FACTORING WITH WHOLE NUMBERS

Objective: This lesson is designed to use the concept of factoring with whole numbers to explore Decomposition, Multiplication, and the relationship between Factoring and the Distributive Property.

(* Note: This lesson should be taught after a lesson on Greatest Common Factor)

Part I: Common Factors with Whole Numbers

Directions: Rewrite the number in expanded form. Then use the given information to factor out a common factor.

Example # 1: 48	**You Try # 1: 36**
Factor out a common factor of 2.	**Factor out a common factor of 2.**
$48 = 40 + 8$	$36 = 30 + 6$
$48 = 2(20 + 4)$	$36 = 2(15 + 3)$
Factor out a common factor of 4.	**Factor out a common factor of 3.**
$48 = 40 + 8$	$36 = 30 + 6$
$48 = 4(10 + 2)$	$36 = 3(10 + 2)$
Factor out a common factor of 8.	**Factor out a common factor of 6.**
$48 = 40 + 8$	$36 = 30 + 6$
$48 = 8(5 + 1)$	$36 = 6(5 + 1)$
Example # 2: 64	**You Try # 2: 99**
Factor out a common factor of 2.	**Factor out a common factor of 3.**
$64 = 60 + 4$	$99 = 90 + 9$
$64 = 2(30 + 2)$	$99 = 3(30 + 3)$
Factor out a common factor of 4.	**Factor out a common factor of 9.**
$64 = 60 + 4$	$99 = 90 + 9$
$64 = 4(15 + 1)$	$99 = 9(10 + 1)$
Extension:	**Extension:**
Factor out a common factor of $\frac{1}{2}$.	**Factor out a common factor of $\frac{1}{3}$.**
$64 = 60 + 4$	$99 = 90 + 9$
$64 = \frac{1}{2}(120 + 8)$	$99 = \frac{1}{3}(270 + 27)$
Example # 3: 270	**You Try # 3: 480**
Factor out a common factor of 2.	**Factor out a common factor of 2.**
$270 = 200 + 70$	$480 = 400 + 80$
$270 = 2(100 + 35)$	$480 = 2(200 + 40)$
Factor out a common factor of 5.	**Factor out a common factor of 4.**
$270 = 200 + 70$	$480 = 400 + 80$
$270 = 5(40 + 14)$	$480 = 4(100 + 20)$
Factor out a common factor of 10.	**Factor out a common factor of 8.**
$270 = 200 + 70$	$480 = 400 + 80$
$270 = 10(20 + 7)$	$480 = 8(50 + 10)$

Part II: Rolling Common Factors

Directions: Given the following terms, students will determine if the factor is a common factor. (A factor is a common factor if it can be multiplied with another whole number factor to produce each term as a product or each term is divisible by the factor.) Using 2 dice numbered from 1-6, students will work in partners to find all of the common factors for each expression for numbers 2-12.Students can use whiteboards to justify their responses.

Example #1: $12+36$	
Is 2 a common factor? (Yes)	②
Is 3 a common factor? (Yes)	③
Is 4 a common factor? (Yes)	④
Is 5 a common factor? (No)	~~5~~
Is 6 a common factor? (Yes)	⑥
Is 7 a common factor? (No)	~~7~~
Is 8 a common factor? (No)	~~8~~
Is 9 a common factor? (Yes)	⑨
Is 10 a common factor? (No)	~~10~~
Is 11 a common factor? (No)	~~11~~
Is 12 a common factor? (Yes)	⑫
You Try # 1: $21+56$	
Is 2 a common factor?	**2**
Is 3 a common factor?	**3**
Is 4 a common factor?	**4**
Is 5 a common factor?	**5**
Is 6 a common factor?	**6**
Is 7 a common factor?	**7**
Is 8 a common factor?	**8**
Is 9 a common factor?	**9**
Is 10 a common factor?	**10**
Is 11 a common factor?	**11**
Is 12 a common factor?	**12**
You Try # 2: $10+12+20$	
Is 2 a common factor?	**2**
Is 3 a common factor?	**3**
Is 4 a common factor?	**4**
Is 5 a common factor?	**5**
Is 6 a common factor?	**6**
Is 7 a common factor?	**7**
Is 8 a common factor?	**8**
Is 9 a common factor?	**9**
Is 10 a common factor?	**10**
Is 11 a common factor?	**11**
Is 12 a common factor?	**12**
You Try #3: $30+60+90$	
Is 2 a common factor?	**2**
Is 3 a common factor?	**3**
Is 4 a common factor?	**4**

Is 5 a common factor?	**5**
Is 6 a common factor?	**6**
Is 7 a common factor?	**7**
Is 8 a common factor?	**8**
Is 9 a common factor?	**9**
Is 10 a common factor?	**10**
Is 11 a common factor?	**11**
Is 12 a common factor?	**12**
You Try # 4: $63+72+81$	
Is 2 a common factor?	**2**
Is 3 a common factor?	**3**
Is 4 a common factor?	**4**
Is 5 a common factor?	**5**
Is 6 a common factor?	**6**
Is 7 a common factor?	**7**
Is 8 a common factor?	**8**
Is 9 a common factor?	**9**
Is 10 a common factor?	**10**
Is 11 a common factor?	**11**
Is 12 a common factor?	**12**

Part III: GCF with Variables

Directions: Find the Greatest Common Factor of the two terms and factor out the GCF.

Example #4: $6x+2$	**You Try #4:** $15y+25$
GCF= 2	GCF= 5
$\therefore 6x+2=2(3x+1)$	$\therefore 15y+25=5(3y+5)$
Example #5: $55+33p$	**You Try #5:** $100+40z$
GCF= 11	GCF= 20
$\therefore 55+33p=11(5+3p)$	$\therefore 100+40z=20(5+2z)$
Example #6: x^2+3x	**You Try #6:** $6c^2+15c$
GCF= x	GCF= $3c$
$\therefore x^2+3x=x(x+3)$	$\therefore 6c^2+15c=3c(2c+5)$

Other Extensions:

- Have students discuss and determine how they could check their expressions.
- Use fractional factors.
- Use the Generic Area Model.
- Include polynomials with more terms (trinomials).

Common Core State Standard 6NS.4: Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. [Example, 36+8 = 4 (9+2)]

Warm-Up

CST/CAHSEE: Algebra 10.0

Simplify.

$$\frac{4x^3+2x^2-8x}{2x}$$

A. $2x^2+x-4$
B. $4x^2+2x-8$
C. $2x^2+2x^2-8x$
D. $8x^4+4x^3-16x^2$

Review: Algebra 11.0

Factor out the Greatest Common Factor (GCF) of the polynomial.

$$30x+45$$

- Show another way to factor the polynomial.

Current: CC Grade 6 NS.4

Rewrite the number in expanded form and factor out a common factor of 5.

365

Other: Grade 6 NS 2.4

Show two ways to find the GCF of 54, 36, and 24.