Factorization can be checked by multiplying the factors. If a polynomial was factored correctly, the product of its factors should equal the original polynomial expression.

Example 2

Verify that $4x(x^2 - 4x - 5)$ is equivalent to $4x^3 - 16x^2 - 20x$.

$$\begin{aligned} 4x(x^2 - 4x - 5) &= (4x)(x^2) + (4x)(-4x) - (4x)(5) \\ &= 4x^3 - 16x^2 - 20x \end{aligned}$$

Check Up

1. a. Factor $8mn^2 - 12m^2n - 4m^2n^2$ using the GCF of its terms.

b. Verify your answer to a. by multiplying the factors.

Compare your answers.

1. a. Factor $8mn^2 - 12m^2n - 4m^2n^2$ using the GCF of its terms.

$$\begin{aligned} 8mn^2 &= 2 \cdot 2 \cdot 2 \cdot m \cdot n \cdot n \\ 12m^2n &= 2 \cdot 2 \cdot 3 \cdot m \cdot m \cdot n \\ 4m^2n^2 &= 2 \cdot 2 \cdot m \cdot m \cdot n \cdot n \end{aligned}$$

The GCF is $2 \cdot 2 \cdot m \cdot n = 4mn$.

$$\frac{8mn^2}{4mn} = 2n \qquad \frac{-12m^2n}{4mn} = -3m \qquad \frac{-4m^2n^2}{4mn} = -mn$$

$$8mn^2 = (4mn)(2n) \qquad -12m^2n = (4mn)(-3m) \qquad -4m^2n^2 = (4mn)(-mn)$$

$$\begin{aligned} 8mn^2 - 12m^2n - 4m^2n^2 &= (4mn)(2n) - (4mn)(3m) - (4mn)(mn) \\ &= 4mn(2n - 3m - mn) \end{aligned}$$

b. Verify your answer to a. by multiplying the factors.

$$4mn(2n-3m-mn) = (4mn)(2n)-(4mn)(3m)-(4mn)(mn)$$
$$= 8mn^2 - 12m^2n - 4m^2n^2$$

The GCF for a polynomial expression will not always be a monomial. In the next example, the GCF of the expression is a binomial.

Multimedia

A video demonstration of the solution for *Example 3* has been provided.

Example 3

Factor $(2x+1)(4)+(2x+1)(x)$.

$2x+1$ is a common factor to both $(2x+1)(4)$ and $(2x+1)(x)$. There are no factors common to 4 and x, other than 1, so $2x+1$ is the GCF.

$2x+1$ can be moved outside a set of brackets using the distributive property in reverse.

$(2x+1)(4)+(2x+1)(x) = (2x+1)(4+x)$

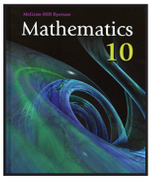
Check Up

1. Factor $(x+y)(x^2)-(x+y)(3y)$.

Compare your answer.

1. Factor $(x+y)(x^2)-(x+y)(3y)$.

$(x+y)(x^2)-(x+y)(3y) = (x+y)(x^2-3y)$



For further information about factoring polynomials using a GCF, see pp. 214 – 219 of *Mathematics 10*.