

Pi Approximation Day puzzles for IB Maths

IB Math Revision · IB Maths SL and HL (AA and AI) · 22 July · Student sheet

Name _____

Class _____

Date _____

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

Starter (5 minutes)

1. Write $22/7$ as a mixed number.
2. Work out $355/113 - 3$ as a fraction.
3. Using $\pi \approx 22/7$, find the circumference of a circle of diameter 14.
4. Find the arc length of a sector of radius 7 and angle 2 radians.

Main activity (30 minutes)

Task A: How good is $22/7$?

Use your GDC's value of π .

- a. Find the absolute error when $22/7$ is used for π , to 3 significant figures.
- b. Find the percentage error, to 3 significant figures.
- c. A circular running track has radius 1 km. By how many metres is its length overestimated if $22/7$ is used for π ? Give 3 significant figures.

Task B: Continued fractions

π can be written as $3 + 1/(7 + 1/(15 + 1/(1 + \dots)))$. Stopping early gives fractions close to π .

- a. Work out $3 + 1/7$.
- b. Work out $3 + 1/(7 + 1/15)$ as a single fraction.
- c. Work out $3 + 1/(7 + 1/(15 + 1/1))$ as a single fraction. How many decimal places of π does it get right?

Task C: The best fraction

A fraction p/q is a good approximation when it is close to π for the size of q .

- a. For each denominator from 1 to 10, find the fraction closest to π . Which one is closest overall?
- b. Find the absolute error of $355/113$, to 3 significant figures.
- c. How many times smaller is the error of $355/113$ than the error of $22/7$? Give the nearest whole number.

Extension

1. Archimedes showed that $223/71 < \pi < 22/7$. Find the width of this interval as a single fraction.