

ACHER/MFM2P Name: _____ Date: _____
Worksheet 7.4: Greatest Common Factors

What is the greatest common factor?
 The greatest common factor or GCF is the **largest** number and/or the **highest** variable that can divide **evenly** into all the terms of a polynomial (i.e. the greatest factor that is **common to all the terms**).

Greatest Common Factors for Numbers:
 Example 1:
 Find the greatest common factor for each set of numbers.

(a) 14 and 21
 $14 = 2 \times 7$
 $21 = 3 \times 7$
GCF = 7

(b) 24 and 48
 $24 = 2 \times 2 \times 3 \times 2$
 $48 = 2 \times 2 \times 2 \times 3 \times 2$
GCF = $2 \times 2 \times 3 = 12$

(c) 8 and 12
 $8 = 2 \times 2 \times 2$
 $12 = 2 \times 2 \times 3$
GCF = $2 \times 2 = 4$

(d) 36 and 42
 $36 = 2 \times 2 \times 3 \times 3$
 $42 = 2 \times 3 \times 7$
GCF = $2 \times 3 = 6$

(e) 14 and 49
 $14 = 2 \times 7$
 $49 = 7 \times 7$
GCF = 7

(f) 9, 27, and 36
 $9 = 3 \times 3$
 $27 = 3 \times 3 \times 3$
 $36 = 2 \times 2 \times 3 \times 3$
GCF = $3 \times 3 = 9$

(g) 15, 25, and 35
 $15 = 3 \times 5$
 $25 = 5 \times 5$
 $35 = 5 \times 7$
GCF = 5

(Hint: Divide the given numbers by prime factors such as 2, 3, 5, 7, 11, 13, 17, 19, evenly until you reach 1.)

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Worksheet 7.4: Greatest Common Factors for Variables

Example 2:
 Find the greatest common factor for each set of variables.

(a) x^3 and x^2
 $x^3 = (x)(x)(x)$
 $x^2 = (x)(x)$
GCF = $(x)(x) = x^2$

(b) y^4 and y^3
 $y^4 = (y)(y)(y)(y)$
 $y^3 = (y)(y)(y)$
GCF = $(y)(y)(y) = y^3$

(Hint: GCF for variables is the variable with the lowest exponent.)

(c) x and x^3
GCF = x

(d) y and y^2
GCF = y

(e) y^4 and y^6
GCF = y^4

(f) a^2 , a^3 and a
GCF = a

Example 3:
 Find the GCF for each set of terms.

(a) $4x$ and $6x^2$
 $4 = 2 \times 2$
 $6 = 2 \times 3$
GCF = $2 \times x = 2x$

(b) $12y^2$ and $36y^3$
 $12 = 2 \times 2 \times 3$
 $36 = 2 \times 2 \times 3 \times 3$
GCF = $2 \times 2 \times 3 \times y^2 = 12y^2$

(c) $14x^2$ and $35x^3$
GCF = $7x^2$

(d) $45x^2y^3$ and $12y^3$
GCF = $3y^3$

Answers: (a) $2x$, (b) $12y^2$, (c) $7x^2$, (d) $3y^3$

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Worksheet 7.5: Common Factors

Factoring is writing an expanded polynomial in its factored form.
 Compare $3(x+7)$ and $6x^2 + 21x$

Factoring is the **opposite** of expanding.
 Expanding is **multiplication**, so factoring is **division**.

**** If every term of a polynomial can be divided by the same number or variable(s), that number or variable(s) is called a common factor.**

What is the greatest common factor?
 The greatest common factor or GCF is the **largest** number and/or the **highest** variable that can divide **evenly** into all the terms of a polynomial (i.e. the greatest factor that is **common to all the terms**).

Steps for Common Factoring

Step 1: Find the GCF for the numerical coefficients of the terms (**the numbers**).
 Step 2: Find the GCF for the variable parts of the terms (**the variables**).
 Step 3: Divide the polynomial by the product of the GCF(s) from Steps 1 and 2.
 Step 4: Write the factored form of the polynomial with **brackets** as the answer.

Example 1: Factor each polynomial.

(a) $7x - 35$
GCF for the numbers = 7
GCF for the variables = N/A
 $= 7(\frac{7x}{7} - \frac{35}{7})$
 $= 7(x - 5)$

(b) $8a + 6b - 2c$
GCF for the numbers = 2
GCF for the variables = N/A
 $= 2(\frac{8a}{2} + \frac{6b}{2} - \frac{2c}{2})$
 $= 2(4a + 3b - c)$

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Worksheet 7.5: Common Factors

2. Factor $9x + 36$
GCF for the numbers = 9
GCF for the variables = None
 $= 9(\frac{9x}{9} + \frac{36}{9})$
 $= 9(x + 4)$
N/A

3. Factor $12x - 42y$
GCF for the numbers = 6
GCF for the variables = N/A
 $= 6(\frac{12x}{6} - \frac{42y}{6})$
 $= 6(2x - 7y)$

4. Factor $9x - 12y + 18z$
GCF for the numbers = 3
GCF for the variables = None
 $= 3(\frac{9x}{3} - \frac{12y}{3} + \frac{18z}{3})$
 $= 3(3x - 4y + 6z)$

5. Factor $4x + 28$
GCF for the numbers = 4
GCF for the variables = None
 $= 4(\frac{4x}{4} + \frac{28}{4})$
 $= 4(x + 7)$

6. Factor $15x^2 - 35x^3$
GCF for the numbers = 5
GCF for the variables = x^2
 $= 5x^2(\frac{15x^2}{5x^2} - \frac{35x^3}{5x^2})$
 $= 5x^2(3 - 7x)$

7. Factor $3x^2 - 12x$
GCF for the numbers = 3
GCF for the variables = x
 $= 3x(\frac{3x^2}{3x} - \frac{12x}{3x})$
 $= 3x(x - 4)$

Answers: 2. $9(x+4)$; 3. $6(2x-7y)$; 4. $3(3x-4y+6z)$; 5. $4(x+7)$; 6. $5x^2(3-7x)$; 7. $3x(x-4)$

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$14n^3$ $28n^2$ $21n^4$

$14 = 2 \times 7$
 $28 = 2 \times 2 \times 7$
 $21 = 3 \times 7$
GCF = $7n^2$

n^3
 n^2
 n^4
GCF = n^2

2, 3, 5,
7, 11, 13
17, 19

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y^4 and $6y^2$

GCF = y^2

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