Year 11 Mathematics Advanced

Topic: Trigonometric Identities and Equations (2 of 3)
Review Questions: Trigonometric equations
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

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6. Proving an identity, then solving an equation with it

Basic equations

1. Solving a basic trigonometric equation on a restricted domain

Q1 Abbotsleigh 2020 Trial Q1 · **1 mark**

What are the solutions to the equation $\sin x = \dfrac{\sqrt{3}}{2}$, for $0 \leq x \leq 2\pi$?

(A) $\dfrac{\pi}{6}, \dfrac{5\pi}{6}$

(B) $\dfrac{\pi}{3}, \dfrac{2\pi}{3}$

(C) $\dfrac{\pi}{4}, \dfrac{3\pi}{4}$

(D) $\dfrac{\pi}{2}, \dfrac{3\pi}{2}$

Q2 Barker 2024 Trial Q12 · **2 marks**

Solve the equation $2\cos\theta = 1$ for $0 \leq \theta \leq 2\pi$.

Q3 Sydney Boys 2022 Trial Q15 · **2 marks**

Solve $\cos\theta = -\dfrac{1}{2}$ for $0 \leq \theta \leq 2\pi$.

Q4 Baulkham Hills 2022 Prelim Q13 · **2 marks**

Solve $\sqrt{3}\tan\theta = 1$ for $0 \leq \theta \leq 2\pi$.

Q5 Hurlstone 2022 Prelim Q14(a) · **2 marks**

Solve $2\cos\theta = -\sqrt{3}$ for $-\pi \leq \theta \leq \pi$.

Q6 Hornsby Girls 2025 Trial Q20 · **3 marks**

Find all values of θ, where $0° \leq \theta \leq 360°$, such that $\cos(\theta - 30°) = \dfrac{\sqrt{3}}{2}$.

Q7 Barker 2024 Prelim Q20(a) · **2 marks**

Solve $\sin\theta - \sqrt{3}\cos\theta = 0$ for $0° \leq \theta \leq 360°$.

Q8 James Ruse 2024 Trial Q15(b) · **2 marks**

Solve $3\sin x + \sqrt{3}\cos x = 0$ over the domain $0 \leq x \leq 2\pi$.

Q9 2023 HSC Q20 · **3 marks**

Find all the values of θ, where $0° \leq \theta \leq 360°$, such that $\sin(\theta - 60°) = -\dfrac{\sqrt{3}}{2}$.

2. Equations with a multiple or compound angle

Q10 Trinity Grammar 2022 Trial Q7 · **1 mark**

What is the solution of $\sin 2x = 1$ in the domain $[0, 2\pi]$?

(A) $x = \dfrac{\pi}{4}, \dfrac{5\pi}{4}$

(B) $x = \dfrac{\pi}{4}, \dfrac{7\pi}{4}$

(C) $x = \dfrac{\pi}{2}, \dfrac{5\pi}{4}$

(D) $x = \dfrac{\pi}{4}, \dfrac{3\pi}{4}$

Q11 Shore 2023 Trial Q19 · **2 marks**

Solve $2 = 4\cos 3x$, in the interval $0 \leq x \leq \dfrac{\pi}{4}$.

Q12 North Sydney Boys 2024 Trial Q12 · **2 marks**

Solve the equation $\tan(2x) = \sqrt{3}$ in the domain $0 \leq x \leq \pi$.

Q13 Barker 2022 Trial Q20(b) · **2 marks**

Consider the graph of $f(x) = 3\sin\left(2x - \dfrac{\pi}{3}\right)$. Solve the equation $3\sin\left(2x - \dfrac{\pi}{3}\right) = 3$ over the domain $0 \leq x \leq \pi$.

Q14 St George Girls 2020 Trial Q17 · **3 marks**

Find the exact solutions to the equation $1 + 2\sin 3x = 2$ in the domain $0 \leq x \leq \pi$.

Q15 Manly 2020 Trial Q24 · **3 marks**

Solve $2\cos(3\theta) = -1$ for $0 \leq \theta \leq \pi$.

Q16 Sydney Tech 2022 Trial Q26 · **3 marks**

Solve $\cos\left(\frac{x}{2} - \frac{\pi}{4}\right) = \frac{1}{2}$ for $0 \leq x \leq 2\pi$.

Q17 Sydney Girls 2024 Trial Q17 · **3 marks**

If $0 \leq \theta \leq 2\pi$, solve $\sqrt{2}\cos\left(2\theta - \frac{\pi}{3}\right) - 1 = 0$.

Harder equations

3. Equations involving reciprocal ratios (sec, cosec, cot)

Q18 Killara 2023 Prelim Q20(b) · **2 marks**

Solve the following trigonometric equation for $0 \leq \theta \leq 2\pi$.

$$\operatorname{cosec}\theta = -2$$

Q19 Baulkham Hills 2024 Trial Q12 · **3 marks**

Solve the equation $2\sec\theta - 1 = 9$, $0 \leq \theta \leq 2\pi$. Give your answer correct to two decimal places.

Q20 Killara 2022 Prelim Q17(b) · **2 marks**

Solve the following equation for $0 \leq x \leq 2\pi$.

$$\sec x = -\frac{2}{\sqrt{3}}$$

Q21 North Sydney Girls 2022 Prelim Q14 · **2 marks**

Solve the equation $\sqrt{3}\operatorname{cosec} x = 2$ for $-2\pi \leq x \leq \pi$.

Q22 Hornsby Girls 2022 Trial Q24 · **2 marks**

Find the value(s) of x when $\cot^2 x + \operatorname{cosec}^2 x = 3$ for $0 \leq x \leq 2\pi$.

Q23 Knox 2021 Prelim Q11(b) · **2 marks**

Solve $4\sin x = 3\operatorname{cosec} x$ for $0 \leq x \leq 2\pi$.

Q24 Sydney Girls 2022 Trial Q22 · **4 marks**

Solve the equation $\sec\theta + 8\cos\theta = 6$ for $0 \leq \theta \leq 2\pi$. Answer correct to 3 decimal places, where necessary.

Q25 James Ruse 2020 Trial Q20 · **4 marks**

Solve $3\tan\theta - \cot\theta = 5$ for $0° \leq \theta \leq 360°$. Give your answers to the nearest degree.

4. Solving by factorising (common factor)

Q26 Hornsby Girls 2021 Prelim Q11 · **3 marks**

Solve $2\sin x\cos x = \sin x$ for $0° \leq x \leq 360°$.

Q27 North Sydney Boys 2024 Prelim Q18 · **2 marks**

Solve $(\sqrt{3}\tan\theta - 1)(\sqrt{2}\sin\theta + 1) = 0$ for $-180° \leq \theta \leq 180°$.

Q28 Pymble 2022 Prelim Q19 · **3 marks**

Solve $2\cos^2 x - \cos x = 0$ in the domain $[0, 2\pi]$.

Q29 Killara 2021 Prelim Q18 · **3 marks**

Solve $\sqrt{3}\sin^2\theta = \sin\theta\cos\theta$ for $0 \leq \theta \leq 2\pi$. Give your answers in radians.

Q30 Hornsby Girls 2022 Prelim Q26 · **3 marks**

Solve $3\cos^2\theta + 4\sin\theta\cos\theta = 0$ for $0° \leq \theta \leq 360°$.

Q31 Gosford 2025 Trial Q23 · **4 marks**

Let $(\tan\theta - 1)(\sqrt{3}\sin\theta - \cos\theta)(\sqrt{3}\sin\theta + \cos\theta) = 0$.

Find all solutions for $(\tan\theta - 1)(\sqrt{3}\sin\theta - \cos\theta)(\sqrt{3}\sin\theta + \cos\theta) = 0$, where $0 \leq \theta \leq \pi$.

5. Equations reducing to a quadratic

Q32 Manly 2024 Trial Q17 · **2 marks**

Solve $2\sin^2 x - 1 = 0$ for $-180° \leq x \leq 180°$.

Q33 Sydney Tech 2020 Trial Q17 · **2 marks**

Solve the equation $\tan^2 x = 3$ for $0 \leq x \leq 2\pi$.

Q34 Cherrybrook Tech 2020 Trial Q18 · **2 marks**

Solve $2\cos^2\alpha - 3\cos\alpha - 2 = 0$ for $0 \leq \alpha \leq \pi$.

Q35 Baulkham Hills 2021 Prelim Q15 · **2 marks**

Solve $2\sin^2 x + \sin x - 1 = 0$ for $0 \leq x \leq 2\pi$.

Q36 Knox 2022 Prelim Q13(e) · **3 marks**

Solve the following equation for θ in the domain $0 \leq \theta \leq 2\pi$.

$$2\cos^2 \theta - \sin \theta - 1 = 0.$$

Q37 North Sydney Girls 2023 Trial Q19 · **3 marks**

Solve $2\sin^2 x - \sin x = 1$ for $x \in [0, 2\pi]$.

Q38 Baulkham Hills 2024 Prelim Q24 · **3 marks**

Solve $2\sin^2 t = 3\cos t$, where $0 \leq t \leq 2\pi$.

Q39 Fort St 2021 Prelim Q4(b) · **4 marks**

Solve $6\sin^2 \theta - \sin \theta - 1 = 0$ for $0° \leq \theta \leq 360°$, correct to the nearest degree.

Q40 Killara 2024 Prelim Q34 · **3 marks**

Solve for y in the following quadratic equation for $0° \leq y \leq 360°$ using trigonometric identities.

$$\sin^2 y + \sqrt{3}\sin y + 1 - \cos^2 y = 0.$$

6. Proving an identity, then solving an equation with it

Q41 Fort St 2022 Trial Q16 · **5 marks**

(a) Show that $(\text{cosec}^2 \theta - 1)\sin^2 \theta = \cos^2 \theta$.

(b) Hence, or otherwise solve $(\text{cosec}^2 \theta - 1)\sin^2 \theta = \dfrac{3}{4}$ for $-\pi \leq x \leq \pi$.

Q42 St George Girls 2023 Prelim Q23 · **4 marks**

(a) Show that $2\cos^2\theta + \sin\theta = 2 + \sin\theta - 2\sin^2\theta$.

(b) Hence or otherwise solve $2\cos^2\theta + \sin\theta = 1$ given that $0 \leq \theta \leq \pi$.

Q43 Killara 2022 Prelim Q26 · **5 marks**

(a) Show that $2\cos^2 x - 3\sin^2 x + 1 = 5\cos^2 x - 2$.

(b) Hence, solve the following equation for $0° \leq x \leq 360°$, giving answers to the nearest degree.

$$2\cos^2 x - 3\sin^2 x + 1 = 0$$

Q44 Abbotsleigh 2024 Prelim Q28 · **4 marks**

(a) Show that $\tan^2 A\,(1 - \sin^2 A) = \sin^2 A$.

(b) Hence, or otherwise, solve $4\tan^2 A\,(1 - \sin^2 A) = 1$, for $0 \leq A \leq 2\pi$.

Q45 Fort St 2023 Trial Q33 · **3 marks**

(a) Show that $\dfrac{\cos^2\theta}{1-\sin\theta} - \dfrac{\cos^2\theta}{1+\sin\theta} = 2\sin\theta$.

(b) Hence solve $\dfrac{\cos^2\theta}{1-\sin\theta} - \dfrac{\cos^2\theta}{1+\sin\theta} = 1$ for $0 \leq \theta \leq \dfrac{\pi}{2}$.

Q46 North Sydney Girls 2020 Trial Q17 · **5 marks**

(a) Show that the equation $\dfrac{4\cos\theta}{\tan\theta} + 15 = 0$ can be expressed as $4\sin^2\theta - 15\sin\theta - 4 = 0$.

(b) Hence solve the equation $\dfrac{4\cos\theta}{\tan\theta} + 15 = 0$ for $0 \leq \theta \leq 2\pi$.

Q47 Loreto Kirribilli 2022 Prelim Q33 · **5 marks**

(a) Show that $\dfrac{\cos\theta}{1+\sin\theta} + \dfrac{1+\sin\theta}{\cos\theta} = 2\sec\theta$.

(b) Hence, solve $\dfrac{\cos\theta}{1+\sin\theta} + \dfrac{1+\sin\theta}{\cos\theta} = 2$ for $0° \leq \theta \leq 360°$.

Q48 Penrith 2025 Trial Q12 · **5 marks**

(a) Show that $\dfrac{1}{1-\sin x} + \dfrac{1}{1+\sin x} = 2\sec^2 x$.

(b) Hence, solve $\dfrac{1}{1-\sin x} + \dfrac{1}{1+\sin x} = 8$ for $0° \leq x \leq 360°$.