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QUESTION WORKBOOK

# The t-formulae

Further Pure 1 · Year FM

6 questions · 25 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

**A1** Write down  $\sin \theta$ ,  $\cos \theta$  and  $\tan \theta$  in terms of  $t = \tan(\theta/2)$ . [3]

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**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. [6]

- 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]

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- 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  $(1 + \operatorname{cosec} \theta)/\cot \theta \equiv (1 + \tan(\theta/2))/(1 - \tan(\theta/2))$ . [6]