**Y13 A Level Mathematics**

**27 Trignometric Functions 1 week**

## Teaching objectives

**a** To understand the definitions of and be able to use secant, cosecant and cotangent.

**b** To understand the definitions of and be able to use arcsin, arccos and arctan

**c** To understand the relationships of secant, cosecant and cotangent to sine, cosine and tangent

**d** To understand the graphs of secant, cosecant and cotangent, their ranges and domains

**e** To understand the graphs of arcsin, arccos and arctan, their ranges and domains

**f** Understand, derive and use $sec^{2}θ=1+tan^{2}θ$ and $cosec^{2}θ=1+cot^{2}θ$

**g** Be able to construct proofs involving trigonometric ratios and identities.

**Resources for advance preparation:**

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|  | **Starter** | **Main teaching**Including key questions, key teaching points, models and resources | **Notes**Including Support and Extension | **Consolidation/Plenary**Including key questions and homework |
| **1** | [Going round in Circles](https://undergroundmathematics.org/trigonometry-triangles-to-functions/going-round-in-circles)Extended Starter: Triangles | From discussion relating to the starter, follow on and derive identities from relabelled triangles.From here two similar resource provide an alternative insight into trig ratios to the traditional one:*Things you might have noticed* from the **Going round in circles** and [Six Trigonometric Functions](https://www.geogebra.org/m/Qz4Ucsja) from MEI both investigate the relationship between the new and familiar trigonometric identities. | For some students, the approaches in these tasks are new and will require some pointers; the use of area with different sides/trig ratios, is probably new to them. | Plenary and homework to be shared at the start of next lesson.[SAN-Trig\_Statements](http://mei.org.uk/files/sow/26-trigonometric-functions-res.pdf) |
| **2** | Look at the SAN-Trig\_statementsFrom last homework.[Muddled Trig](https://undergroundmathematics.org/trigonometry-triangles-to-functions/muddled-trig) | **Muddled Trig** provides the opportunity to extend the students understanding of **domain** and **range** into trig with an opportunity to look at the graphs of $\frac{1}{sin⁡(x)}$ and arcsin.[KM:Graphing the Inverse sine function](http://www.kangaroomaths.com/free_resources/ks5/resources/session8/thefamilyof6/theinversesinefunctionautograph.doc) provides a guided activity which can then be extended with other trig functions.With this under their belt and strategies for identifying key points on a graph this is an opportunity for the students to graph the other functions and their inverses, creating their own matching card revision activity to share with other students in the class.  | As an extension, the activity can be linked with transformations of graphs, with functions such as $cosec(θ+π)$ | Completion of revision cards to allow for peer review at the start of next lesson (to check for accuracy)If students are able to, then working electronically will help both with the sharing of the resources produced and with reviewing some of them the next lesson. |
|  | **Starter** | **Main teaching**Including key questions, key teaching points, models and resources | **Notes**Including Support and Extension | **Consolidation/Plenary**Including key questions and homework |
| **3** | Review of revision cards, either physically or through whole class looking at them on an IWB for example. | Given the students awareness of what sec(x), cosec(x) and cotangent(x) are from previous lesson, now is the time to develop the identities used and to apply them to problems.[MEI: Sometimes, Always, Never](http://mei.org.uk/files/sow/26-trignometric-functions-res.pdf) cards can be used to test ‘special’ values to see if they are Sometimes or Never but the derivation of the identities is needed for the Always category. | All students should be able to derive some of the identities, try not to let any freeload given that they will all see all the proofs by the end of the lesson!Starting the proof section with $sin^{2}\left(x\right)+cos^{2}\left(x\right)=1$ might be a nice easy entry to trigonometric proof. |  |
| **4** | Extending the identity work from last lesson:KM:[Trio](http://www.kangaroomaths.com/free_resources/ks5/resources/session8/thefamilyof6/trio/) | Constructing proofs of trig identities involving the six trig ratios, using matching task [KM: Matching Trig](http://www.kangaroomaths.com/free_resources/ks5/resources/session8/thefamilyof6/matchtrig.xls) Similar Tarsia activity – a bit more meaty from Integral website -[Trig identities Hexagon](https://2017.integralmaths.org/pluginfile.php/13790/mod_book/chapter/437/Trigidentities1HexJig.pdf) |  | Links to past exam questions from Physics and Maths Tutor.MEI used but other boards available[Exam questions Set 1](http://pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Topic-Qs/OCR-MEI/C4%20Trigonometry%20-%20Identities%20%26%20Functions%20-%20sec%2C%20cosec%2C%20cot%201%20QP.pd)[Exam questions Set 2](http://pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Topic-Qs/OCR-MEI/C4%20Trigonometry%20-%20Identities%20%26%20Functions%20-%20sec%2C%20cosec%2C%20cot%202%20QP.pdf)MS available here:[MS Set 1](http://pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Topic-Qs/OCR-MEI/C4%20Trigonometry%20-%20Identities%20%26%20Functions%20-%20sec%2C%20cosec%2C%20cot%201%20MS.pdfhttp%3A/pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Topic-Qs/OCR-MEI/C4%20Trigonometry%20-%20Identities%20%26%20Functions%20-%20sec%2C%20cosec%2C%20cot%201%20MS.pdf)[MS Set 2](http://pmt.physicsandmathstutor.com/download/Maths/A-level/C4/Topic-Qs/OCR-MEI/C4%20Trigonometry%20-%20Identities%20%26%20Functions%20-%20sec%2C%20cosec%2C%20cot%202%20MS.pdf) |