**Y13 A Level Mathematics**

**27 Trignometric Identities 1 week**

## Teaching objectives

**a To understand and use the formulae** $sin\left(A\pm B\right), cos\left(A\pm B\right),tan\left(A\pm B\right)$

**b To understand and use the double angle formulae**

**c To understand geometrical proofs of the addition and double angle formulae**

**d To understand and use expressions for** $a cos\left(θ\right)+b cos\left(θ\right)$ **in the equivalent forms of** $r cos\left(θ\pm α\right)$ **or** $r sin\left(θ\pm α\right)$

**e To be able to construct proofs involving trigonometric functions and identities.**

**Resources for advance preparation:**

**https://wikibooka,org/wiki/Trigonometry/Additions\_Formula\_for\_Sines**

**I’ve put this link in as it appears to be a reasonable, accurate, free and readable page including examples. Proof and an embedded link to a Khan Academy video of the proof**

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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** | [UM: Starting from our existing knowledge of sine, cosine and tangent of 30, 60&45, can we work out the exact value of sine(15)](https://undergroundmathematics.org/trigonometry-compound-angles/r7050)  | [RISP-26](http://www.s253053503.websitehome.co.uk/risps/risp26.html):This could take the entire lesson so either **be careful!!** Or enjoy! You are welcomeIdeas about how to add and subtract angles in trig ratios.[KM: Looking at the proof of the compound angle formula](http://www.kangaroomaths.com/free_resources/ks5/resources/session8/compound/proof)The teacher’s notes here are well worth reading…Another proof and questions can be [found here (CIMT)](http://www.cimt.org.uk/projects/mepres/alevel/pure_ch15.pdf)It might be worth holding off proving one of the identities and leaving it until the plenary. | Alluding to the requirement of differentiation and integration when introducing the idea since simply having to find the surd value, with today’s calculators is trivial. |  |
| **2** | Recap the compound angle formulae. Now, can you use them to derive sine(2A) in terms of sine(A) and cosine(A)? | And so on for the other identities.A Nice consolidation exercise which will lead to the discovery of the half angle formula (possibly) is the [UM:Countdown activity.](https://undergroundmathematics.org/trigonometry-compound-angles/trig-countdown)Again, the CIMT document referenced above in one of several internet sources which do cover the proof and provide plenty of basic practice of the use of these formulae. |  | [MEI: Three Challenging questions](http://mei.org.uk/files/sow/28-trigonometric-identities-res.pdf) |
|  | **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** | [UM:Transformation…or not?](https://undergroundmathematics.org/trigonometry-compound-angles/transformation-or-not/) | Introducing the problem, looking at the initial graph provides a good starting point to the lesson, what is the transformation? From there, introducing the idea that this can be written as the sum of other trig functions leads to the familiar result. A really nice resource which seems to have been written for this exercise. | The use of graphical calculators means that there is less upheaval although I have found that using geogebra enables the sequence of events which lead to the conclusion to be more clearly documented. | [**KM: RcosTriples**](http://www.kangaroomaths.com/free_resources/ks5/resources/session8/compound/trio)**YMMV but this is a nice check that the students have understood some of the previous work.** |
| **4** | [t for tan](https://undergroundmathematics.org/trigonometry-compound-angles/t-for-tan) While this is now in the new Edexcel Further Maths 1 course it provides an interesting geometric proof of a trigonometric identity. | At this point everything which needs to be covered appears to have been done. There is too much in each of the “sessions” to actually be done in an hour and as such I would consider them to be areas rather than sessions.Exam practice questions are again going to be few and far between but from the old spec try….[Physics and Maths tutor](http://www.physicsandmathstutor.com/a-level-maths-papers/) to give you an idea of what is available from your exam board. | **Both** [**geogebra**](http://geogebra.org) **and** [**Desmos**](https://www.desmos.com/calculator) **are available as mobile apps and web pages so there is minimal barrier to entry for either hugely powerful piece of software and I have found that students adapt to both with equal aplomb.**  |  |