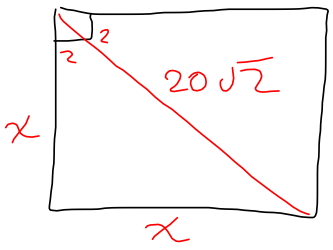
17, 20, 12

(12)



$a^2 + b^2 = c^2$

$x^2 + x^2 = (20\sqrt{2})^2$

$x = 20$

# of sq = 10

10×10

$= 100$

(17) a) $\sqrt[3]{54}$

$= \sqrt[3]{27 \cdot 2}$

$= 3\sqrt[3]{2}$

$1^3 = 1$

$2^3 = 8$

$3^3 = 27$

$4^3 = 64$

1.5A Factoring

3(x+2) ⟷ 3x+6 (Expand/Multiply →, ← Factor)

To factor is to write an algebraic expression as a product of two or more other algebraic expressions .

Why factor? To arrive at equivalent expressions which are presented in simpler terms which allows us to:

- Solve equations
- Graph relations

In grade 10 you learned how to:

- Common Factor
- Factor by Grouping
- Factor Simple Trinomials
- Factor Complex Trinomials
- Factor a Difference of Squares
- Factor a Perfect Square Trinomial

Common Factoring

Always your first and last step.

WHEN?

2 or more terms

HOW?

- Take out the greatest common factor.
- Divide the expression by the GCF to find the other factor.

a) $2mn - 4mnt$

$= 2mn(1 - 2t)$

b) $6t^5 - 9t^2$

$= 3t^2(2t^3 - 3)$

c) $3x^4 - 6x^3 + 9x$

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

d) $4x(a-b) - 3(a-b)$

$= (a-b)(4x - 3)$

Factor by Grouping

WHEN?

An even # of terms: 4, 6, 8, etc...

HOW?

- Group terms to form pairs.
- Factor the pairs by finding common factors.
- Factor out the shared common binomial factor.

a) $3x(m-5)+2(5-m)$

$= 3x(m-5)-2(m-5)$

$=(m-5)(3x-2)$

The terms *m - 5* and *5 - m* are opposites. This means that one divided by the other is *-1*.

b) $x(y-2)-4(2-y)$

$= x(y-2)+4(y-2)$

$=(y-2)(x+4)$

c) $mx+2y+my+2x$

$= mx+my+2y+2x$

$= m(x+y)+2(x+y)$

$=(x+y)(m+2)$

d) $22vx-6vy+11wx-3wy$

$= 2v(11x-3y)+w(11x-3y)$

$=(11x-3y)(2v+w)$

e) y^2+1-y^3-y

$=(y^2+1)-y(y^2+1)$

$=(y^2+1)(1-y)$

f) $16x^5+8x^4-6x^3-3x^2+4x+2$

$=8x^4(2x+1)-3x^2(2x+1)+2(2x+1)$

$=(2x+1)(8x^4-3x^2+2)$

Simple Trinomials

3 terms

$ax^2 + bx + c$ where a = 1

$(x + n_1)(x + n_2)$

M = ac

A = b

$N = n_1, n_2$

a) $x^2 - 9x + 14$

M : 14
A : −9
N : −2, −7

$= (x-7)(x-2)$

b) $5x^2 + 15x - 140$

$= 5(x^2 + 3x - 28)$

$= 5(x+7)(x-4)$

c) $a^2 + 8ab + 15b^2$

M: 15
A: 8
N: 5, 3

$(a+5b)(a+3b)$

d) $x^4 + 2x^2b - 24b^2$

M: −24
A: 2
N: 6, −4

$= (x^2+6b)(x^2-4b)$

Difference of Squares

2 terms

2 perfect squares separated by a subtraction: $a^2 - b^2$

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

conjugates

a) $49x^2 - 16y^2$

$= (7x - 4y)(7x + 4y)$

b) $3x^2 - 12$

$= 3(x^2 - 4)$

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

c) $a^2 - \frac{1}{9}$

$\sqrt{\frac{1}{9}} = \frac{1}{3}$

$= (a - \frac{1}{3})(a + \frac{1}{3})$

d) $81 - m^{12}$

$m^6 \cdot m^6$

$= (9 - m^6)(9 + m^6)$

$= (3 - m^3)(3 + m^3)(9 + m^6)$

e) $(3x - 2)^2 - (5x + 1)^2$

$= [(3x - 2) - (5x + 1)][(3x - 2) + (5x + 1)]$

$= (3x - 2 - 5x - 1)(3x - 2 + 5x + 1)$

$= (-2x - 3)(8x - 1)$

$= -(2x + 3)(8x - 1)$

$\sqrt{(3x - 2)^2} = (3x - 2)$

Complex Trinomials

3 terms

$ax^2 + bx + c$ where $a \neq 1$

$(a_1x + f_1)(a_2x + f_2)$

M = ac
A = b
N = n_1, n_2

1. Use a, n_1 and n_2 to find the factors.

$$\frac{a}{n_1}, \frac{a}{n_2}$$

2. Reduce.

$$\frac{a_1}{f_1}, \frac{a_2}{f_2}$$

OR

Decompose the middle term using n_1, n_2 and factor by grouping.

a) $10x^2 - 11x - 6$

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

M: −60
A: −11
N: −15, 4

$\frac{10x}{-15}$ $\frac{10x}{4}$

$= \frac{2x}{-3}$ $\frac{5x}{2}$

b) $14x^2 + 31xy - 10y^2$

$= (2x+5y)(7x-2y)$

M: −140
A: 31
N: 35, −4

$\frac{14x}{35y}$ $\frac{14x}{-4y}$

$= \frac{2x}{5y}$ $\frac{7x}{-2y}$

c) $18a^2b + 3ab - 6b$

$= 3b(6a^2 + a - 2)$

$= 3b(3a+2)(2a-1)$

M: −12
A: 1
N: 4, −3

$\frac{4}{6a}$ $\frac{-3}{6a}$

$= \frac{2}{3a}$ $\frac{-1}{2a}$

e) $2x^2 - 3x - 5$

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

$\frac{-5}{2x}$ $\frac{2}{2x}$

$= \frac{1}{x}$

Perfect Square Trinomials

3 terms

$ax^2 + bx + c$

OR

$\left(\sqrt{a}x \pm \sqrt{c}\right)^2$

same sign as b

where a & c are perfect squares and
b is twice the product of their square roots.

↳ $b = 2\sqrt{a}\sqrt{c}$

a) $m^2 + 10m + 25$

$= (m+5)^2$

b) $2x^2 - 24x + 72$

$= 2(x^2 - 12x + 36)$

$= 2(x-6)^2$

c) $16a^2 + 24a + 9$

$= (4a+3)^2$

d) $x^4 - 8x^2 + 16$

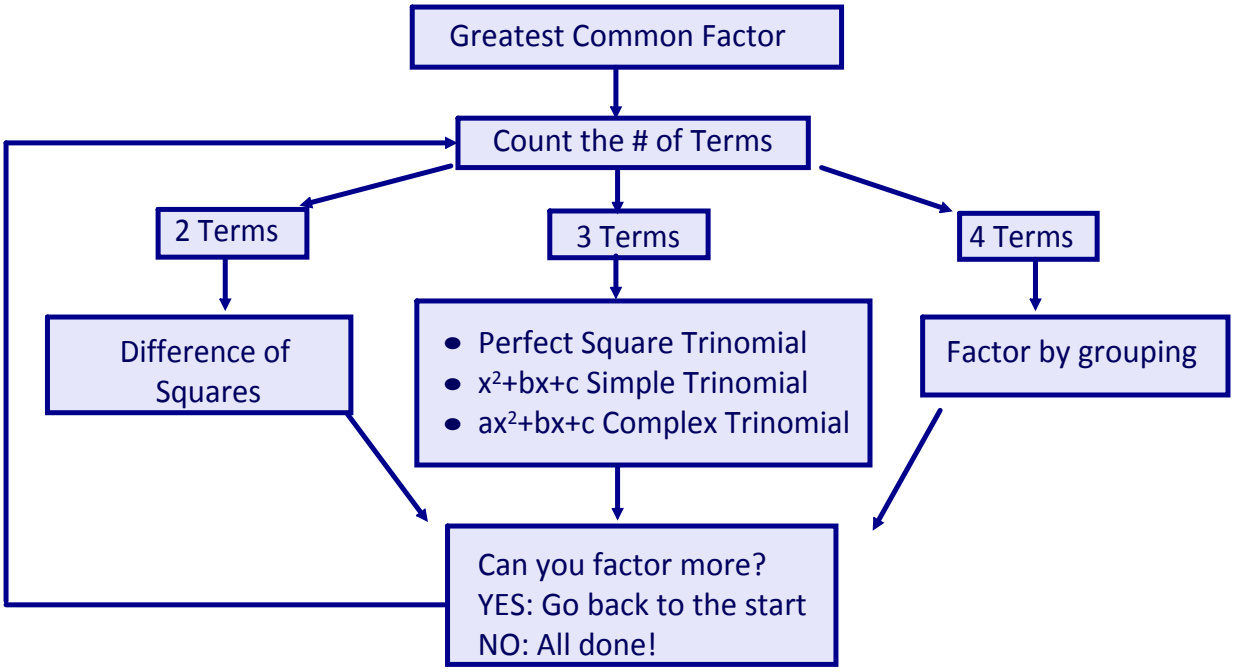
$= (x^2-4)^2$

$= (x^2-4)(x^2-4)$

$= (x-2)(x+2)(x-2)(x+2)$

$= (x-2)^2(x+2)^2$

Factoring Flowchart



Check you answer by EXPANDING

HOMEWORK
Handout 1.6