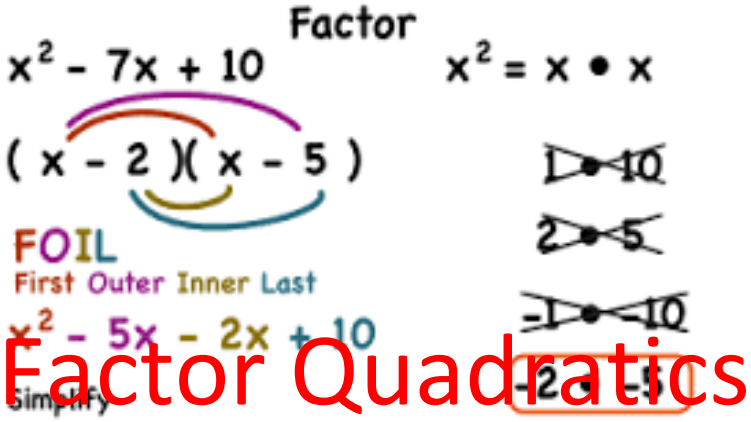
2.2 Notes

Factoring Quadratics



Factor Quadratics

I Can (Rewrite expressions in different forms using mathematical properties)

Bellwork:

List all the factor pairs:

1. 6
   1·6
   2·3

2. 24
   1·24
   2·12
   3·8
   4·6

3. 48
   1·48
   2·24
   3·16
   4·12
   6·8

Multiply the following binomials.

4. (3x – 4)(x – 2)

   $3x^2-6x-4x+8$

   $3x^2-10x+8$

5. (7x – 6)(x – 3)

   $7x^2-21x-6x+18$

   $7x^2-27x+18$

You just practiced multiplying two binomials. Today we will be **factoring**, which is the reverse of multiplying.

$$(x + 2)(x + 5) = x^2 + 5x + 2x + 10$$

$$= x^2 + 7x + 10$$

Signs

Equation → $3x^2 + 7x + 2 \Rightarrow (3x+1)(x+2)$

(Standard form)

1st term: $3x^2$ — middle term: $7x$ — last term: 2

Factor Pairs: $1 \cdot 3$, $x \cdot x$

Factor Pairs: $1 \cdot 2$

Guess → $(3x + 1)(1x + 2)$

(+) or (−) sign

(+) or (−) sign

Check: $3x^2 + 6x + x + 2$

$7x$

$3x^2 + 7x + 2$

Signs

Equation → $3x^2 - 7x + 2 \Rightarrow (3x-1)(x-2)$

(Standard form)

1st term — middle term — last term

$1 \cdot 3$
$x \cdot x$

Factor Pairs

$1 \cdot 2$

Factor Pairs

Guess → $(3x - 1)(x - 2)$

(+) or (−) sign — (+) or (−) sign

Check: $3x^2 - 6x - 1x + 2$

$3x^2 - 7x + 2$

Signs

Equation → $3x^2 - 5x - 2 \rightarrow (3x+1)(x-2)$

(Standard form)

1st term — middle term — last term

$1 \cdot 3$
$x \cdot x$

Factor Pairs

$1 \cdot 3$ $1 \cdot 2$

$1 \quad -6$

$1 \cdot 2$

Factor Pairs

Guess → $(3x + 1)(x - 2)$

(+) or (−) sign — (+) or (−) sign

Check: $3x^2 - 6x + x - 2$

$3x^2 - 5x - 2$

Signs

Equation → $3x^2 + 5x - 2$ $(3x-1)(x+2)$

(Standard form)

1st term — middle term — last term

$1 \cdot 3$
$x \cdot x$

Factor Pairs

$1 \cdot 2$

Factor Pairs

Guess → $(3x - 1)(x + 2)$

(+) or (−) sign — (+) or (−) sign

Check: $3x^2 + 6x - 1x - 2$

Example:

Equation → $2x^2 - 7x + 5$

(Standard form)

1st term — middle term — last term

$1 \cdot 2$
$x \cdot x$

Factor Pairs

$1 \cdot 2$ $1 \cdot 5$

-5 -2

$1 \cdot 5$

Factor Pairs

Guess → $(2x - 5)(x - 1)$

(+) or (−) sign — (+) or (−) sign

$-5x$
$-2x$
$-7x$

Check:

Example:

Equation → $5x^2 + 6x - 8 = (5x-4)(x+2)$

(Standard form)

1st term — middle term — last term

1·5
x·x

Factor Pairs

1·5 1·8
2·4

5·2 = +10
1·4 = −4

1·8
2·4

Factor Pairs

Guess → $(5x - 4)(x + 2)$

(+) or (−) sign

(+) or (−) sign

−4x
+10x
6x

Check:

Example:

Equation → $x^2 - 10x + 24 = (x-4)(x-6)$

(Standard form)

1st term — middle term — last term

x·x

Factor Pairs

1·24
2·12
3·8
4·6

Factor Pairs

Guess → $(x - 4)(x - 6)$

(+) or (−) sign

(+) or (−) sign

−4x
−6x
−10x

check:

Example:

Equation → $2x^2 + 13x + 6 = (2x+1)(x+6)$
(Standard form)

1st term: $2x^2$ — middle term: $13x$ — last term: 6

Factor Pairs: $1 \cdot 2$, $x \cdot x$

$1 \cdot 2$ $1 \cdot 6$

$1 + 12$

Factor Pairs: $1 \cdot 6$, $2 \cdot 3$

Guess → $(2x + 1)(x + 6)$

(+) or (−) sign

(+) or (−) sign

$+1x$

$+12x$

check: $+13x$

Practice:

Equation → $5x^2 - 8x - 13 = (5x-13)(x+1)$
(Standard form)

1st term: $5x^2$ — middle term: $-8x$ — last term: -13

Factor Pairs: $1 \cdot 5$, $x \cdot x$

$1 \cdot 5$ $1 \cdot 13$

$-13 + 5$

Factor Pairs: $1 \cdot 13$

Guess → $(5x - 13)(x + 1)$

(+) or (−) sign

(+) or (−) sign

$-13x$

$+5x$

Practice:

Equation → $x^2 + 25x + 24$ $= (x+1)(x+24)$

(Standard form)

1st term — middle term — last term

$x \cdot x$ — Factor Pairs

$1 \cdot 24$, $2 \cdot 12$, $3 \cdot 8$, $4 \cdot 6$ — Factor Pairs

$(x+24)(x+1)$

$2 \cdot 3$

$3 \cdot 2$

Guess → $(x + 24)(x + 1)$

(+) or (−) sign

(+) or (−) sign

$24x$

$1x$

$25x$

Special Case: Difference of perfect squares:

$$a^2 - b^2 = (a - b)(a + b)$$

Factor:

$x^2 - 16$

$x^2 + 0x - 16$

$x \cdot x$

$1 \cdot 16$, $2 \cdot 8$, $4 \cdot 4$

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

$m^2 - 81$

$m \cdot m$ $9 \cdot 9$

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

$9m$

$-9m$

$0m$

$4x^2 - 9$

$1 \cdot 4$, $2 \cdot 2$

$x \cdot x$

$1 \cdot 9$, $3 \cdot 3$

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

$6x$

$-6x$

$0x$

Factor:

$5m^2 + 17m - 12$ $(5m-3)(m+4)$

1·5 m·m

1·12
2·6
3·4

+20
−3

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

−3m
20m
17m

$2n^2 + 15n + 7$

1·2
n·n

1·7

$(2n + 1)(n + 7)$

1n
14n
15n

$4m^2 + 8m + 3$

1·4
2·2
m·m

1·3

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

2m
6m
8m

$n^2 - 6n - 16$

n·n

1·16
2·8
4·4

$(n + 2)(n - 8)$

2n
−8n
−6n