

Expand and simplify the following:

**1** a  $(\sqrt{2} + 3)(\sqrt{2} + 1)$

c  $(\sqrt{7} - 2)(\sqrt{7} - 5)$

e  $(\sqrt{7} - \sqrt{2})(\sqrt{5} - \sqrt{2})$

g  $(5 + \sqrt{2})(\sqrt{3} + \sqrt{2})$

i  $(\sqrt{6} - \sqrt{2})(5 - \sqrt{6})$

b  $(\sqrt{3} + 5)(\sqrt{3} - 1)$

d  $(\sqrt{2} + \sqrt{3})(\sqrt{2} + \sqrt{5})$

f  $(\sqrt{10} + \sqrt{2})(\sqrt{5} + \sqrt{3})$

h  $(2 - \sqrt{3})(2 - \sqrt{5})$

j  $(\sqrt{2} + \sqrt{3})(2\sqrt{2} + 1)$

**2** a  $(\sqrt{2} + 1)^2$

d  $(\sqrt{3} + \sqrt{2})^2$

g  $(2\sqrt{3} + 1)^2$

j  $(2\sqrt{2} + \sqrt{7})^2$

m  $(5\sqrt{3} + 2\sqrt{2})^2$

p  $(\sqrt{x} + \sqrt{y})^2$

b  $(\sqrt{3} - 5)^2$

e  $(\sqrt{5} - \sqrt{2})^2$

h  $(3\sqrt{2} - 4)^2$

k  $(3\sqrt{5} + \sqrt{10})^2$

n  $(7\sqrt{3} - 2\sqrt{5})^2$

q  $(2\sqrt{m} + 5)^2$

c  $(\sqrt{5} + 2)^2$

f  $(\sqrt{3} + \sqrt{10})^2$

i  $(5 + 2\sqrt{5})^2$

l  $(\sqrt{7} - 3\sqrt{5})^2$

o  $(5\sqrt{10} - 10\sqrt{3})^2$

r  $(3\sqrt{p} - 2\sqrt{q})^2$

**3** a  $(\sqrt{2} + 1)(\sqrt{2} - 1)$

c  $(\sqrt{10} - 7)(\sqrt{10} + 7)$

e  $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$

g  $(\sqrt{10} - \sqrt{8})(\sqrt{10} + \sqrt{8})$

i  $(2\sqrt{3} - 5)(2\sqrt{3} + 5)$

b  $(5 + \sqrt{3})(5 - \sqrt{3})$

d  $(4 - \sqrt{2})(4 + \sqrt{2})$

f  $(\sqrt{7} - \sqrt{5})(\sqrt{7} + \sqrt{5})$

h  $(\sqrt{11} + \sqrt{7})(\sqrt{11} - \sqrt{7})$

j  $(6 - 3\sqrt{2})(6 + 3\sqrt{2})$

**1** Rationalise the denominator for each of the following:

a  $\frac{1}{\sqrt{2}}$

b  $\frac{1}{\sqrt{5}}$

c  $\frac{2}{\sqrt{3}}$

d  $\frac{5}{\sqrt{10}}$

e  $\frac{3}{\sqrt{2}}$

f  $\frac{6}{\sqrt{3}}$

g  $\frac{10}{\sqrt{5}}$

h  $\frac{2}{\sqrt{11}}$

i  $\frac{\sqrt{2}}{\sqrt{3}}$

j  $\frac{\sqrt{3}}{\sqrt{5}}$

k  $\frac{\sqrt{5}}{\sqrt{10}}$

l  $\frac{\sqrt{3}}{\sqrt{15}}$

m  $\frac{1}{2\sqrt{2}}$

n  $\frac{2}{5\sqrt{3}}$

o  $\frac{7}{2\sqrt{5}}$

p  $\frac{10}{2\sqrt{3}}$

q  $\frac{\sqrt{6}}{2\sqrt{3}}$

r  $\frac{\sqrt{5}}{5\sqrt{2}}$

s  $\frac{2\sqrt{3}}{3\sqrt{2}}$

t  $\frac{5\sqrt{7}}{3\sqrt{5}}$

u  $\frac{2 + \sqrt{3}}{\sqrt{3}}$

v  $\frac{1 + \sqrt{5}}{\sqrt{2}}$

w  $\frac{\sqrt{7} + \sqrt{3}}{2\sqrt{7}}$

x  $\frac{\sqrt{10} - \sqrt{5}}{5\sqrt{10}}$

**1** Express with a rational denominator.

a  $\frac{1}{1 + \sqrt{2}}$

b  $\frac{1}{\sqrt{3} - 1}$

c  $\frac{1}{\sqrt{7} - \sqrt{5}}$

d  $\frac{1}{\sqrt{10} + \sqrt{2}}$

e  $\frac{3}{\sqrt{3} + 2}$

f  $\frac{5}{5 - \sqrt{2}}$

g  $\frac{10}{\sqrt{5} - \sqrt{2}}$

h  $\frac{12}{\sqrt{7} - \sqrt{3}}$

i  $\frac{1}{2\sqrt{3} + 5}$

j  $\frac{2}{5 - 2\sqrt{2}}$

k  $\frac{3}{3\sqrt{2} + 2\sqrt{3}}$

l  $\frac{1}{4\sqrt{3} - 3\sqrt{2}}$

m  $\frac{5 + \sqrt{2}}{5 - \sqrt{2}}$

n  $\frac{4 + \sqrt{3}}{4 - \sqrt{3}}$

o  $\frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}}$

p  $\frac{3\sqrt{2} - \sqrt{3}}{3\sqrt{2} + \sqrt{3}}$