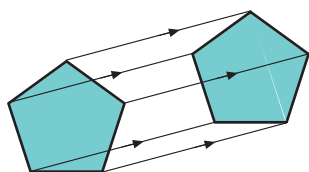


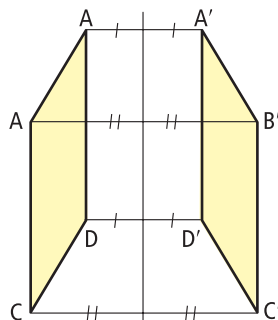
Motion geometry

These diagrams illustrate how Mathomat can be used to study motion geometry. This type of geometry helps in the drawing of three dimensional diagrams and the understanding of congruency.

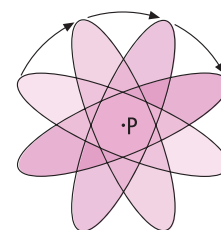
(A figure is congruent if it will fit exactly over another figure.) See Get transforming pages 28/29 of the manual (5.1 on MAC) and the Pentagon café (10.1 on MAC) investigations.



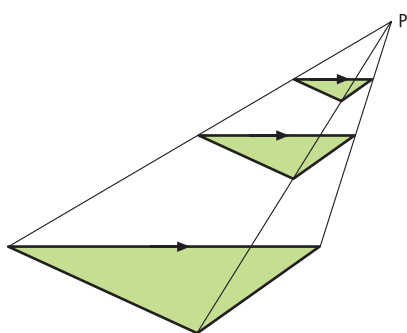
translation



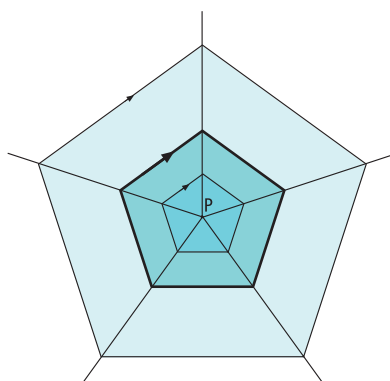
reflection



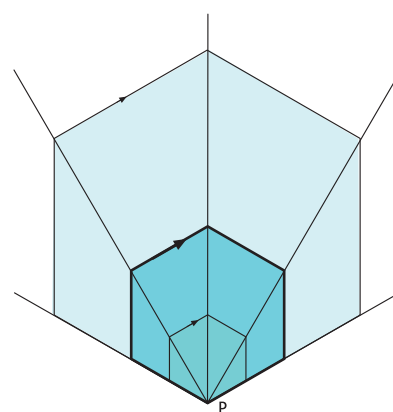
rotation



dilation

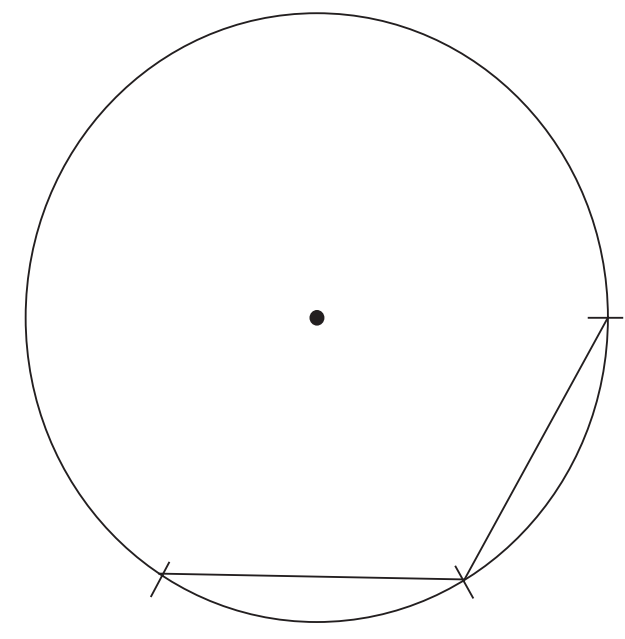


dilation



dilation

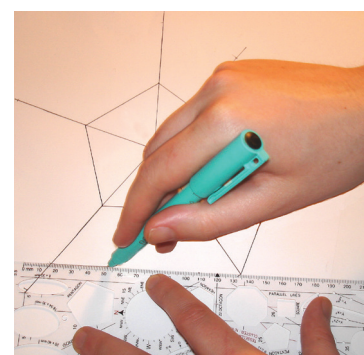
Enlarging polygons



You are not limited by the size of the smaller polygons on Mathomat. You can use the Mathomat regular polygon expansion tool to create 50mm sided regular polygons, see 'Constructing the Archimedean solids', 6.3 on MAC and pages 38/39 of the manual. See also 'Method 4' for using the perimeter of the Mathomat protractor to create a 55mm sided hexagon (page 6.4 on MAC), as shown left.

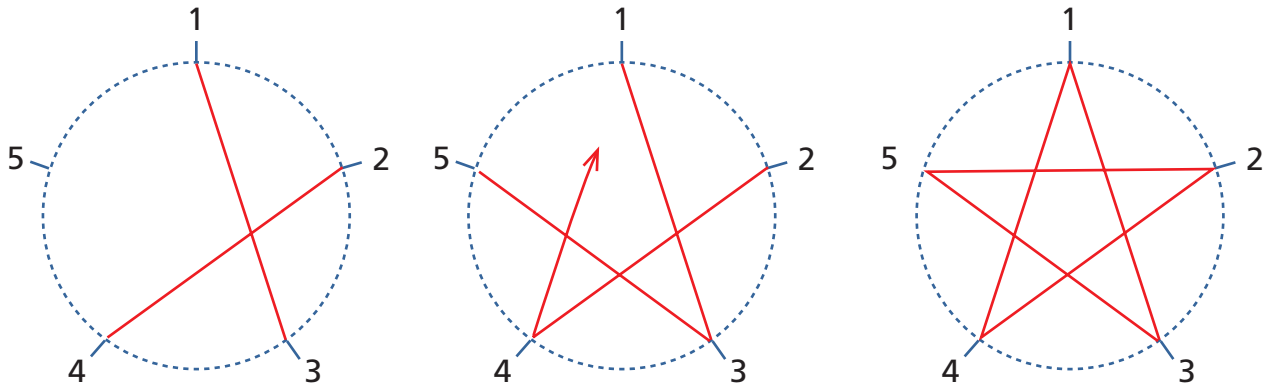
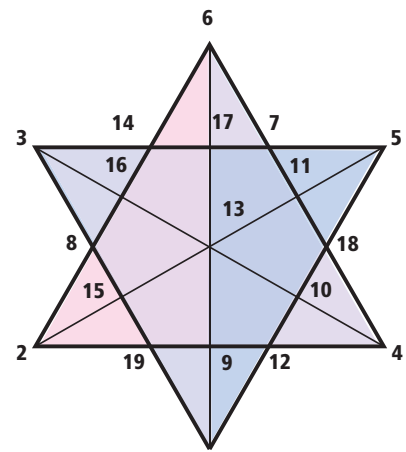
Bigger and bigger

See Pentagon café and Constructing the Archimedean solids for a way to draw even larger polyhedra starting with one drawn around the protractor.



Magic hexagram

The points on the hexagram, right, have been numbered starting from the bottom point. Can you see its magic properties? Each line, horizontal or vertical sums to the same total of 46.



The pentagram and the hexagram are examples of star polygons. The pentagram has the symbol (5,2) meaning it has five equally spaced points with every second point joined by a line. The hexagram has the symbol (6,2) because it has 6 equally spaced points, with every second one joined by a line.

Investigation challenge: when do you think two star polygons look the same?

Solution ideas for predicting the number of lines that will be needed to draw a mystic rose from the Mystic investigation.

Method 1: Count the lines.

Point 1 will be joined to 9 other points. Point 2 is joined to 8 other points, and so on. As a result there are $9+8+7+6+5+4+3+2+1 = 45$ lines. This counting method is simple, but it is hard to use for predicting the number of lines in other types of star polygon.

Method 2: Work out a rule.

Each point is joined by 9 other points. So there are $(10 \times 9) \div 2 = 45$ lines. We need to divide by 2 as each line joins 2 points. This rule could be generalised to $(n \times (n-1)) \div 2$.

Method 3: A table

Make a table, based on simpler cases, then look for a pattern.

Number of points	2	3	4	5	6	7
Number of lines	1	3	6	10	15	21
		+2	+3	+4	+5	+6