

Common Factor

$$\underline{5p^2q} - \underline{50p^6q^3} + \underline{35p^3}$$

$$\underline{5p^2} (q - 10p^4q^3 + 7p)$$

$$\underline{14x^2y^3z} - \underline{21x^3y^4z} + \underline{42xyz^2}$$

$$\underline{7xyz} (2xy^2 - 3x^2y^3 + 6z)$$

$$x^2 - 3x - 4$$

$$y^4 + 11y^2 + 30$$

Trinomials

$$z^2 + 5zy + 6y^2$$

$$m^2 - 8m + 16$$

Expand:

$$(x+2)(x+1)$$

$$\underline{x^2} + \underline{x} + \underline{2x} + \underline{2}$$

$$x^2 + \underline{3x} + 2$$

$$(x+5)(x-4)$$

$$\underline{x^2} - \underline{4x} + \underline{5x} - \underline{20}$$

$$x^2 + \underline{x} - 20$$

$$(x-7)(x-1)$$

$$\underline{x^2} - \underline{x} - \underline{7x} + \underline{7}$$

$$x^2 - \underline{8x} + 7$$

Factor the following

1. $x^2 + \underline{19}x + \underline{18}$

simple trinomial ($1x^2$)

$$\underline{1} + \underline{18} = 19$$

$$\underline{1} \times \underline{18} = 18$$

$$(x+1)(x+18)$$

or

$$(x+18)(x+1)$$

two binomials

$$\begin{array}{l} 18 \\ 1 \times 18 \\ 2 \times 9 \\ 3 \times 6 \end{array}$$

2. $x^2 - 5x + 6$ ← simple trinomial ($1x^2$)

$\underline{-2} + \underline{-3} = -5$
 $\underline{-2} \times \underline{-3} = 6$

$(x-2)(x-3)$ ← two binomials

6
-1 x -6
-2 x -3

Simple trinomials

3. $x^2 + 5x - 24$

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

$\underline{-3} + \underline{8} = 5$
 $\underline{-3} \times \underline{8} = -24$

- 24
- 1 x 24
- 2 x 12
- 3 x 8
- 4 x 6

larger factor is positive

$x^2 + 7x + 12$

$(x+3)(x+4)$

$\underline{3} + \underline{4} = 7$
 $\underline{3} \times \underline{4} = 12$

- 12
- 1 x 12
- 2 x 6
- 3 x 4

$x^2 + x - 6$

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

$\underline{-2} + \underline{3} = 1$
 $\underline{-2} \times \underline{3} = -6$

- 6
- 1 x 6
- 2 x 3

larger factor is positive

$$4. \quad 3x^2 - 18x - 120$$

$$3(x^2 - \underline{6x} - \underline{40})$$

simple trinomial

$$3(x+4)(x-10)$$

* Always take out a common factor first (if possible)

$$3 \rightarrow 1 \cdot \underline{3}$$

$$18 \rightarrow 2 \cdot \underline{3} \cdot 3$$

$$120 \rightarrow 2 \cdot 2 \cdot \underline{3} \cdot 2 \cdot 5$$

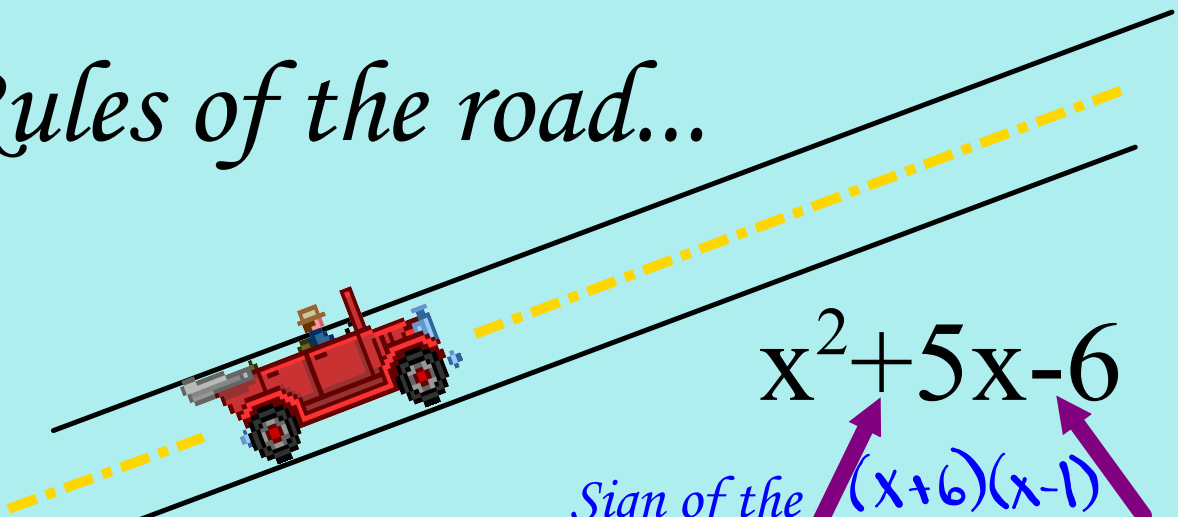
$$\text{GCF} = 3$$

$$\begin{array}{l} \underline{4} + \underline{-10} = -6 \\ \underline{4} \times \underline{-10} = -40 \end{array}$$

-40
1x-40
2x-20
4x-10
5x-8

larger factor is negative

Rules of the road...



$$x^2 - 5x + 6$$

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

both signs are negative

Signs are the same.

$$x^2 + 5x - 6$$

$$(x+6)(x-1)$$

Sign of the biggest number is positive.

Signs are different.

$$x^2 + 5x + 6$$



both signs are positive

signs are the same

$$(x+2)(x+3)$$

$$x^2 - x - 12$$

Sign of the biggest number is negative

signs are different

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



Check out
a few
on
your own.

Hard Trinomial

There is no common factor

$$2x^2 + 7x + 3$$

$$\begin{aligned} & \underline{2x^2} + \underline{7x} + \underline{3} \\ & \underline{(x+1)}(x+\underline{\frac{6}{2}}) \\ & \boxed{(2x+1)(x+3)} \end{aligned}$$

$$\begin{aligned} \frac{1}{1} + \frac{6}{6} &= 7 \\ \frac{1}{1} \times \frac{6}{6} &= 6 \\ & \uparrow \\ & 2 \times 3 \end{aligned}$$

$$\begin{array}{c} 6 \\ \hline 1 \times 6 \\ \hline 2 \times 3 \end{array}$$

Hard Trinomial

$$5x^2 + 34x - 7$$

$$= (x-1)(x+35)$$

$$= (5x-1)(x+7)$$

Handwritten work for factoring $5x^2 + 34x - 7$. The expression is written with red underlines under each term. A green bracket groups the factors $(x-1)(x+35)$. A red circle around the -1 in $(x-1)$ has an arrow pointing to the 5 in $(x+35)$. A green arrow points from the 5 in $(x+35)$ to the 5 in $(5x-1)$. The final factored form $(5x-1)(x+7)$ is written in blue.

$$-\frac{1}{1} + \frac{35}{1} = 34$$

$$-\frac{1}{1} \times \frac{35}{1} = -35$$

Handwritten work for finding factors of -35 that sum to 34 . The factors -1 and 35 are circled in blue. The factors -5 and 7 are also listed. A red arrow points from the circled -1 and 35 to the 34 in the first equation. A red arrow points from the circled -1 and 35 to the text "larger factor is positive".

Hard Trinomial

$$6x^2 - 7x + 2$$

$$\left(x - \frac{3}{6} \right) \left(x - \frac{4}{6} \right)$$

$$\frac{-3}{6} + \frac{-4}{6} = -7$$

$$\frac{-3}{6} \times \frac{-4}{6} = 12$$

$$12$$

$$-1x - 12$$

$$-2x - 6$$

$$\underline{-3x - 4}$$

$$\left(x - \frac{1}{2} \right) \left(x - \frac{2}{3} \right) \text{ reduce}$$

$$(2x - 1)(3x - 2)$$

$$\underline{8x^2 + 10x - 3}$$

$$\left(x - \frac{2}{8}\right)\left(x + \frac{12}{8}\right)$$

$$\left(x - \frac{1}{4}\right)\left(x + \frac{3}{2}\right) \text{ reduce}$$

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

$$\begin{array}{l} -\frac{2}{8} + \frac{12}{8} = 10 \\ -\frac{2}{8} \times \frac{12}{8} = -24 \end{array}$$

-24
 -1×24
 -2×12
 -3×8
 -4×6

larger factor is positive

$$x^2 + \underline{11}x + \underline{30}$$

$$(x+5)(x+6)$$

both factors are positive

$$\underline{5} + \underline{6} = 11$$

$$\underline{5} \times \underline{6} = 30$$

30
 1×30
 2×15
 3×10
 5×6

signs are the same

$$x^2 - \underline{11}x + \underline{30}$$

$$(x-5)(x-6)$$

both factors are negative

$$\underline{-5} + \underline{-6} = -11$$

$$\underline{-5} \times \underline{-6} = 30$$

30
 -1×30
 2×15
 3×10
 5×6

signs are the same

$$x^2 + \underline{x} - \underline{30}$$

$$(x-5)(x+6)$$

larger factor is positive

$$\underline{-5} + \underline{6} = 1$$

$$\underline{-5} \times \underline{6} = -30$$

30
 -1×30
 -2×15
 -3×10
 -5×6

signs are different

$$x^2 - \underline{x} - \underline{30}$$

$$(x+5)(x-6)$$

larger factor is negative

$$\underline{5} + \underline{-6} = -1$$

$$\underline{5} \times \underline{-6} = -30$$

30
 1×30
 2×15
 3×10
 5×6

signs are different

Check out the sheet. :)

Factor each completely.

1) $b^2 + 8b + 7$

$$(b + 7)(b + 1)$$

2) $n^2 - 11n + 10$

$$(n - 10)(n - 1)$$

3) $m^2 + m - 90$

$$(m - 9)(m + 10)$$

4) $n^2 + 4n - 12$

$$(n - 2)(n + 6)$$

5) $n^2 - 10n + 9$

$$(n - 1)(n - 9)$$

6) $b^2 + 16b + 64$

$$(b + 8)^2$$

7) $m^2 + 2m - 24$

$(m + 6)(m - 4)$

8) $x^2 - 4x + 24$

Not factorable

9) $k^2 - 13k + 40$

$(k - 5)(k - 8)$

10) $a^2 + 11a + 18$

$(a + 2)(a + 9)$

11) $n^2 - n - 56$

$(n + 7)(n - 8)$

12) $n^2 - 5n + 6$

$(n - 2)(n - 3)$

Factor each completely.

1) $3p^2 - 2p - 5$

$$(3p - 5)(p + 1)$$

2) $2n^2 + 3n - 9$

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

3) $3n^2 - 8n + 4$

$$(3n - 2)(n - 2)$$

4) $5n^2 + 19n + 12$

$$(5n + 4)(n + 3)$$

5) $2v^2 + 11v + 5$

$$(2v + 1)(v + 5)$$

6) $2n^2 + 5n + 2$

$$(2n + 1)(n + 2)$$

7) $7a^2 + 53a + 28$

$$(7a + 4)(a + 7)$$

8) $9k^2 + 66k + 21$

$$3(3k + 1)(k + 7)$$

$$2x^2 - 6x - 108$$

$$2(x^2 - \underline{3x} - \underline{54})$$

simple trinomial

$$2(x+6)(x-9)$$

Always do common factor first (if possible)

larger factor is negative

$\underline{6}$	$+$	$\underline{-9}$	$=$	$\underline{-3}$	-54
$\underline{6}$	x	$\underline{-9}$	$=$	$\underline{-54}$	$1x - 54$
					$2x - 27$
					$3x - 18$
					<u>$6x - 9$</u>

signs are opposite

$$2x^2 + \underline{11x} + \underline{5}$$

hard trinomial

$$(x+1)(x+10)$$

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

There is no common factor

$\underline{1}$	$+$	$\underline{10}$	$=$	$\underline{11}$	10
$\underline{1}$	x	$\underline{10}$	$=$	$\underline{10}$	<u>$1x 10$</u>
					$2x 5$

Expand:

$$(3x+2)(x+1)$$

$$3x^2+3x+2x+2$$

$$3x^2+5x+2$$

$$(2x+5)(3x-4)$$

$$6x^2-8x+15x-20$$

$$6x^2+7x-20$$

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

$$2x^2-2x-7x+7$$

$$2x^2-9x+7$$

$$2x^2 + 5x + 3$$

$$\left(x + \frac{2}{2}\right)\left(x + \frac{3}{2}\right)$$


$$(x+1)(2x+3)$$

$$\underline{2} + \underline{3} = 5$$

$$\underline{2} \times \underline{3} = 6$$

DECOMPOSITION

If there is a numerical coefficient in front of x , then we use a method for factoring called *DECOMPOSITION*.


$$4x^2 + 5x - 6$$

$$2x^2+5x+3$$

$$2x^2+2x+3x+3$$

$$2x(x+1)+3(x+1)$$

$$(2x+3)(x+1)$$

Check out pages 167,177 and 178.

Numbers _____ , 13 and 15. :)

