Slices of π

Teacher notes

Why use this resource?

This many-ways problem looks at how $\sin\theta$, $\cos\theta$ and $\tan\theta$ are related to each other. By working on the task, students can combine graph sketching, the unit circle, identities and solving equations. The starting image is enticing and accessible and students are required to extend their knowledge of trigonometric functions into the 2nd quadrant and to the whole circle. Several approaches are suggested in the Things you might have noticed section.

Possible approach

Working individually, students can consider the image and any questions they may have, then pair up to compare ideas before sharing in larger groups.

Once a group has answers they are happy with they could be asked to consider different approaches and make connections between them. Alternatively, partially completed work could be shared with other groups and students could be asked to continue the work.

The final diagram in the Things you might have noticed section could be projected and different groups could explain why the sectors are defined by the given inequality.

Key questions

The Things you might have noticed section contains several questions which could be used to prompt thinking. In addition to these, you could ask students

- Where do different functions swap over? How could we find this out?
- Which graph is steeper near the origin: $\sin x$ or $\tan x$?
- Will patterns be symmetrical? Explain why or why not.

Possible support

- Students may need to discuss the task to understand that θ increases from 0 to π in the starting diagram, rather than resetting to 0 between the slices.
- Students could have white boards to encourage graph sketching.
- Students could check their answers using values on their calculators, but they will gain more from convincing themselves from graphs and solving equations.
- Students could be asked a related question, such as What if we only used $\sin\theta$ and $\cos\theta$? What would the diagram look like?

Possible extension

- What happens if we combine trigonometric functions and look at those as inequalities? (See Big Trig.)

You can watch video of teachers discussing this task here.