

Factorising Quadratics ($a \neq 1$)

Starter

1. (Review of last lesson)

Factorise: (a) $x^2 - 8x - 20$ (b) $3y^2 - 12y - 36$

Working: (a) $1 \times -20 = -20 \Rightarrow$ Multiply: $-20 = -10 \times 2$
 Add: $-8 = -10 + 2$
Split $-8x$ into $-10x + 2x$: $x^2 - 8x - 20 = x^2 - 10x + 2x - 20$
Factorise by grouping (same brackets): $= x(x - 10) + 2(x - 10)$
 $= (x - 10)(x + 2)$

N.B. $-8x$ could also be split into $2x - 10x$.

(b) $3y^2 - 12y - 36 = 3(y^2 - 4y - 12)$
 Now factorise $y^2 - 4y - 12$:
 $1 \times -12 = -12 \Rightarrow$ Multiply: $-12 = -6 \times 2$
 Add: $-4 = -6 + 2$
Split $-4y$ into $-6y + 2y$: $y^2 - 4y - 12 = y^2 - 6y + 2y - 12$
Factorise by grouping (same brackets): $= y(y - 6) + 2(y - 6)$
 $= (y - 6)(y + 2)$

$\therefore 3y^2 - 12y - 36 = 3(y - 6)(y + 2)$
N.B. $-4y$ could also be split into $2y - 6y$.

2. (Review of a previous lesson)

Factorise: (a) $8x^2 + 10x + 12x + 15$ (b) $18x^2 - 3x - 12x + 2$

Working: (a) $8x^2 + 10x + 12x + 15 = 2x(4x + 5) + 3(4x + 5)$
 $= (4x + 5)(2x + 3)$

(b) $18x^2 - 3x - 12x + 2 = 3x(6x - 1) - 2(6x - 1)$
 $= (6x - 1)(3x - 2)$

E.g. 1 Factorise $3x^2 + 19x + 6$.

Working: $3 \times 6 = 18 \Rightarrow$ Multiply: $18 = 18 \times 1$
 Add: $19 = 18 + 1$

Split $19x$ into $18x + x$: $3x^2 + 19x + 6 = 3x^2 + 18x + x + 6$

N.B. The 6 remains the same.

Factorise by grouping: $3x^2 + 19x + 6 = 3x(x + 6) + 1(x + 6)$
 $= (x + 6)(3x + 1)$

N.B. $19x$ could also be split into $x + 18x$.

E.g. 2 Factorise $2x^2 + 5x - 12$.

Working: $2 \times -12 = -24 \Rightarrow$ Multiply: $-24 = 8 \times -3$
Add: $5 = 8 + -3$

Split $5x$ into $8x - 3x$: $2x^2 + 5x - 12 = 2x^2 + 8x - 3x - 12$

N.B. The -12 remains the same.

Factorise by grouping: $2x^2 + 5x - 12 = 2x(x + 4) - 3(x + 4)$
 $= (x + 4)(2x - 3)$

N.B. $5x$ could also be split into $-3x + 8x$.

E.g. 3 Factorise $3x^2 - 5x + 2$.

Working: $3 \times 2 = 6 \Rightarrow$ Multiply: $6 = -3 \times -2$
Add: $-5 = -3 + -2$

Split $-5x$ into $-3x - 2x$: $3x^2 - 5x + 2 = 3x^2 - 3x - 2x + 2$

N.B. The 2 remains the same.

Factorise by grouping: $3x^2 - 5x + 2 = 3x(x - 1) - 2(x - 1)$
 $= (x - 1)(3x - 2)$

N.B. $19x$ could also be split into $x + 18x$.

E.g. 4 Factorise $3x^2 - 14x - 5$.

Working: $3 \times -5 = -15 \Rightarrow$ Multiply: $-15 = 1 \times -15$
Add: $-14 = 1 + -15$

Split $-14x$ into $x - 15x$: $3x^2 - 14x - 5 = 3x^2 + x - 15x - 5$

N.B. The -5 remains the same.

Factorise by grouping: $3x^2 - 14x - 5 = x(3x + 1) - 5(3x + 1)$
 $= (3x + 1)(x - 5)$

N.B. $-14x$ could also be split into $-15x + x$.

Video: [Factorising quadratics \(a > 1\)](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p113 E4.3 Qu 1-23
A*-G class textbook:	p102 E4.3 Qu 1-23
9-1 homework book:	p41 E4.3 Qu 1-16
A*-G homework book:	p30 E4.3 Qu 1-14

[Homework book answers \(only available during a lockdown\)](#)