

A Level Maths Pure 2: Trigonometry, Sequences and Vectors Practice Exam

Pearson Edexcel A Level Mathematics (9MA0) · 22 questions · 60 marks

Name _____

Date _____

Score / 60

- Answer every question. Show your working: most marks are for method.
- Calculator allowed.
- Topics: The number e and $y=e^x$; Graphs of $\sin$, $\cos$ and $\tan$; Fundamental trig identities; Reciprocal trig functions; Inverse trig functions; Exponential functions and graphs; Logarithms and the laws of logs; Linearising data with logs; Sine and cosine rules; Area of a triangle; Radian measure, arc length and sector area; Solving basic trig equations; Compound angle formulae; Double angle formulae; Small angle approximations; Solving equations using logarithms; Exponential growth and decay models; Position vectors and geometry problems; Locating roots by change of sign; Staircase and cobweb diagrams; Solving quadratic-form trig equations; Iteration $x = g$.
- The mark scheme is a separate free PDF: [alevelmathrevision.com/alevel-frontend/downloads/practice-exams/9ma0/a-level-maths-pure-2-trigonometry-sequences-and-vectors-practice-exam-mark-scheme.pdf](https://www.alevelmathrevision.com/alevel-frontend/downloads/practice-exams/9ma0/a-level-maths-pure-2-trigonometry-sequences-and-vectors-practice-exam-mark-scheme.pdf)

1. The exponential function takes the value 7 at one point. Solve $e^x = 7$, stating the exact answer as a logarithm and its value to 3 s.f. [2]

2. Explain why the equation $\sin\left(\frac{x}{2}\right) = -0.4$ has exactly two solutions in the interval $0 \leq x \leq 720^\circ$. [2] [2]

3. By factorising the left-hand side as a difference of two squares, establish the identity $\sin^4 x - \cos^4 x \equiv \sin^2 x - \cos^2 x$. [2] [2]

4. Show that $\frac{\sec^2 x - 1}{\sec^2 x} \equiv \sin^2 x$. [2] [2]

5. Let $\theta = \arccos \frac{1}{3}$. Explain why $\sin \theta$ is positive and hence evaluate $\sin\left(\arccos \frac{1}{3}\right)$ exactly. [2] [2]



6. Show that the curve $y = 3^{x-2}$ is the image of $y = 3^x$ under a stretch parallel to the y -axis, and state its scale factor. [2]
7. Use the laws of logarithms to prove that $\log_a \left(\frac{1}{x} \right) = -\log_a x$ for $x > 0$. [2]
8. Exponentiate both sides of $\ln y = 3 \ln x - 2$ and simplify, so that y is a constant multiple of a power of x . [2]
9. A triangle has sides of length 5 cm, 7 cm and 9 cm. Find the size of its largest angle, giving your answer in degrees to 1 decimal place. [3]
10. A regular pentagon is drawn with all five of its vertices on a circle of radius 5 cm. By splitting the pentagon into five triangles that meet at the centre of the circle, find the area of the pentagon, giving your answer to 3 significant figures. [3]
11. The chord AB of a circle with centre O and radius 6 cm subtends an angle of $\frac{\pi}{3}$ radians at O . Find the exact area of the minor segment cut off by the chord AB . [3]
12. Solve $\cos(x - 40^\circ) = 0.5$ for $0 \leq x < 360^\circ$. [3]
13. Prove that $\sin(x + 30^\circ) + \cos(x + 60^\circ) \equiv \cos x$. [3]



- 14.** Using one double angle formula in the numerator and another in the denominator, prove [3]

$$\frac{1 - \cos 2x}{\sin 2x} \equiv \tan x. \quad [3]$$
- 15.** When θ (in radians) is close to zero, the ratio $\frac{1 - \cos 2\theta}{\theta \tan \theta}$ is close to a whole number. Show that [3]

$$\frac{1 - \cos 2\theta}{\theta \tan \theta} \approx 2. \quad [3]$$
- 16.** Find the value of x for which seven to the power x is twice five to the power x , that is $7^x = 2 \times 5^x$, to 3 [3]
 significant figures. [3]
- 17.** The mass of a radioactive substance is modelled by $m = m_0 e^{-kt}$, where t is the time in days. The [3]
 mass halves every 8 days. Find the exact value of k , and its value to 3 significant figures. [3]
- 18.** Use vectors to show that the points $A(1, 2)$, $B(4, 8)$ and $C(6, 12)$ lie on a straight line. [3] [3]
- 19.** Given that $g(x) = 2^x - 3x$, show that the equation $g(x) = 0$ has a root in the interval $[0, 1]$ and another [3]
 root in the interval $[3, 4]$. [3]
- 20.** The equation $x^2 - x - 2 = 0$ has a root $x = 2$. A student uses $x_{n+1} = x_n^2 - 2$ with $x_0 = 2.1$. Find x_1 and [3]
 x_2 , and explain why the iteration does not converge to 2. [3]



21. Multiply $\tan x + \frac{2}{\tan x} = 3$ by $\tan x$ to form a quadratic, then find the four solutions with $0 < x < 360^\circ$, [4]
to 1 d.p. where not exact. [4]

22. (a) Show that the equation $x^2 - 6x + 2 = 0$ can be written in the form $x = \frac{x^2 + 2}{6}$. [1] [4]
(b) Using $x_{n+1} = \frac{x_n^2 + 2}{6}$ with $x_0 = 0.5$, find x_1 , x_2 and x_3 , giving x_2 and x_3 to 4 decimal places. [3]

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