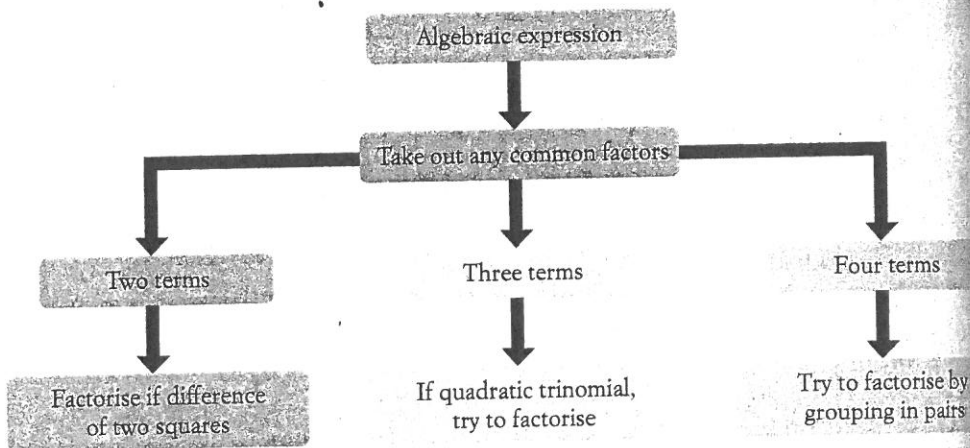## Summary

Factorisation strategies

- Look for any common factors and factorise first
- If there are two terms, try factorising using the difference of two squares
- If there are three terms, try factorising as a quadratic trinomial
- If there are four terms, try factorising by grouping in pairs

Algebraic expression

↓

Take out any common factors

Two terms | Three terms | Four terms

Factorise if difference of two squares | If quadratic trinomial, try to factorise | Try to factorise by grouping in pairs

Exercise 3-14   Mixed factorisations

See Example 31

1. Factorise each expression.

a $m^2 - 16m + 64$
b $3d^2 - 3d$
c $3d^2 - 4d - 15$
d $3k - 15 - 5h + hk$
e $25y^2 - 64$
f $100f^2 - 64$
g $q^2 + 3q - 3pq$
h $3 + 2g - g^2$
i $24b^2 + 44b - 40$
j $25r^2 - 1$
k $b^3 + b^2 + b + 1$
l $4x^2 - 20x + 25$
m $4 - d - 5d^2$
n $b^3 - b^2 - b + 1$
o $8 - 2v^2$
p $mn^2 + mnp + 3mn + 3mp$
q $2w^2 - 24w + 72$
r $36h^2 + 12h + 1$

2. Factorise each expression.

a $15r^2 - 31rt - 24t^2$
b $4d^2 + 4d + 1$
c $9g^2 - 36k^2$
d $e^3 - 3e^2 - 10e$
e $5(p + q)^2 - 125(p - q)^2$
f $28x^2 - 7$
g $a^2 - b^2 + 4a - 4b$
h $c^3 - 2c^2 - 4c + 8$
i $6a^2 + 13a - 5$
j $t^2 - 3t + 5t - 35$
k $18p^2 + 24p + 8$
l $1 - 2a - 24a^2$
m $9x^2 - 27x + 18x - 54$
n $2a^2b - 6ab - 3a + 9$
o $2a^2 + 12a + 18$
p $25u^2 - 10u + 1$
q $4k^2 - 5k - 21$
r $48 - 3w^2$
s $3 - 27s^2$
t $k^3 + 4k^2 - 16k - 64$
u $5y^3 - 10y^2 + 15y$
v $m^3n - 4mn$
w $8 - 2a^2$
x $32c^2 - 40c - 12$

9780170193085

Answers

i $(n+10)(n+1)$

j $(a+6)(a+5)$

k $(d+4)(d+6)$

l $(y+4)(y+11)$

3 a $(y-3)(y+1)$

b $(r-7)(r+2)$

c $(h-4)(h+1)$

d $(w-9)(w+2)$

e $(e-9)(e+3)$

f $(a-6)(a+2)$

4 a $(x+4)(x-1)$

b $(t+8)(t-3)$

c $(m+5)(m-3)$

d $(a+2)(a-1)$

e $(k+7)(k-2)$

f $(w+6)(w-2)$

g $(m-4)(m-1)$

h $(w-2)(w-4)$

i $(k-3)(k-4)$

j $(p-6)(p-4)$

k $(n-2)(n-1)$

l $(a-1)^2$

5 a $(m+2)^2$ b $(p+10)^2$ c $(a-5)^2$

6 a $3(m+1)(m+2)$

b $2(y+2)(y-1)$

c $5(t-10)(t+8)$

d $5e^2(e+8)(e-3)$

e $x(x-11)(x+10)$

f $4(b-7)(b+6)$

g $4(w+4)(w-3)$

h $3a(a-4)(a+1)$

i $2(e+5)(e+4)$

j $-(t+8)(t-3)$

k $-(u-7)(u+6)$

l $-(x-7)(x+4)$

m $-(b+4)(b-3)$

n $-(k-3)(k-4)$

o $-(x-5)(x-7)$

7 a $(h-6)(h+3)$

b $-(t+9)(t-2)$

c $(w+1)(w+7)$

d $5e^2(e+8)(e-3)$

e $(k+3)(k-15)$

f $3(c+5)^2$

g $(q-1)(q-5)$

h $(a-3)(a-1)$

i $6(x+8)(x-2)$

j $(x-8)^2$

k $8(u-4)(u+1)$

l $(b+5)(b+6)$

m $(y-6)^2$

n $5(r-2)(r+1)$

o $4l(l-4)(l+2)$

p $(g-20)(g-4)$

q $-2(d-6)(d+9)$

r $-(n+2)(n-13)$

Exercise 3-13

1 a $(x+5)(2x+1)$

b $(x+3)(4x+1)$

c $(x+3)(5x+2)$

d $(6x+5)(3x+2)$

e $(w+15)(2w+1)$

f $(e+3)(4e+3)$

g $(2f+3)(4f+1)$

h $(d+1)(3d+2)$

i $(b+1)(2b+7)$

j $(y+1)(5y+11)$

k $(4g+3)(2g+5)$

l $(3a+7)(2a+3)$

2 a $(y-4)(2y-3)$

b $(2k-3)(5k-2)$

c $(2e-3)(3e-2)$

d $(b-3)(4b-1)$

e $(w-3)(6w-5)$

f $(2t+5)(4t+3)$

g $(3x-2)^2$

h $(3f-4)(4f-3)$

i $(2h-9)^2$

j $(y+1)(5y-11)$

k $(4d-5)(d+1)$

l $(2m+3)(m-3)$

m $(3t-10)(t+3)$

n $(6h-7)(h+1)$

o $(y-4)(2y+3)$

p $(2a+1)(4a-3)$

q $(5u-4)(3u+1)$

r $(3c+1)(3c-5)$

3 a $(5m+7)(m-1)$

b $(3g-4)(2g+3)$

c $(3p-2)(p+2)$

d $(7w-1)(w+1)$

e $(5y-1)(y+3)$

f $(3n-2)(n+4)$

g $(4b-3)(b+3)$

h $(4m-1)(2m+3)$

i $(3x+8)(x-2)$

4 a $(9w-10)^2$ b $4(y+1)^2$ c $(5h-4)^2$

5 a $2(t+2)(3t-1)$ b $3(g+4)(2g-3)$

c $4(2e-3)(3e+1)$ d $2(a-2)(4a+3)$

e $4(t+2)(3t-1)$

f $-(5q+3)(5q-2)$

g $-2(2m-1)(3m-2)$

h $-(3h+4)(4h-5)$

i $6(2c+3)(2c+1)$

j $-3(z+1)(2z-5)$

k $2(2d-3)(3d+5)$

l $-2(x-3)(3x-2)$

6 a $(a+1)(2a+3)$

b $(2m-5)(6m-1)$

c $(4x-1)(x+3)$

d $(w-1)(7w-1)$

e $(h-3)(4h+5)$

f $(4x-3)(2x+1)$

g $(r+5)(5r+1)$

h $(d-7)(2d-1)$

i $(3n+1)(2n-3)$

j $-(3m-2)(3m+4)$

k $-(5c-3)(c+1)$

l $(3g+2)(5g+3)$

m $-(4q+3)(2q-5)$

n $(x-2)(3x-7)$

o $-(3d-4)(d+4)$

Exercise 3-14

1 a $(m-8)^2$

b $3d(d-1)$

c $(d-3)(3d+5)$

d $(3+h)(k-5)$

e $(5y+8)(5y-8)$

f $4(5f+4)(5f-4)$

g $q(q+3-3p)$

h $(3-g)(g+1)$

i $4(2b+5)(3b-2)$

j $(5r+1)(5r-1)$

k $(b^2+1)(b+1)$

l $(2x-5)^2$

m $-(5d-4)(d+1)$

n $(b-1)^2(b+1)$

o $2(2+v)(2-v)$

p $m(n+3)(n+p)$

q $2(w-6)^2$

r $(6h+1)^2$

2 a $(3r-8t)(5r+3t)$

b $(2d+1)^2$

c $9(g+2k)(g-2k)$

d $e(e-5)(e+2)$

e $-20(2p-3q)(3p-2q)$

f $7(2x+1)(2x-1)$

g $(a-b)(a+b+4)$

h $(c-2)^2(c+2)$

i $(3a-1)(2a+5)$

j $(t+7)(t-5)$

k $2(3p+2)^2$

l $-(6a-1)(4a+1)$

m $9(x+2)(x-3)$

n $(a-3)(2ab-3)$

o $2(a+3)^2$

p $(5u-1)^2$

q $(k-3)(4k+7)$

r $3(4+w)(4-w)$

s $3(1+3s)(1-3s)$

t $(k+4)2(k-4)$

u $5y(y^2-2y+3)$

v $mn(m+2)(m-2)$

w $-2(a+2)(a-2)$

x $4(2c-3)(4c+1)$

Exercise 3-15

1 a $x+y$ b $\frac{1}{2(t-r)}$ c $\frac{b-c}{a}$

d -1 e $w-4$ f $\frac{s}{d+t}$

g $\frac{k+5}{k-5}$ h $3(c-1)$ i $\frac{a+1}{m+n}$

j $\frac{y+4}{2}$ k $\frac{k+1}{k+4}$ l $\frac{4a+5c}{a-e}$

m $\frac{s+2}{s-3}$ n $\frac{1-2c}{3c-1}$ o $\frac{a+4}{2(p+2)}$

2 a $\frac{7m+10}{m(m+1)(m+2)}$ b $\frac{2w-20}{w(w+3)(w+5)}$

c $\frac{4b-7}{(b-1)(b+2)(b-3)}$ d $\frac{-k-2}{k(k+1)(k-1)}$

e $\frac{5h+12}{4h(h+1)}$ f $\frac{-4d-1}{(d+2)(d+1)}$

g $\frac{42-5r}{4(r+6)(r-6)}$ h $\frac{d^2+3d-6}{d(d+2)(d-2)}$

i $\frac{-k^2+9k-5}{(k+1)(k-1)(k-4)}$ j $\frac{3q-1}{(q+1)(q-1)}$

3 a $6m$ b $1\frac{1}{24}$ c $\frac{1}{2}$ d $6t$

e $\frac{10}{h+1}$ f $\frac{3}{2(a-b)}$ g $\frac{-t}{5(r+t)}$ h

i $\frac{4}{p}$ j $\frac{3}{2}$ k

m $\frac{(d+1)(d-5)}{4(f-3)}$ n $\frac{r+3}{4(f-3)}$