



The Sutton Academy

# Knowledge Rich Curriculum Plan

Year 12 Maths

Unit 10 - Trigonometric identities and equations

| Maths<br>Year 12   | Unit: Trigonometric identities and equations  |                   |   |            |  |
|--|---|-------------------|---|------------|--|
| Lesson/Learning<br>Sequence  | Intended Knowledge:<br><i>Students will know that...</i>  | Tiered Vocabulary | Prior Knowledge:<br><i>In order to know this students, need to already know that...</i>   | Assessment |  |
| <p><b>Lesson 49: Angles in all four quadrants/Exact Trigonometry</b><br/>Lesson Objective: To learn how to use the CAST diagram and exact trigonometry to find the exact values of trigonometric ratios.</p> | <ul style="list-style-type: none"> <li>• Students will know how to use a unit circle to derive equations of sine, cosine and tangent.</li> <li>• Students will know how to use a unit circle to generate the graphs of sine and cosine.</li> <li>• Students will know how to use the unit circle to find the exact solutions to the sine, cosine and tangent of any basic angle.</li> <li>• Students will know how to use the quadrants to determine whether each of the trigonometric ratios is positive or negative.</li> <li>• Students will know how to use the CAST diagram to find sine, cosine or tangent of any positive or negative angle using the corresponding acute angle made with the x-axis.</li> <li>• Students will know how to use the CAST diagram to find the exact solutions to the sine, cosine and tangent of any angles.</li> <li>• Students will know how to then apply the trigonometric ratios to an equilateral triangle with sides of 2 units and a perpendicular line to find the exact solutions to the sine, cosine and tangent of 30 and 60 degrees.</li> <li>• Students will know how to then apply the trigonometric ratios to an isosceles triangle with equal sides of 1 unit to find the exact solutions to the sine, cosine and tangent of 45 degrees.</li> <li>• Students will know how to use the unit circle to manipulate the angles of trigonometric ratios into an acute form to then use exact trigonometry to find the solution.</li> </ul> |                   | <ul style="list-style-type: none"> <li>• <i>Students need to know how to use the standard trigonometric ratios.</i></li> <li>• <i>Students need to know the basic concepts of four quadrants.</i></li> </ul>  |            |  |
| <p><b>Lesson 50: Trigonometric identities</b><br/>Lesson Objective: To learn how to use trigonometric identities to simplify trigonometrical expressions and complete proofs.</p>                            | <ul style="list-style-type: none"> <li>• Students will know how to derive <math>\sin^2x + \cos^2x = 1</math> using the unit circle equation and Pythagoras' theorem.</li> <li>• Students will know how to derive <math>\tan x = \sin x / \cos x</math> using the unit circle.</li> <li>• Students will know how to recognise when each identity can be used.</li> <li>• Students will know how to replace parts of an expression using an identity.</li> <li>• Students will know to simplify trigonometric expressions using identities.</li> </ul>  |                   | <ul style="list-style-type: none"> <li>• <i>Students need to know how to use the unit circle.</i></li> <li>• <i>Students need to know the equations provided by the unit circle.</i></li> <li>• <i>Students need to know how to rearrange formulae.</i></li> <li>• <i>Students need to know how to substitute values or expressions into formulae.</i></li> <li>• <i>Students need to know how to use the sine and cosine rules.</i></li> <li>• <i>Students need to know the difference between acute, obtuse and reflex angles.</i></li> </ul> |            |  |

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|   | <ul style="list-style-type: none"> <li>Students will know how to prove a more complicated identity using the basic identities.</li> <li>Students will know how to use identities to combined multiple trigonometric equations.</li> </ul>  |                   |   |            |
| <b>Lesson 51: Simple trigonometric equations</b><br>Lesson Objective: To learn how to solve simple trigonometric equations.       | <ul style="list-style-type: none"> <li>Students will know that solutions for sine and cosine only exist between -1 and 1 inclusive.</li> <li>Students will know that solutions for tangent exist for all values.</li> <li>Students will know how to use a CAST diagram to find all the possible solutions to trigonometric equations in a given range.</li> <li>Students will know how to use the graphs of sine, cosine and tangent to find all the possible solutions to trigonometric equations in a given range.</li> <li>Students will know that the calculator only gives the principal values in a given range of the inverse trigonometric functions.</li> <li>Students will know that the principal value will not always be a solution to the equation.</li> <li>Students will know how to use identities to simplify equations before finding all the possible solutions in the given range.</li> </ul> |                   | <ul style="list-style-type: none"> <li><i>Students need to know how to use standard trigonometric ratios.</i></li> <li><i>Students need to know how to use the inverse function of sine, cosine and tangent.</i></li> <li><i>Students need to know how to use trigonometric identities to simplify trigonometric expressions and equations.</i></li> <li><i>Students need to know how to use the CAST diagram to find values.</i></li> <li><i>Students need to know how to use the graphs of sine, cosine and tangent to find values.</i></li> <li><i>Students need to know how to solve linear equations.</i></li> </ul> |            |
| <b>Lesson 52: Harder trigonometric equations</b><br>Lesson Objective: To learn how to solve more complex trigonometric equations. | <ul style="list-style-type: none"> <li>Students will know how to solve trigonometric equations in the form <math>\sin(kx)</math>, <math>\cos(kx)</math> and <math>\tan(kx)</math>.</li> <li>Students will know to adjust the given range, use it to find all the possible solutions and then divide all the solutions by <math>k</math>.</li> <li>Students will know how to solve trigonometric equations in the form <math>\sin(x+k)</math>, <math>\cos(x+k)</math> and <math>\tan(x+k)</math>.</li> <li>Students will know to adjust the given range, use it to find all the possible solutions and then add or subtract all the solutions by <math>k</math>.</li> </ul>   |                   | <ul style="list-style-type: none"> <li><i>Students need to know how to rearrange formulae.</i></li> <li><i>Students need to know how to solve linear equations.</i></li> <li><i>Students need to know how to substitute values or expressions into formulae.</i></li> <li><i>Students need to know the basic trigonometry identities.</i></li> <li><i>Students need to know how to solve basic trigonometric equations.</i></li> <li><i>Students need to know how to solve using the CAST diagram.</i></li> </ul>   |            |

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|  |   |                   | <ul style="list-style-type: none"> <li>• <i>Students need to know how to solve using graphs of sine, cosine and tangent.</i></li> </ul>  |            |  |
| <p><b>Lesson 53: Equations and identities</b><br/>Lesson Objective: To learn how to solve quadratic equations in <math>\sin x</math>, <math>\cos x</math> and <math>\tan x</math>.</p> | <ul style="list-style-type: none"> <li>• Students will know how to factorise quadratic expressions in <math>\sin x</math>, <math>\cos x</math> and <math>\tan x</math>.</li> <li>• Students will know how to solve quadratic equations in <math>\sin x</math>, <math>\cos x</math> and <math>\tan x</math>.</li> <li>• Students will know how to find all possible solutions to quadratic equations in <math>\sin x</math>, <math>\cos x</math> and <math>\tan x</math>.</li> </ul> |                   | <ul style="list-style-type: none"> <li>• <i>Students need to know how to solve trigonometric equations.</i></li> <li>• <i>Students need to know how to use identities to simplify trigonometric expressions and equations.</i></li> <li>• <i>Students need to know how to use CAST diagram to find all the possible solutions in a given range.</i></li> <li>• <i>Students need to know how to use the graphs of sine, cosine and tangent to find all possible solutions in a given range.</i></li> <li>• <i>Students need to know how to factorise quadratic expressions.</i></li> <li>• <i>Students need to know how to solve quadratic equations.</i></li> <li>• <i>Students need to know how to rearrange formulae.</i></li> </ul> |            |  |