

Lesson 1 Factoring Polynomials

Definitions:

Factor: a number that divides evenly into another number
ie. factors of 18 are 1, 2, 3, 6, 9, and 18

Multiples: of a number are determined by multiplying the number by any whole number other than 1 (or by skip counting)
ie. some multiples of 6 are 6, 12, 18, 24...

Greatest Common Factor (GCF): of two or more terms is the greatest factor the terms have in common.

Perfect Square Trinomial: $(a + b)^2 = a^2 + 2ab + b^2$
recall $(a+b)^2 = (a+b)(a+b)$

shortcut {
The square of the first term in the binomial a^2
Twice the product of the first and second terms in the binomial $2ab$
The square of the 2nd term in the binomial b^2

Example 1: Greatest Common Factor (GCF)

Factor:

a) $x^2 + 4x$
 $x(x + 4)$

b) $y^3 - 2y^2$
 $y^2(y - 2)$

c) $4cd^2 + 20cd$
 $4cd(d + 5)$

d) $6p + 18p^2$
 $6p(1 + 3p)$

** check using multiplication*

Be careful!

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Example 2: Difference of Squares

Factor:

a) $x^2 - 4$
 $(x+2)(x-2)$

$a^2 - b^2$
 pattern $(a+b)(a-b)$
 check FOIL $a^2 - ab + ab - b^2$
 $a^2 - b^2$

b) $25a^2 - 16b^2$
 $(5a+4b)(5a-4b)$

Example 3: Factoring Trinomials $a = 1$ (Product, Sum, Factors)

Factor:

$ax^2 + bx + c$

a) $x^2 - 4x - 21$

P -21
 S -4
 F -7, 3

$(x-7)(x+3)$

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

← perfect square trinomial

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

P 4
 S -4
 F -2, -2

or $(x-2)^2$
 ← binomial squared

c) $t^2 - 3t - 10$

P -10
 S -3
 F -5, 2

$(t-5)(t+2)$

d) $x^2 + 3x - 28$

P -28
 S 3
 F 7, -4

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

Example 4: Factoring Trinomials $a \neq 1$ (PSF)

Always check for a GCF first!!

Factor:

a) $3x^2 - 10x - 8$

b) $4x^2 + 3x - 7$

$P -24$ $(3x + 2)(x - 4)$
 $S -10$
 $F \frac{-12, 2}{3, 1}$
 divide \rightarrow
 in front \leftarrow largest number that divides into 12 and 3 is 3 and into 2 and 3 is 1
 -4 2
 switch brackets

$P -28$ $(x - 1)(4x + 7)$
 $S 3$
 $F \frac{7, -4}{1, 4}$
 divide $7 -1$

You can check by using FOIL

c) $3t^2 + 13t + 4$

d) $2d^2 + 6d - 56$

GCF!!

$P 12$ $(3t + 1)(t + 4)$
 $S 13$
 $F \frac{12, 1}{3, 1}$
 divide $4 1$

$2(d^2 + 3d - 28)$
 $2(d + 7)(d - 4)$
 $P -28$
 $S 3$
 $F 7, -4$

Exercise 1 Factoring Polynomials

1.) Factor: (follow example 1)

a.) $12m - 24p$ b.) $x - xy$ c.) $y^5 - 3y^3$ d.) $2a^2 - 14ab$
 $12(m - 2p)$ $x(1 - y)$ $y^3(y^2 - 3)$ $2a(a - 7b)$

2.) Factor: (follow example 2)

a.) $a^2 - b^2$ b.) $9x^2 - 36y^2$
 $(a - b)(a + b)$ $(3x - 6y)(3x + 6y)$

3.) Factor: (follow example 3)

a.) $x^2 - 7x + 12$ b.) $x^2 - x - 6$ c.) $x^2 + 25x + 24$
 $(x - 4)(x - 3)$ $(x - 3)(x + 2)$ $(x + 24)(x + 1)$

4.) Factor: (follow example 4)

a.) $3x^2 + 7x + 2$ b.) $2x^2 + 3x - 2$ c.) $2x^2 + 7x - 4$
 $(3x + 1)(x + 2)$ $(2x - 1)(x + 2)$ $(2x - 1)(x + 4)$

5.) Factor: (follow example 1, then 3)

a.) $2x^2 - 16x + 32$ b.) $3x^2 + 6x - 9$
 $2(x - 4)(x - 4)$ $3(x + 3)(x - 1)$
 $\quad \quad \quad \vee$
 $2(x - 4)^2$

Extra Practice: Pg. 176; #3-5, 7, 8, 10a, b