Diwali maths activities for IB Maths SL and HL: HL

IB Math Revision · IB HL and A Level Further Maths (no calculator) · Student sheet

Name _____ Class _____ Date _____

No calculator needed: every answer is exact.

Starter (5 minutes)

1. Write $\text{cis}(\pi/4) \times \text{cis}(\pi/12)$ in the form $\text{cis}\,\theta$.

2. Find $|3 - 4i|$.

3. Find $1 + 2 + 4 + \ldots + 2^9$.

4. Find $\int_0^{\pi} \sin x \, dx$.

Main activity (30 minutes)

Task A: Rangoli by rotation

A rangoli has 8 petals whose tips are the solutions of $z^8 = 16$, drawn on an Argand diagram.

a. Find the modulus of each petal tip.

b. One tip is $\sqrt{2}$. Write the next tip anticlockwise in the form $a + bi$.

c. Find the exact area of the regular octagon with the 8 tips as its corners.

d. Find the sum of all 8 tips, and explain the answer.

Task B: The diya’s bowl

The bowl of a diya is the curve $y = x^2/4$, for $0 \le y \le 4$, turned through 2π about the y-axis (units: cm).

a. Find the radius of the top of the bowl.

b. Find the volume of oil the bowl holds when full, in terms of π.

c. How deep is the oil when the bowl is half full? Give your answer in the form $a\sqrt{b}$.

Extension

1. Find the product of all 8 petal tips (the solutions of $z^8 = 16$).