DOUBLE ANGLE FORMULAE

1 **(a)** By writing $\sin 3\theta$ as $\sin(2\theta + \theta)$, write $\sin 3\theta$ in terms of $\sin\theta$.

(b) Hence write $\cos 3\theta$ in terms of $\cos\theta$. **(c)** Hence write $\tan 3\theta$ in terms of θ.

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2 If $\sin\theta = \frac{3}{4}$, $90° < \theta < 180°$, evaluate (in surd form):

(a) $\sin 2\theta$ **(b)** $\cos 2\theta$ **(c)** $\tan 2\theta$. **(d)** In which quadrant is 2θ?

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3 Simplify:

(a) $\dfrac{\sin 2A}{1+\cos 2A}$ **(b)** $\frac{1}{2}\sin 2\theta \tan\theta$ **(c)** $\cos^2 2\theta - \sin^2 2\theta$ **(d)** $\cos^2 30° - \sin^2 30°$

(e) $\sin 4x \cos 4x$ **(f)** $1 + \cos(180° + 2\theta)$ **(g)** $\sin x \cos x \cos 2x$ **(h)** $2\sin 2x \cos 2x$

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3 Simplify:

(i) $(\sin\theta+\cos\theta)^2$ **(j)** $(\sin A-\cos A)^2$ **(k)** $\dfrac{2\tan\theta}{1-\tan^2\theta}$ for $\theta=22.5°$ **(l)** $\sin^2 50°+\sin^2 40°$

(m) $\sin(45°-x)\cos(45°-x)$ **(n)** $\dfrac{1-\cos 2\theta}{1+\cos 2\theta}$ **(o)** $2\cos^2 3x-1$

4 If $\sin\theta = \frac{3}{5}, \frac{\pi}{2} \leq \theta \leq \pi$ and $\tan\phi = \frac{7}{24}, 0 \leq \phi \leq \frac{\pi}{2}$, find the value of:

(a) $\sin(\theta - \phi)$ **(b)** $\cos(\theta - \phi)$ **(c)** $\tan(\theta - \phi)$

5 Simplify:

(a) $1+\tan^2\left(\frac{\pi}{2}-\alpha\right)$ **(b)** $1-\cos^2(\pi+\theta)$ **(c)** $\sin\theta\cos\left(\frac{\pi}{2}-\theta\right)+\cos\theta\sin\left(\frac{\pi}{2}-\theta\right)$

(d) $2\cos^2\frac{\pi}{6}-1$ **(e)** $1-\sin\theta\cos\left(\frac{\pi}{2}-\theta\right)$ **(f)** $\sin(\pi-\theta)\cos\phi-\cos(\pi-\theta)\sin\phi$