

Maths art for A Level Maths: curve stitching, tessellations and graph pictures

A Level Math Revision · A Level Maths (Year 12 and Year 13) · Student sheet

Name _____

Class _____

Date _____

No calculator needed. Task C is best done in a graph plotter.

Starter (5 minutes)

1. Find each interior angle of a regular hexagon.
2. Find the gradient of the line through (0, 8) and (2, 0).
3. Write down the centre and radius of $x^2 + y^2 = 25$.

Main activity (35 minutes)

Task A: Curve stitching

On squared paper, mark 1 to 9 along both axes. Join (1, 0) to (0, 9), (2, 0) to (0, 8), and so on up to (9, 0) to (0, 1). The straight lines make a curve.

- a. Find the equation of the line joining (2, 0) and (0, 8).
- b. Find the equation of the line joining (3, 0) and (0, 7).
- c. Show that the line joining (k, 0) and (0, 10 - k) has equation $(10 - k)x + ky = k(10 - k)$.

Task B: Tessellations

At every corner of a tiling the angles must add to 360° .

- a. For which regular polygons does the interior angle divide exactly into 360° ?
- b. A tiling has a square, a regular hexagon and a regular 12-sided polygon at every corner. Show that the angles fit.
- c. For polygons with p , q and r sides meeting at a point, the angle condition becomes $1/p + 1/q + 1/r = 1/2$. Check it for $p = 4$, $q = 6$, $r = 12$.

Task C: Graph pictures

Draw a face with equations, on graph paper or in a grapher.

- a. An eye is the circle with centre $(2, 2)$ and radius 0.5 . Write its equation.
- b. The smile is $y = 0.2x^2 - 3$ for $-3 \leq x \leq 3$. Find the y -coordinate of its ends.
- c. Show that the ends of the smile are inside the face $x^2 + y^2 = 25$.

Extension

1. The curve-stitching lines all touch the curve $\sqrt{x} + \sqrt{y} = \sqrt{10}$. Show that the line for $k = 5$, $x + y = 5$, meets the curve at $(2.5, 2.5)$ with the same gradient.