SIMPLIFYING TRIGONOMETRIC EXPRESSIONS

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

EXERCISE 11C.1

1 Simplify:

a $\sin\theta + \sin\theta$ **b** $2\cos\theta + \cos\theta$

d $3\sin\theta - 2\sin\theta$ **e** $\tan\theta - 3\tan\theta$

2 Simplify:

a $3\sin^2\theta + 3\cos^2\theta$ **b** $-2\sin^2\theta - 2\cos^2\theta$

d $3 - 3\sin^2\theta$ **e** $4 - 4\cos^2\theta$

g $\cos^2\theta - 1$ **h** $\sin^2\theta - 1$

j $\dfrac{1 - \sin^2\theta}{\cos^2\theta}$ **k** $\dfrac{1 - \cos^2\theta}{\sin\theta}$

3 Simplify:

a $3\tan x - \dfrac{\sin x}{\cos x}$ **b** $\dfrac{\sin^2 x}{\cos^2 x}$

d $\dfrac{\sin x}{\tan x}$ **e** $3\sin x + 2\cos x\tan x$

4 Expand and simplify if possible:

a $(1 + \sin\theta)^2$ **b** $(\sin\alpha - 2)^2$

d $(\sin\alpha + \cos\alpha)^2$ **e** $(\sin\beta - \cos\beta)^2$

5 Expand and simplify: $(\sin x + \tan x)(\sin x - \tan x)$

EXERCISE 11C.2

1 Factorise:

a $1 - \sin^2\theta$ **b** $\sin^2\alpha - \cos^2\alpha$

d $2\sin^2\beta - \sin\beta$ **e** $2\cos\phi + 3\cos^2\phi$

g $\tan^2\theta + 5\tan\theta + 6$ **h** $2\cos^2\theta + 7\cos\theta + 3$

2 Simplify:

a $\dfrac{1 - \sin^2\alpha}{1 - \sin\alpha}$ **b** $\dfrac{\tan^2\beta - 1}{\tan\beta + 1}$

d $\dfrac{\cos^2\phi - \sin^2\phi}{\cos\phi - \sin\phi}$ **e** $\dfrac{\sin\alpha + \cos\alpha}{\sin^2\alpha - \cos^2\alpha}$

3 Show that:

a $(\cos\theta + \sin\theta)^2 + (\cos\theta - \sin\theta)^2$ simplifies to 2

b $(2\sin\theta + 3\cos\theta)^2 + (3\sin\theta - 2\cos\theta)^2$ simplifies to 13

c $(1 - \cos\theta)\left(1 + \dfrac{1}{\cos\theta}\right)$ simplifies to $\tan\theta\sin\theta$

EXERCISE 11C.1

1 **a** $2\sin\theta$ **b** $3\cos\theta$ **c** $2\sin\theta$ **d** $\sin\theta$
e $-2\tan\theta$ **f** $-3\cos^2\theta$

2 **a** 3 **b** -2 **c** -1 **d** $3\cos^2\theta$
e $4\sin^2\theta$ **f** $\cos\theta$ **g** $-\sin^2\theta$ **h** $-\cos^2\theta$
i $-2\sin^2\theta$ **j** 1 **k** $\sin\theta$ **l** $\sin\theta$

3 **a** $2\tan x$ **b** $\tan^2 x$ **c** $\sin x$ **d** $\cos x$
e $5\sin x$ **f** $\dfrac{2}{\cos x}$

4 **a** $1+2\sin\theta+\sin^2\theta$ **b** $\sin^2\alpha-4\sin\alpha+4$
c $\tan^2\alpha-2\tan\alpha+1$ **d** $1+2\sin\alpha\cos\alpha$
e $1-2\sin\beta\cos\beta$ **f** $-4+4\cos\alpha-\cos^2\alpha$

5 $\sin^2 x-\tan^2 x$

EXERCISE 11C.2

1 **a** $(1-\sin\theta)(1+\sin\theta)$
b $(\sin\alpha+\cos\alpha)(\sin\alpha-\cos\alpha)$
c $(\tan\alpha+1)(\tan\alpha-1)$ **d** $\sin\beta(2\sin\beta-1)$
e $\cos\phi(2+3\cos\phi)$ **f** $3\sin\theta(\sin\theta-2)$
g $(\tan\theta+3)(\tan\theta+2)$ **h** $(2\cos\theta+1)(\cos\theta+3)$
i $(3\cos\alpha+1)(2\cos\alpha-1)$

2 **a** $1+\sin\alpha$ **b** $\tan\beta-1$ **c** $\cos\phi-\sin\phi$
d $\cos\phi+\sin\phi$ **e** $\dfrac{1}{\sin\alpha-\cos\alpha}$ **f** $\dfrac{\cos\theta}{2}$