Year 11 Mathematics Extension 1

Topic: Further Trigonometry (1 of 4)
Review Questions: Trigonometry in Three Dimensions
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.

Contents

Trigonometry in three dimensions

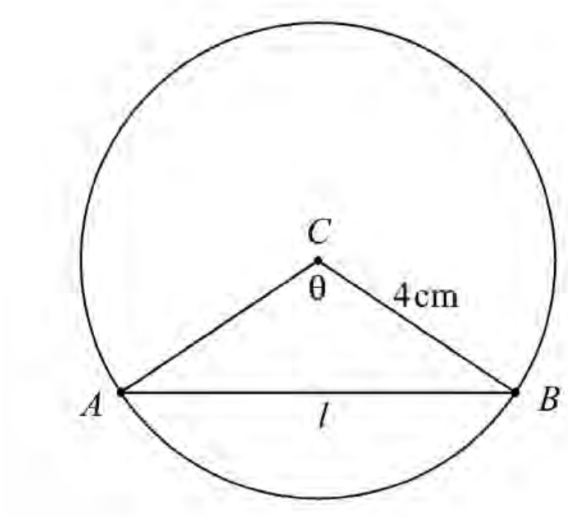
1. Solving problems in three dimensions

Trigonometry in three dimensions

1. Solving problems in three dimensions

Q1 2023 Hurlstone Trial Q11c(i) · 1 mark

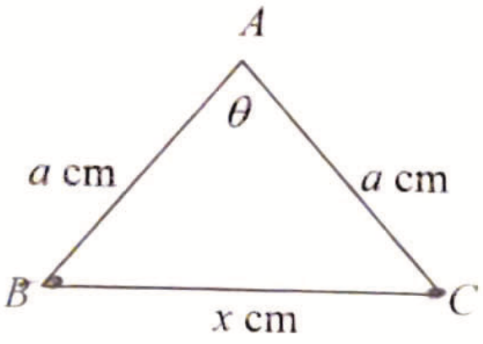
In the diagram, C is the centre of a circle of radius 4 cm and $\angle ACB = \theta$ radians. The length of chord AB is l cm.



Show that the length l of AB is given by $l = 4\sqrt{2 - 2\cos\theta}$.

Q2 2022 Shore Trial Q14c(i) · 1 mark

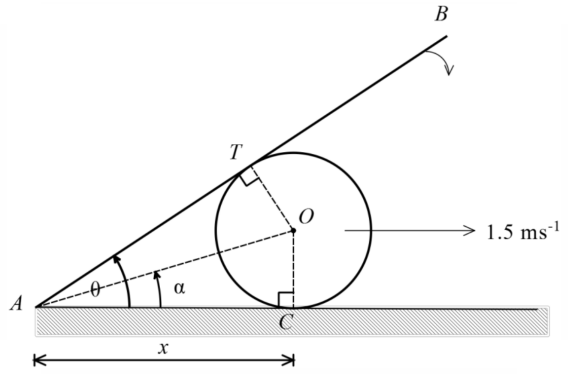
In the triangle ABC, $AB = AC = a$ cm. The angle BAC is increasing at the rate of 2 radians/min. Let $\angle BAC = \theta$ radians and $BC = x$ cm.



Show that $x = a\sqrt{2 - 2\cos\theta}$.

Q3 2024 Trinity Grammar Trial Q14b(i) · **1 mark**

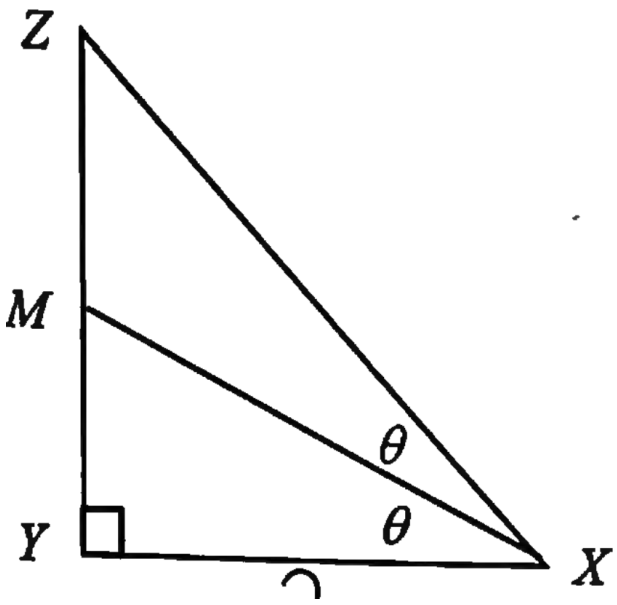
A rod AB is leaning on a metal disc of radius 1 m, as shown in the diagram below. The centre of the disc is at O. One end of the rod, A, is fixed to the ground, while the disc is tangential to the ground at C, such that $\angle ACO = \angle ATO = 90°$. Let $\angle OAC = \alpha$, $\angle BAC = \theta$ and $AC = x$.



Write an expression for $\tan\alpha$ in terms of x.

Q4 2022 Knox Trial Q14b · **3 marks**

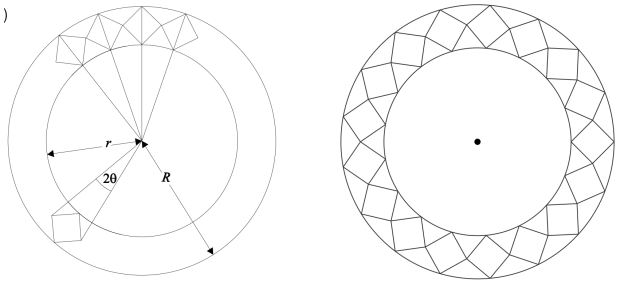
XYZ is a right-angled triangle, with the right angle at Y and M located along YZ as shown. The lengths of XY and YZ are $\sqrt{2}$ cm and 2 cm respectively. It is also known that $\angle MXY = \angle ZXM$.



Find the exact length of MY.

Q5 2021 Sydney Grammar Trial Q14d · **3 marks**

The diagram shows two concentric circles with radii R and r, $R > r > 0$. In the annulus between these circles n unit squares are arranged. One diagonal of each square lies on a radius of the larger circle, and the two circles intersect each square at the two vertices at the ends of this diagonal. Each square subtends an angle of 2θ at the common centre of the circles. Each adjacent pair of squares intersects precisely once at a common vertex. (The case $n = 17$ is shown completed on the right.)

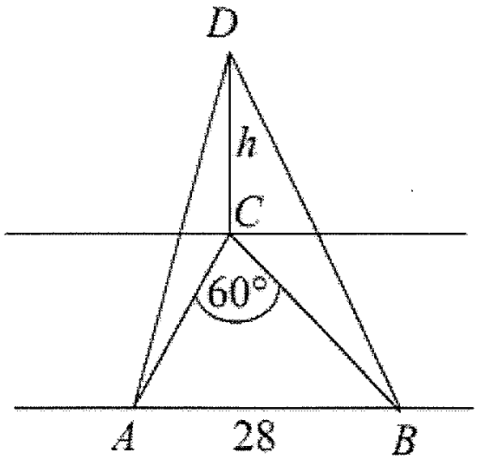


(i) Show that $r = \dfrac{1}{\sqrt{2}}\left(\dfrac{1}{\tan\theta} - 1\right)$.

(ii) Find a similar expression for R and hence show that $\dfrac{R}{r} = \dfrac{1 + \tan\theta}{1 - \tan\theta}$.

Q6 2022 Girraween Prelim Q8b · **8 marks**

A canal has two parallel sides. A vertical pole CD of height h metres stands with its base at C on one edge of the canal. A and B are two points on the other edge of the canal such that $AB = 28$ metres and $\angle ACB = 60°$. From A and B the angles of elevation of the top D of the pole are α and β respectively, where $\tan\alpha = \frac{1}{3}$ and $\tan\beta = \frac{1}{8}$.



(i) Use the cosine rule to show that the height of the pole is 4 metres.

(ii) Find the area of $\triangle ACB$.

(iii) Hence find the width of the canal in simplest exact form.