

Common Factors

Oct 26/2011

Factor the number 40.

$$40 = \underline{2 \cdot 2 \cdot 2 \cdot 5}$$

$$\begin{aligned} 40 &= (2)(20) \\ &= (2)(2)(10) \\ &= (2)(2)(2)(5) \end{aligned}$$

What does it mean to factor?

Represent as a product of prime factors.

1. Using a Model (e.g., alge-tiles)

Model the expression as an area. The lengths of the sides are factors.

Some factors can be reduced further. Repeat this process until no factors can be reduced.

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Factor: $3x^2 + 2x = x(3x + 2)$

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Factor: $2x^2 + 4x = x(2x + 4)$ f

	$2x$	$+4$				
x	x^2	x^2	x	x	x	x

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Factor: $2x^2 + 4x = 2 \cdot x \cdot (x + 2)$ f

	$2x$					
x	x^2	x^2				
$+2$	x	x				

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2. Factor Algebraically

Look for the Greatest Common Factor of the coefficients and the GCF of the variables.

Ex.1 Factor: $8x^3 - 6x^2y^2 + 4x^2y$ $8 = 2 \cdot 2 \cdot 2$

$$6 = 3 \cdot 2$$

The GCF of 8, 6, and 4 is 2. $4 = 2 \cdot 2$

The GCF of x^3 , x^2y^2 , and x^2y is x^2 .

$$x^3 = x \cdot x \cdot x \quad x^2y^2 = x \cdot x \cdot y \cdot y \quad x^2y = x \cdot x \cdot y$$

$$\begin{aligned} 8x^3 - 6x^2y^2 + 4x^2y &= \frac{2x^2}{1} \left(\frac{8x^3}{2x^2} - \frac{6x^2y^2}{2x^2} + \frac{4x^2y}{2x^2} \right) \\ &= 2x^2 (4x - 3y^2 + 2y) \end{aligned}$$

$$\begin{aligned} 36 &= 2 \left(\frac{36}{2} \right) \\ &= 2(18) \end{aligned}$$

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$$\begin{aligned} 18 &= 2 \cdot 3 \cdot 3 \\ 36 &= 2 \cdot 2 \cdot 3 \cdot 3 \\ 42 &= 2 \cdot 3 \cdot 7 \end{aligned}$$

$$\begin{aligned} \text{GCF} &= 2 \cdot 3 \\ &= 6 \end{aligned}$$

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3. Factoring by Grouping

Some polynomials do not have common factors in all terms. They can sometimes be factored by grouping terms with common factors.

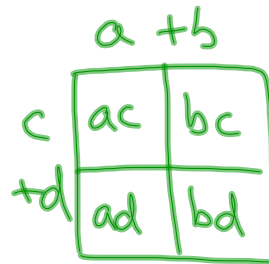
Ex.2 Factor: $ac + bc + ad + bd$

$$= \underbrace{c(a+b)}_x + \underbrace{d(a+b)}_x \quad \text{let } x = a+b$$

$$= cx + dx$$

$$= x(c+d)$$

$$= (a+b)(c+d)$$



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Assigned Work:

p.202-203 # 1, 3bd, 5bc, 6def, 7, 8, 9, 10

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#1 (a)

	$2x$	$-b$
$2x$	$4x^2$	$-6x$
		$-6x$

$$4x^2 - 12x$$

$$= 2x(2x - 6)$$

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

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

$$4x^2 - 12x$$

$$4 = 2 \cdot 2$$

$$12 = 2 \cdot 2 \cdot 3$$

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

GCF = $4x$

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3(b) $15a^3$ $20a^2$

$$15 = 3 \cdot 5$$

$$20 = 4 \cdot 5$$

$$= 2 \cdot 2 \cdot 5$$

$$a^3 = a \cdot a \cdot a$$

$$a^2 = a \cdot a$$

$$\text{GCF} = 5a^2$$

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$$\begin{aligned}
 8(a) \quad & 9x^2 - 6x + 18 \\
 & = 3 \left(\frac{9x^2}{3} - \frac{6x}{3} + \frac{18}{3} \right) \\
 & = 3(3x^2 - 2x + 6)
 \end{aligned}$$

$9 = 3 \cdot 3$
 $6 = 3 \cdot 2$
 $18 = 2 \cdot 9$
 $= 2 \cdot 3$

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$$\begin{aligned}
 8(f) \quad & \text{FOIL} \\
 & x(3x-5) + (3x-5)(x+1) \\
 & = 3x^2 - 5x + (3x^2 + 3x - 5x - 5) \\
 & = 3x^2 - 5x + 3x^2 - 2x - 5 \\
 & = 6x^2 - 7x - 5
 \end{aligned}$$

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$9(b)$

$$-10a^2c + 20ac - 5ac^3$$

$$= 5ac \left(\frac{-10a^2c}{5ac} + \frac{20ac}{5ac} - \frac{5ac^3}{5ac} \right)$$

$$= 5ac(-2a + 4 - c^2)$$

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