HALF-ANGLE FORMULAE - THE t FORMULAE

1 If $t = \tan\frac{A}{2}$, then $\sin A + \cos A = \ldots$

A $\frac{1+2t-t^2}{1+t^2}$ **B** $\frac{t^2-2t+1}{1+t^2}$ **C** $\frac{(1-t)^2}{1+t^2}$ **D** $\frac{(1+t)^2}{1+t^2}$

2 Simplify:

(a) $\frac{2\tan 9°}{1-\tan^2 9°}$ **(b)** $\frac{1-\tan^2 15°}{1+\tan^2 15°}$ **(c)** $\frac{1+\tan^2 22.5°}{2\tan 22.5°}$

3 If $t = \tan\frac{A}{2}$, express each of the following in terms of t:

(a) $\sin A - \cos A$ **(b)** $3\sin A + 4\cos A$ **(c)** $2\cos A - \sin A$ **(d)** $\cot A$

3 If $t = \tan\frac{A}{2}$, express each of the following in terms of t:

(e) $\cot A - \tan A$ **(f)** $\dfrac{\cot A - \tan A}{\cot A + \tan A}$ **(g)** $1 - \frac{1}{2}\sin A \tan\frac{A}{2}$ **(h)** $1 + \tan A \tan\frac{A}{2}$

3 If $t = \tan\frac{A}{2}$, express each of the following in terms of t:

(i) $\dfrac{\tan A - \tan\frac{A}{2}}{\cot\frac{A}{2} + \tan A}$ **(j)** $\cot\frac{A}{2} - 2\cot A$ **(k)** $\dfrac{1+\sin A+\cos A}{1+\sin A-\cos A}$ **(l)** $\dfrac{\sin A+\sin\frac{A}{2}}{1+\cos A+\cos\frac{A}{2}}$

6 If $t = \tan\frac{A}{2}$, solve for t the equation $12\tan A = 5$, $180° < A < 270°$.

8 If $\sec\theta - \tan\theta = x$, prove that $x = \dfrac{1-t}{1+t}$.