Lesson 1.3: Factoring Polynomials – G C F

Specific Outcome: 5.1 – Determine the common factors in the terms of a polynomial, and express the polynomials in factored form. 5.4 – Identify and explain errors in a polynomial factorization. 5.5 – Factor a polynomial, and verify by multiplying the factors.

A. FACTORING BY REMOVING A *MONOMIAL* GCF

To factor $\boldsymbol{6c + 4c^2}$: 1. Find GCF of coefficients
2. Find GCF of variables
3. Factor the GCF out of each term

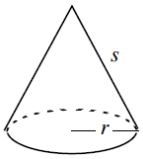
Practice: Factor each of the following polynomials.

a) $5a^2 - 25 =$ b) $18x^2 - 16x^3 =$ c) $-m - 6m^2 =$ d) $18x^2y^2 - 45xy^2 + 9x =$

e) $30a^3b^2c - 15a^2bc^2 - 35abc^2 =$ f) **Verify** e) above by **expanding** the factors:

Problem Solving:

1. The surface area of a cone is given by the formula $SA = \pi r^2 + \pi rs$, where r is the radius of the base of the cone and s is the slant height.



Write the formula given above in factored form.

$SA = \pi r^2 + \pi rs$ =

2. Here is a student's solution for factoring. Identify any errors and write a correct solution if necessary.

Factor: $3m^2 + 9m^3 - 3m$
Solution: $3m^2 + 9m^3 - 3m = 3m(m + 3m^2)$

HOMEWORK P. 155 – 8(bdf), 10(bdf), 12(a), 14, 16(bdf)

B. FACTORING BY REMOVING A *BINOMIAL* GCF

Factor: $2(x + 3) - 5x(x + 3)$

Practice: Factor each of the following expressions.

a) $x(2 - x) + 7(2 - x)$ b) $3a(a + 8) - 5(a + 8)$ c) $2r(2r - 3) - 9(2r - 3)$ *d) $5a(4 - 3a) + (3a - 4)$

C. FACTORING BY *GROUPING* THEN REMOVING GCF

- **Grouping** is used when the polynomial to be factored has **4 terms**.
- **Brackets** are used when grouping.

Factor: $\mathbf{x^2 + 2x + 6x + 12}$

1. Use brackets to group:
2. Find GCF from each group:
3. Find binomial GCF:
4. **Write as Factors:**

Practice: Factor each polynomial.

a) $x^2 + 3x + 15x + 45$ b) $x^2 - 9x - 5x + 45$ c) $2a^2 - 6a - 3a + 9$ d) $2x^2 + 9x - 8x - 36$ *e) $ab + x^2 - ax - bx$

Problem Solving:

1. Consider the polynomial $3a^2 + 4a + 9a + c$, where c is a constant. If $a + 3$ is a factor, then the other factor must be

A. $a + 4$
B. $3a + 4$
C. $3a + 9$
D. $a + 12$

*2. $x(x-2) + 3(2-x)$ is equivalent to

A. $(x-2)(x-3)$
B. $(x-2)(x+3)$
C. $(2-x)(x-3)$
D. $(2-x)(x+3)$

HOMEWORK:

2. Factor.

d) $a^2 - 9a - 5a + 45$ **e)** $x^2 - 15x - 4x + 60$ **f)** $t^2 + 7t - 3t - 21$

3. Factor.

a) $2x^2 + 2x + 3x + 3$ **b)** $3x^2 + x + 6x + 2$ **c)** $3m^2 + 9m + 5m + 15$

10. One factor of $xy - 4xz - 12tz + 3ty$ is

A. $(4t + x)$
B. $(3t - x)$
C. $(y - 4z)$
D. $(3x + t)$

ANSWER KEY:

2. **a)** $(x + 2)(x + 6)$ **b)** $(x + 3)(x + 15)$ **c)** $(m - 5)(m + 2)$
d) $(a - 9)(a - 5)$ **e)** $(x - 15)(x - 4)$ **f)** $(t + 7)(t - 3)$

3. **a)** $(x + 1)(2x + 3)$ **b)** $(3x + 1)(x + 2)$ **c)** $(m + 3)(3m + 5)$
d) $(2b - 3)(3b - 2)$ **e)** $(a - 3)(2a - 1)$ **f)** $(5x + 2)(x - 5)$
g) $(4 + p)^2$ **h)** $(5 - y)(3 - y)$ **i)** $(a + x)(a + y)$

4. **a)** $(b - x)(a - x)$ or $(x - a)(x - b)$ **b)** $(b - 3)(4b - a)$ **c)** $(x - 3y^2)(4x - 5)$

10. C

14.

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