

Diwali maths activities for IB Maths SL and HL

IB Math Revision · IB Maths SL and HL (AA and AI) · Student sheet

Name _____

Class _____

Date _____

The starter is non-calculator. A GDC is useful for the main activity.

Starter (5 minutes)

1. Find the area of a sector of radius 6 with angle $\pi/3$.
2. Find the length of an arc of radius 10 with angle 0.8 radians.
3. Write down the image of (2, 5) after reflection in the line $y = x$.
4. Find each interior angle of a regular hexagon.

Main activity (35 minutes)

Task A: An eight-point rangoli

Eight points of a rangoli are equally spaced on a circle of radius 4 centred at the origin. The first point is (4, 0).

- a. Find the exact coordinates of the second point, anticlockwise.
- b. Find the distance between neighbouring points, to 3 significant figures.
- c. The eight points are joined to make a regular octagon. Find its exact area.
- d. Find the area inside the circle but outside the octagon, to 3 significant figures.

Task B: Rangoli petals

A petal is made of two circular segments placed back to back along a chord. Each segment is cut from a circle of radius 6 by a chord that subtends an angle of $2\pi/3$ at the centre.

- a. Find the exact area of one segment.
- b. Find the area of the petal, to 3 significant figures.

Task C: The diya

A diya is modelled as a hemispherical bowl of inner radius 4 cm.

- a. Find the volume of oil the diya holds when full, to 3 significant figures.
- b. (AA) The bowl is the region swept out when the curve $x = \sqrt{16 - y^2}$, $-4 \leq y \leq 0$, is rotated through 2π about the y -axis. Oil is poured in to a depth of 2 cm. Use integration to find the volume of oil.
- c. What fraction of the full diya is this?

Task D: Tessellations

Rangoli floors often tile regular polygons with no gaps.

- a. Two copies of a regular n -gon and one equilateral triangle meet exactly at a point. Find n .
- b. A regular polygon has interior angles of 140° . How many sides does it have? Can it tessellate on its own?

Extension

1. (HL) The eight rangoli points are $z = 4 \operatorname{cis}(k\pi/4)$, $k = 0, 1, \dots, 7$. Show that they are the roots of $z^8 = 65\,536$. Find their sum and their product.