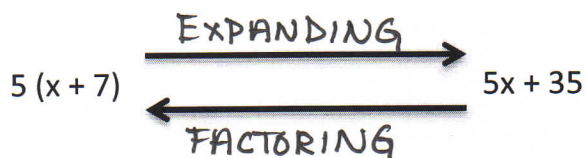


QUADRATIC RELATIONS: Common Factoring

Date: Notes

Factoring is the: opposite of expanding



Factors: are the numbers you multiply to get another number. For example, the factors of 15 are 3 and 5 because $3 \times 5 = 15$.

EXAMPLE 1: What are the factors of the following?

- | | | | |
|-------|-------|----------|-----------|
| a) 24 | b) 20 | c) x^2 | d) $6a^2$ |
| 12, 2 | 20, 1 | x, x | 3, 2 |
| 24, 1 | 10, 2 | | 1, 6 |
| 6, 4 | 4, 5 | | a, a |
| 8, 3 | | | |

Greatest Common Factor (GCF): The highest number (and variables) that divide into all the terms. The GCF may be a constant (a number), a variable, or both.

EXAMPLE 2: What is the greatest common factor (GCF) for the following terms?

- | | | |
|--|--|--|
| a) $6x, 24$
$6x: 1, 6, x, 2, 3$
$24: 1, 2, 4, 2, 12, 3, 8, 6, 4$
GCF: 3
YOU TRY!
$4x, 16$
$4x: 4, 1, 2, 2, x$
$16: 1, 16, 2, 8, 4, 4$
GCF: 4 | b) $10x^2, 15x$
$10x^2: 10, 1, x, x, 2, 5$
$15x: 1, 15, x, 3, 5$
GCF: $5x$ | c) $6x^3, -12x^2, 18x$
$6x^3: 6, 1, 2, 3, x, x, x$
$-12x^2: -12, 1, -3, 4, -2, 6, x, x$
$18x: 18, 1, 2, 9, 3, 6, x$
GCF: $6x$ |
| d) $4x, 16$
$4x: 4, 1, 2, 2, x$
$16: 1, 16, 2, 8, 4, 4$
GCF: 4 | e) $15x^2, 20x$
$15x^2: 1, 15, 3, 5, x, x$
$20x: 1, 20, 2, 10, 4, 5, x$
GCF: $5x$ | f) $6x^3, -24x^2, 36x$
$6x^3: 1, 6, 2, 3, x, x, x$
$-24x^2: -1, 24, -2, 12, -3, 8, -4, 6, x, x$
$36x: 1, 36, 2, 18, 3, 12, 4, 9, 6, 6, x$
GCF is: $6x$ |

QUADRATIC RELATIONS: Common Factoring

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Common Factoring Steps

1. Determine the greatest common factor (GCF) between all terms. If you have the same variable in each term, take the smallest exponent of the same variable.
2. Write the GCF in front of an open bracket.
3. Divide out the GCF from each term and put the quotient inside the bracket.
4. check your answer by expanding
(should get back to original).

EXAMPLE 3: Common factor the following. Check your answers by expanding.

a) $10x - 15$ GCF: 5
 $= 5(2x - 3)$
 $\frac{10x}{5} = 2x$ $\frac{-15}{5} = -3$

b) $20x - 12x^2$ GCF: $4x$
 $= 4x(5 - 3x)$
 $\frac{20x}{4x} = 5$ $\frac{-12x^2}{4x} = -3x$

c) $x^3 + 12x^2$ GCF: x^2
 $= x^2(x + 12)$
Check
 $x^3 + 12x^2$ ✓

d) $-6x + 24x^2$ GCF: $-6x$
 $= -6x(1 + (-4x))$
 $= -6x(1 - 4x)$
Check
 $= -6x + 24x^2$ ✓

YOU TRY!

e) $12x - 3$ GCF: 3
 $= 3(4x - 1)$
Check
 $= 12x - 3$ ✓

f) $24x - 16x^2$ GCF: $8x$
 $= 8x(3 - 2x)$
Check
 $= 24x - 16x^2$ ✓

g) $x^3 - 14x$ GCF: x
 $= x(x^2 - 14)$
Check
 $= x^3 - 14x$ ✓

h) $-4x + 12x^2$ GCF: $-4x$
 $= -4x(1 - 3x)$
Check
 $= -4x + 12x^2$ ✓

EXAMPLE 4: Factor a trinomial by finding the greatest common factor. Check your answers.

a) $3x^2 - 9x + 12$ GCF: 3
 $= 3(x^2 - 3x + 4)$
Check
 $= 3x^2 - 9x + 12$ ✓

b) $-4x^3 - 12x^2 + 8x$ GCF: $-4x$
 $= -4x(x^2 - 3x - 2)$
Check
 $= -4x^3 + 12x^2 + 8x$ ✓

c) $-2x^2 - 16x + 20$ GCF: -2
 $= -2(x^2 + 8x - 10)$
Check
 $= -2x^2 - 16x + 20$ ✓

d) $24x^3 + 16x^2 - 4x$ GCF: $4x$
 $= 4x(6x^2 + 4x - 1)$
Check
 $= 24x^3 + 16x^2 - 4x$ ✓