NAME Answer Key DATE PERIOD

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
$3(a + b) = 3a + 3b$	$3a + 3b = 3(a + b)$
$x(y - z) = xy - xz$	$xy - xz = x(y - z)$
$6y(2x + 1) = 6y(2x) + 6y(1)$ $= 12xy + 6y$	$12xy + 6y = 6y(2x) + 6y(1)$ $= 6y(2x + 1)$

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

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

$12mp = 2 \cdot 2 \cdot 3 \cdot m \cdot p$

$80m^2 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot m \cdot m$

GCF $= 2 \cdot 2 \cdot m$ or $4m$

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

$12mp + 80m^2 = 4m(3 \cdot p) + 4m(2 \cdot 2 \cdot 5 \cdot m)$

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

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

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

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

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

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

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

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

Check using the FOIL method.

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

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

$= 6ax + 3ay + 2bx + by$ ✓

Exercises

Factor each polynomial.

1. $24x + 48y$ $24(x+2y)$
2. $30mp^2 + m^2p - 6p$ $p(30mp+m^2-6)$
3. $q^4 - 18q^3 + 22q$ $q(q^3-18q^2+22)$
4. $9x^2 - 3x$ $3x(3x-1)$
5. $4m + 6p - 8mp$ $2(2m+3p-4mp)$
6. $45r^3 - 15r^2$ $15r^2(3r-1)$
7. $14t^3 - 42t^5 - 49t^4$ $7t^3(2-6t^2-7t)$
8. $55p^2 - 11p^4 + 44p^5$ $11p^2(5-p^2+4p^3)$
9. $14y^3 - 28y^2 + y$ $y(14y^2-28y+1)$
10. $4x + 12x^2 + 16x^3$ $4x(1+3x+4x^2)$
11. $4a^2b + 28ab^2 + 7ab$ $ab(4a+28b+7)$
12. $6y + 12x - 8z$ $2(3y+6x-4z)$
13. $x^2 + 2x + x + 2$ $(x+1)(x+2)$
14. $6y^2 - 4y + 3y - 2$ $(2y+1)(3y-2)$
15. $4m^2 + 4mp + 3mp + 3p^2$ $(4m+3p)(m+p)$
16. $12ax + 3xz + 4ay + yz$ $(3x+y)(4a+z)$
17. $12a^2 + 3a - 8a - 2$ $(3a-2)(4a+1)$
18. $xa + ya + x + y$ $(a+1)(x+y)$

13.) $(x^2+2x)+(x+2)$

$x(x+2)+1(x+2)$

$\boxed{(x+1)(x+2)}$

14.) $(6y^2-4y)+(3y-2)$

$2y(3y-2)+1(3y-2)$

$\boxed{(2y+1)(3y-2)}$

15.) $(4m^2+4mp)+(3mp+3p^2)$

$4m(m+p)+3p(m+p)$

$\boxed{(4m+3p)(m+p)}$

16.) $(12ax+3xz)+(4ay+yz)$

$3x(4a+z)+y(4a+z)$

$\boxed{(3x+y)(4a+z)}$

17.) $(12a^2+3a)+(-8a-2)$

$3a(4a+1)-2(4a+1)$

$\boxed{(3a-2)(4a+1)}$

18.) $(xa+ya)+(x+y)$

$a(x+y)+1(x+y)$

$\boxed{(a+1)(x+y)}$

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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 $9x^2 + x = 0$. Then check the solutions.

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

$9x^2 + x = 0$	Original equation
$x(9x + 1) = 0$	Factor the GCF of $9x^2 + x$, which is x.
$x = 0$ or $9x + 1 = 0$	Zero Product Property
$x = 0$ $\quad x = -\frac{1}{9}$	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.

$9x^2 + x = 0$

$9(0)^2 + 0 \stackrel{?}{=} 0$

$0 = 0$ ✓

$9x^2 + x = 0$

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

$\frac{1}{9} + \left(-\frac{1}{9}\right) \stackrel{?}{=} 0$

$0 = 0$ ✓

Exercises

Solve each equation. Check your solutions.

1. $x(x + 3) = 0$ $x = 0, -3$
2. $3m(m - 4) = 0$ $m = 0, 4$
3. $(r - 3)(r + 2) = 0$ $r = -2, 3$
4. $3x(2x - 1) = 0$ $x = 0, \frac{1}{2}$
5. $(4m + 8)(m - 3) = 0$ $m = -2, 3$
6. $5t^2 = 25t$ $t = 0, 5$
7. $(4c + 2)(2c - 7) = 0$ $c = -\frac{1}{2}, \frac{7}{2}$
8. $5p - 15p^2 = 0$ $p = 0, \frac{1}{3}$
9. $4y^2 = 28y$ $y = 0, 7$
10. $12x^2 = -6x$ $x = -\frac{1}{2}, 0$
11. $(4a + 3)(8a + 7) = 0$ $a = \frac{-7}{8}, -\frac{3}{4}$
12. $8y = 12y^2$ $y = 0, \frac{2}{3}$
13. $x^2 = -2x$ $x = -2, 0$
14. $(6y - 4)(y + 3) = 0$ $y = -3, \frac{2}{3}$
15. $4m^2 = 4m$ $m = 0, 1$
16. $12x = 3x^2$ $x = 0, 4$
17. $12a^2 = -3a$ $a = -\frac{1}{4}, 0$
18. $(12a + 4)(3a - 1) = 0$ $a = \frac{1}{3}$

1.) $x(x+3)=0$

$x=0$ or $x+3=0$

$x=-3$

2.) $3m(m-4)=0$

$3m=0$ or $m-4=0$

$m=0$ or $m=4$

3.) $(r-3)(r+2)=0$

$r-3=0$ or $r+2=0$

$r=3$ or $r=-2$

4.) $3x(2x-1)=0$

$3x=0$ or $2x-1=0$

$x=0$ or $2x=1$

$x=\frac{1}{2}$

5.) $(4m+8)(m-3)=0$

$4m+8=0$ or $m-3=0$

$4m=-8$ or $m=3$

$m=-2$

6.) $5t^2=25t$

$5t^2-25t=0$

$5t(t-5)=0$

$5t=0$ or $t-5=0$

$t=0$ or $t=5$

7.) $(4c+2)(2c-7)=0$

$4c+2=0$ or $2c-7=0$

$4c=-2$ $2c=7$

$c=\frac{-1}{2}$ or $c=\frac{7}{2}$

8.) $5p-15p^2=0$

$5p(1-3p)=0$

$5p=0$ or $1-3p=0$

$p=0$ or $1=3p$

$\frac{1}{3}=p$

9.) $4y^2=28y$

$4y^2-28y=0$

$4y(y-7)=0$

$4y=0$ or $y-7=0$

$y=0$ or $y=7$

10.) $12x^2=-6x$

$12x^2+6x=0$

$6x(2x+1)=0$

$6x=0$ or $2x+1=0$

$x=0$ or $2x=-1$

$x=\frac{-1}{2}$

11.) $(4a+3)(8a+7)=0$

$4a+3=0$ or $8a+7=0$

$4a=-3$ $8a=-7$

$a=\frac{-3}{4}$ or $a=\frac{-7}{8}$

12.) $8y=12y^2$

$0=12y^2-8y$

$0=4y(3y-2)$

$4y=0$ or $3y-2=0$

$y=0$ or $3y=2$

$y=\frac{2}{3}$

13.) $x^2 = -2x$

$x^2 + 2x = 0$

$x(x+2) = 0$

$x = 0$ or $x + 2 = 0$

$x = -2$

14.) $(6y-4)(y+3) = 0$

$6y - 4 = 0$ or $y + 3 = 0$

$6y = 4$ or $y = -3$

$y = \frac{2}{3}$

15.) $4m^2 = 4m$

$4m^2 - 4m = 0$

$4m(m-1) = 0$

$4m = 0$ or $m - 1 = 0$

$m = 0$ or $m = 1$

16.) $12x = 3x^2$

$0 = 3x^2 - 12x$

$0 = 3x(x-4)$

$3x = 0$ or $x - 4 = 0$

$x = 0$ or $x = 4$

17.) $12a^2 = -3a$

$12a^2 + 3a = 0$

$3a(4a+1) = 0$

$3a = 0$ or $4a + 1 = 0$

$a = 0$ or $4a = -1$

$a = -\frac{1}{4}$

18.) $(12a+4)(3a-1) = 0$

$12a - 4 = 0$ or $3a - 1 = 0$

$12a = 4$ or $3a = 1$

$a = \frac{1}{3}$ or $a = \frac{1}{3}$