

4.3.3 Exact Trig

Name: _____ Class: _____ Date: _____

KEY WORDS exact value

<!-- Session 2 native-skill companion -->

Objective

Practise exact trig within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Exact trigonometric values from special triangles · Foundation

Bisect an equilateral triangle of side 2 to obtain a 30–60–90 triangle with sides 1,√3,2. A right isosceles triangle has sides 1,1,√2. Apply opposite/hypotenuse, adjacent/hypotenuse and opposite/adjacent to derive sine, cosine and tangent. Use degree angles and retain surds exactly; tan90° is undefined.

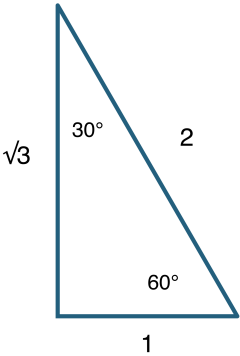
$\sin 30^\circ = \frac{1}{2}, \quad \cos 45^\circ = \frac{\sqrt{2}}{2}, \quad \tan 60^\circ = \sqrt{3}$

For angles 0°,30°,45°,60°,90°, sine values are 0,1/2,√2/2,√3/2,1; cosine values are 1,√3/2,√2/2,1/2,0. For 0°,30°,45°,60°, tangent values are 0,1/√3,1,√3. The side 1 opposite 30° in the bisected equilateral triangle gives sin30°=1/2; the adjacent √3 gives cos30°=√3/2 and tan30°=1/√3. In the isosceles right triangle, sin45°=cos45°=1/√2=√2/2. A right triangle with hypotenuse 10 and angle 30° has opposite side 5 and adjacent side 5√3. Since sin90°=1 and cos90°=0, tangent at 90° would divide by zero.

Sine and cosine interchange when the chosen acute angle changes to its complement. Do not turn √3 into a rounded decimal when an exact answer is required. Tangent at 90° is not zero.

AQA G21 is additional Foundation and includes the listed exact values. Derive them from labelled special triangles, then use them in G20 right-triangle calculations.

Bisected equilateral triangle: sides 1, √3, 2



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find sin30°.

2.2 (Foundation) Find tan45°.

2.3 (Foundation) Find the opposite length for hypotenuse 10 and angle 30°.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: All trigonometric functions have finite values at 90° .

Solutions

2.1 Opposite 1 divided by hypotenuse 2.

2.2 Equal opposite and adjacent sides give ratio 1.

2.3 $10 \times \sin 30^\circ = 5$.

3.1 False. $\sin 90^\circ = 1$ and $\cos 90^\circ = 0$, but $\tan 90^\circ = \sin 90^\circ / \cos 90^\circ$ is undefined.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.