of the rotation. Often a student will say that the purple shape in the left circle is a "diamond" or rhombus.

Quadrilaterals Examples

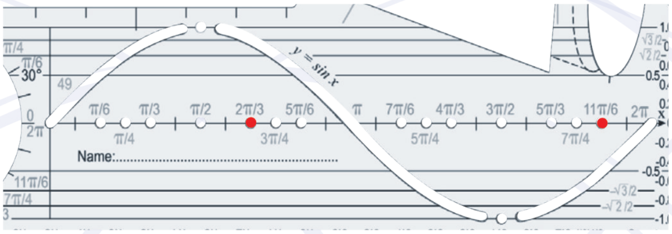
The Golden Ratio

Drawing a golden rectangle

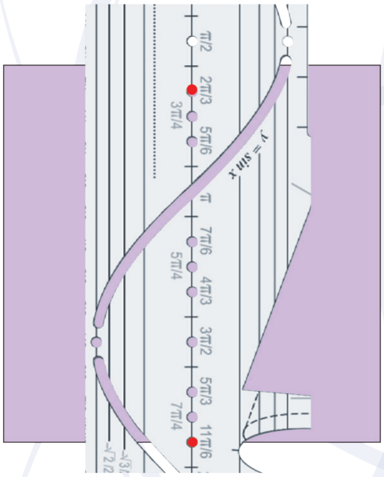
Shape 23



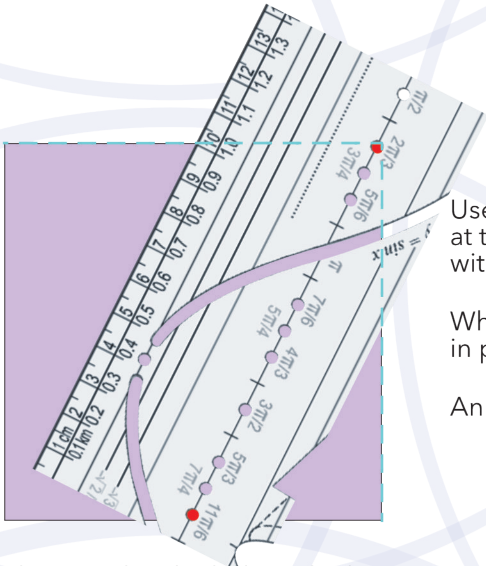
Draw an enlarged square, use a factor of two. Mark the bottom side in the middle.



Locate the following two holes on the template by the Sin Graph.



Place the $\frac{11\pi}{6}$ hole at the centre of the bottom side. Place a pencil in the hole so that the template can swivel.

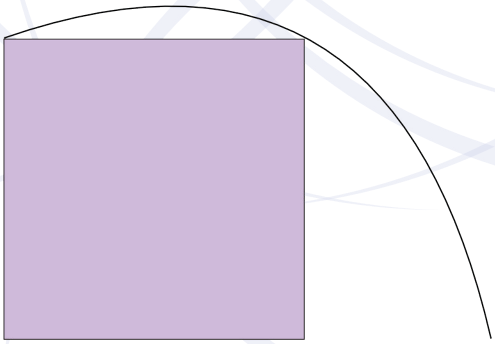


Use a second pencil in the hole at the top, it will line up exactly with the vertex of the square.

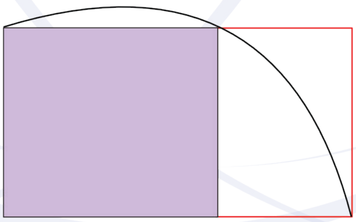
While holding the bottom pencil in place, draw with the top one.

An arc will form as you draw.

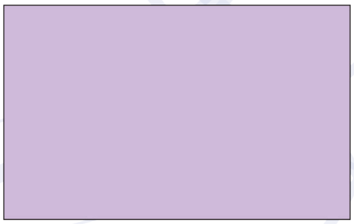
The pencil in the hole at the bottom side of the square will only anchor the template. You do not draw with it.



Start your arc from the top right vertex of the square and draw as shown. Stop the arc at the bottom of the side of the square.



Draw a line from the bottom side of the square to where the arc stops. Continue to draw the sides and top as shown in red.



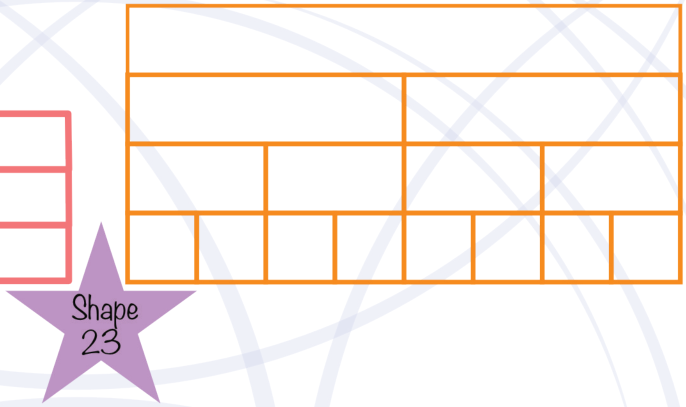
Your new rectangle is a golden rectangle.

Read about and explore the Golden Ratio in the series of Teacher's Manuals.

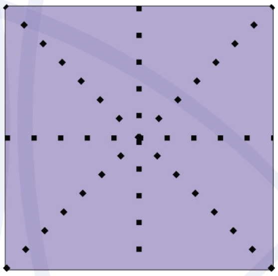
Quadrilaterals Examples

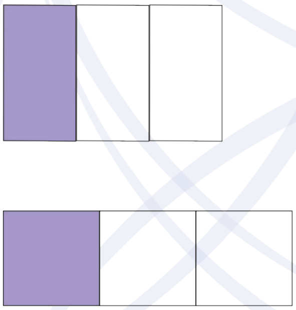
Fractions and Symmetry

Students can build their own fraction walls, using either the rectangle, square and even the equilateral triangle.
They should not work from ready made fractions charts. To show how equivalent fractions work, drawing it is best as it develops their understanding.



Enlarging the regular shapes will make them easier to explore.
The lines of symmetry of the square can be marked out, the shape can be cut out and the symmetry can be proven by folding along the dotted lines.
The important conclusion is that opposite sides must fit on each other as well as opposite angles.
Adjacent sides as well as adjacent angles will also fit.

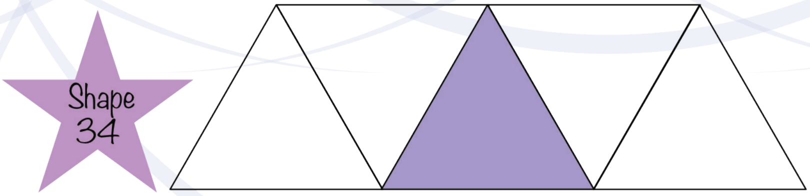




Using the rectangle and square to illustrate continuous fractions, helps students to work with fractions divided in equal-sized portions from the very start.

Both of the diagrams on the left shows ⅓. When the two pieces are compared to each other they are not the same size.

This is a good topic for discussion and investigating fractions.



$\frac{1}{5}$

Representing continuous fractions with odd-numbered denominators can be easily done using a strip of equilateral triangles.