**8-5 Study Guide and Intervention**

***Using the Distributive Property***

**Use the Distributive Property to Factor** The Distributive Property has been used to multiply a polynomial by a monomial. It can also be used to express a polynomial in factored form. Compare the two columns in the table below.

|  |  |
| --- | --- |
| **Multiplying** | **Factoring** |
| 3(*a* + *b*) = 3*a* + 3*b* | 3*a* + 3*b* = 3(*a* + *b*) |
| *x*(*y* – *z*) = *xy* – *xz* | *xy* – *xz* = *x*(*y* – *z*) |
| 6*y*(2*x* + 1) = 6*y*(2*x*) + 6*y*(1)= 12*xy* + 6*y* | 12*xy* + 6*y* = 6*y*(2*x*) + 6*y*(1)= 6*y*(2*x* + 1) |

**Example 1: Use the Distributive Property to
factor 12*mp* + 80**$m^{2}$**.**

Find the GCF of 12*mp* and 80$m^{2}$.

12*mp* = 2 ⋅ 2 ⋅ 3 ⋅ *m* ⋅ *p*

80$m^{2}$ = 2 ⋅ 2 ⋅ 2 ⋅ 2 ⋅ 5 ⋅ *m ⋅ m*

GCF = 2 ⋅ 2 ⋅ *m* or 4*m*

Write each term as the product of the GCF and its remaining factors.

12*mp* + 80$m^{2}$ = 4*m*(3 ⋅ *p*) + 4*m*(2 ⋅ 2 ⋅ 5 ⋅ *m*)

= 4*m*(3*p*) + 4*m*(20*m*)

= 4*m*(3*p* + 20*m*)

Thus 12*mp* + 80$m^{2}$ = 4*m*(3*p* + 20*m*).

**Example 2: Factor 6*ax* + 3*ay* + 2*bx* + *by*by grouping.**

6*ax* + 3*ay* + 2*bx* + *by*

= (6*ax* + 3*ay*) + (2*bx* + *by*)

= 3*a*(2*x* + *y*) + *b*(2*x* + *y*)

= (3*a* + *b*)(2*x* + *y*)

Check using the FOIL method.

(3*a* + *b*)(2*x* + *y*)

= 3*a*(2*x*) + (3*a*)(*y*) + (*b*)(2*x*) + (*b*)(*y*)

= 6*ax* + 3*ay* + 2*bx* + *by* ✓

**Exercises**

**Factor each polynomial.**

 **1.** 24*x* + 48*y* **2.** 30*m*$p^{2}$ + $m^{2}$*p* – 6*p* **3.** $q^{4}$ – 18$q^{3}$ + 22*q*

 **4.** 9$x^{2}$ – 3*x* **5.** 4*m* + 6*p* – 8*mp* **6.** 45$r^{3}$ – 15$r^{2}$

 **7.** 14$t^{3}$ – 42$t^{5}$ – 49$t^{4}$ **8.** 55$p^{2}$ – 11$p^{4}$ + 44$p^{5}$ **9.** 14$y^{3}$ – 28$y^{2}$ + *y*

**10.** 4*x* + 12$x^{2}$ + 16$x^{3}$ **11.** 4$a^{2}$*b* + 28*a*$b^{2}$ + 7*ab* **12.** 6*y* + 12*x* – 8*z*

**13.** $x^{2}$ + 2*x* + *x* + 2 **14.** 6$y^{2}$ – 4*y* + 3*y* – 2 **15.** 4$m^{2}$ + 4*mp* + 3*mp* + 3$p^{2}$

**16.** 12*ax* + 3*xz* + 4*ay* + *yz* **17.** 12$a^{2}$ + 3*a* – 8*a* – 2 **18.** *xa* + *ya* + *x* + *y*

**8-5 Study Guide and Intervention** *(continued)*

***Using the Distributive Property***

**Solve Equations by Factoring** The following property, along with factoring, can be used to solve certain equations.

|  |  |
| --- | --- |
| **Zero Product Property** | For any real numbers *a* and *b*, if *ab* = 0, then either *a* = 0, *b* = 0, or both *a* and *b* equal 0. |

**Example : Solve 9**$x^{2}$ **+ *x* = 0. Then check the solutions.**

Write the equation so that it is of the form *ab* = 0.

9$x^{2}$ + *x* = 0 Original equation

*x*(9*x* + 1) = 0 Factor the GCF of 9$x^{2}$ + *x*, which is *x*.

*x* = 0 or 9*x* + 1 = 0 Zero Product Property

*x* = 0 *x* = – $\frac{1}{9}$ Solve each equation.

The solution set is $\left\{0, - \frac{1}{9}\right\}$ .

**Check** Substitute 0 and – $\frac{1}{9}$ for *x* in the original equation.

 9$x^{2}$ + *x* = 0 9$x^{2}$ + *x* = 0

9$\left(0\right)^{2}$ + 0 ≟ 0 9$\left(- \frac{1}{9} \right)^{2}$ + $\left(-\frac{1}{9}\right)$ ≟ 0

0 = 0 ✓ $\frac{1}{9}$ + $\left(-\frac{1}{9}\right)$ ≟ 0

 0 = 0 ✓

**Exercises**

**Solve each equation. Check your solutions.**

 **1.** *x*(*x* + 3) = 0 **2.** 3*m*(*m* – 4) = 0 **3.** (*r* – 3)(*r* + 2) = 0

 **4.** 3*x*(2*x* – 1) = 0 **5.** (4*m* + 8)(*m* – 3) = 0 **6.** 5$t^{2}$ = 25*t*

 **7.** (4*c* + 2)(2*c* – 7) = 0 **8.** 5*p* – 15$p^{2}$ = 0 **9.** 4$y^{2}$ = 28*y*

**10.** 12$x^{2}$ = –6*x* **11.** (4*a* + 3)(8*a* + 7) = 0 **12.** 8*y* = 12$y^{2}$

**13.** $x^{2}$ = –2*x* **14.** (6*y* – 4)(*y* + 3) = 0 **15.** 4$m^{2}$ = 4*m*

**16.** 12*x* = 3$x^{2}$ **17.** 12$a^{2}$ = –3*a* **18.** (12*a* + 4)(3*a* – 1) = 0