



QUESTION WORKBOOK

The t-formulae

Further Pure 1 · Year FM

6 questions · 20 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 Write down $\sin \theta$, $\cos \theta$ and $\tan \theta$ in terms of $t = \tan(\theta/2)$. [2]

A2 Given that $t = \tan(\theta/2) = 2$, find $\sin \theta$ and $\cos \theta$ exactly. [3]

SECTION B · Standard

B1 Use the t-formulae to solve $3 \cos \theta - 4 \sin \theta = 5$ for $0 \leq \theta < 2\pi$, giving the answer to 3 significant figures. [4]

B2 Explain why the substitution $t = \tan(\theta/2)$ cannot find a solution at $\theta = \pi$, and state what should be done about it. [3]

B3 Show that $\tan 22.5^\circ = \sqrt{2} - 1$, using the t-formula for $\tan \theta$ with $\theta = 45^\circ$. [4]

SECTION C · Stretch

C1 Prove the identity $(1 + \operatorname{cosec} \theta)/\cot \theta \equiv (1 + \tan(\theta/2))/(1 - \tan(\theta/2))$. [4]