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The Distributive Property Pattern

AB-TDP 1

Instructions: The Distributive Property pattern shows two equivalent forms of an expression involving a factor multiplied by a group. In these problems, if you are given the grouped form, then use the Distributive Property to re-write the expression without the group. But if you are given the distributed form, then apply the Distributive Property in *reverse* to "factor out" the common factor. See examples:

#	grouped form		distributed form
1	$a(b + c)$	=	$ab + ac$
2	$2(x - y)$	=	$2x - 2y$
3	$5(a - b)$	=	$5a - 5b$
4	$a(x + y)$	=	$ax + ay$
5	$4(a + b - c)$	=	$4a + 4b - 4c$
6	$2(x - y + z)$	=	$2x - 2y + 2z$
7	$x(a + b + c)$	=	$xa + xb + xc$
8	$y(x^2 + x)$	=	$yx^2 + yx$
9	$-2(a + b + c)$	=	$(-2a) + (-2b) + (-2c)$
10	$-3(x + y)$	=	$(-3x) + (-3y)$
11	$2(5a + 5b)$	=	$10a + 10b$
12	$5(x + 2y)$	=	$5x + 10y$

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Applying the Distributive Property - Set 1

AB-TDP 2

Instructions: Apply the Distributive Property to eliminate the group in each expression.

1. $4(2x + 10)$
   $4(2x) + 4(10)$
   $8x + 40$

2. $5(a + 2b)$
   $5(a) + 5(2b)$
   $5a + 10b$

3. $-2(x + 1)$
   $(-2)(x) + (-2)(1)$
   $-2x - 2$

4. $-3(x - 1)$
   $(-3)(x) + (-3)(-1)$
   $-3x + 3$

5. $a(a + b + c)$
   $a(a) + a(b) + a(c)$
   $a^2 + ab + ac$

6. $x(x^2 - x - 1)$
   $x(x^2) + x(-x) + x(-1)$
   $x^3 - x^2 - x$

7. $3(2x + b + 6c)$
   $3(2x) + 3(b) + 3(6c)$
   $6x + 3b + 18c$

8. $-1(5x - 2y + 7z)$
   $(-1)(5x) + (-1)(-2y) + (-1)(7z)$
   $-5x + 2y - 7z$

9. $2x(y + 4)$
   $2x(y) + 2x(4)$
   $2xy + 8x$

10. $x^2(x - 1)$
    $x^2(x) + x^2(-1)$
    $x^3 - x^2$

11. $-a(a - 2b)$
    $(-a)(a) + (-a)(-2b)$
    $-a^2 + 2ab$

12. $3x(4x + 5y)$
    $3x(4x) + 3x(5y)$
    $12x^2 + 15xy$

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Applying the Distributive Property - Set 2

Instructions: Apply the Distributive Property to eliminate the group in each expression.

1. $-5(5x^2 + x - 2)$

   $(-5)(5x^2) + (-5)(x) + (-5)(-2)$

   $-25x^2 - 5x + 10$

2. $y(3y + 5)$

   $y(3y) + y(5)$

   $3y^2 + 5y$

3. $-3(x^2 - 5)$

   $(-3)(x^2) + (-3)(-5)$

   $-3x^2 + 15$

4. $b(3a - 4b + c)$

   $b(3a) + b(-4b) + b(c)$

   $3ab - 4b^2 + bc$

5. $9(x + ax + 10)$

   $9(x) + 9(ax) + 9(10)$

   $9x + 9ax + 90$

6. $4x(x^2 - y^2)$

   $4x(x^2) + 4x(-y^2)$

   $4x^3 - 4xy^2$

7. $-x^2(x + y - 1)$

   $(-x^2)(x) + (-x^2)(y) + (-x^2)(-1)$

   $-x^3 - x^2y + x^2$

8. $6(2x - 5y + 4z)$

   $6(2x) + 6(-5y) + 6(4z)$

   $12x - 30y + 24z$

9. $xy(x + y)$

   $xy(x) + xy(y)$

   $x^2y + xy^2$

10. $5(-a^3 - 2a^2 + 1)$

    $5(-a^3) + 5(-2a^2) + 5(1)$

    $-5a^3 - 10a^2 + 5$

11. $4y(2y - x + 10)$

    $4y(2y) + 4y(-x) + 4y(10)$

    $8y^2 - 4xy + 40y$

12. $-2(-2x - 3y - 4z)$

    $(-2)(-2x) + (-2)(-3y) + (-2)(-4z)$

    $4x + 6y + 8z$

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Identifying Common Factors

Instructions: In order to apply the Distributive Property in reverse, you need to be able to identify factors that are common to each term in a polynomial. You can only factor something out if it's a factor of *every* term. For each polynomial, list any factors that all of its terms have in common. (If there are no common factors, write "none")

		common factors
1	$2x^2 + 6x + 4$	2
2	$3a^3 + 3a^2 + 3a$	3a
3	$bx + by - bz$	b
4	$5a - 10b - 20c$	5
5	$axy + bxc - yzx$	x
6	$2xy + 2xa + 2xb$	2x
7	$x^6 + x^4 + x^2$	x^2
8	$3a - 6b - 12c$	3
9	$ay + by + bc$	none
10	$-2x + (-2y) + (-2z)$	-2
11	$-4x^2 + 8x + 16$	4
12	$6x^3 + 2x^2 - 4x$	2x

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"Factoring Out" - Set 1

Instructions: Look at each polynomial to identify the common factor(s) in each term. Then, use the Distributive Property in reverse to factor them out.

1. $6x + 24$
   $6(x) + 6(4)$
   $6(x + 4)$

2. $5a^2 - 10a$
   $5a(a) - 5a(2)$
   $5a(a - 2)$

3. $2x^2 + 20$
   $2(x^2) + 2(10)$
   $2(x^2 + 10)$

4. $4a - 4b - 4c$
   $4(a) - 4(b) - 4(c)$
   $4(a - b - c)$

5. $3x^2 + 3y^2 + 3$
   $3(x^2) + 3(y^2) + 3(1)$
   $3(x^2 + y^2 + 1)$

6. $9y - 99$
   $9(y) - 9(11)$
   $9(y - 11)$

7. $ab + bc$
   $b(a) + b(c)$
   $b(a + c)$

8. $2xy - 2xz$
   $2x(y) - 2x(z)$
   $2x(y - z)$

9. $(-7)a^2 + (-7)b^2$
   $(-7)(a^2) + (-7)(b^2)$
   $-7(a^2 + b^2)$

10. $5x + 40y + 25$
    $5(x) + 5(8y) + 5(5)$
    $5(x + 8y + 5)$

11. $-xy - 2xz$
    $(-x)(y) + (-x)(2z)$
    $-x(y + 2z)$

12. $3x^3 - 6x^2 - 9x$
    $3x(x^2) - 3x(2x) - 3x(3)$
    $3x(x^2 - 2x - 3)$

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"Factoring Out" - Set 2

Instructions: Look at each polynomial to identify the common factor(s) in each term. Then, use the Distributive Property in reverse to factor them out.

1. $2x^2 + 2x + 6$

   $2(x^2) + 2(x) + 2(3)$

   $2(x^2 + x + 3)$

2. $x^3 + x^2 - x$

   $x(x^2) + x(x) - x(1)$

   $x(x^2 + x - 1)$

3. $5x^2 + 5x + 5$

   $5(x^2) + 5(x) + 5(1)$

   $5(x^2 + x + 1)$

4. $3a - 6b - 9c$

   $3(a) - 3(2b) - 3(3c)$

   $3(a - 2b - 3c)$

5. $ax + ay^2 + az$

   $a(x) + a(y^2) + a(z)$

   $a(x + y^2 + z)$

6. $2ax + 2ay + 2az$

   $2a(x) + 2a(y) + 2a(z)$

   $2a(x + y + z)$

7. $4x + 16y$

   $4(x) + 4(4y)$

   $4(x + 4y)$

8. $-5x - 5y$

   $(-5)(x) + (-5)(y)$

   $-5(x + y)$

9. $7a^2 + 7ab$

   $7a(a) + 7a(b)$

   $7a(a + b)$

10. $-2x + (-4y) + (-6z)$

    $(-2)(x) + (-2)(2y) + (-2)(3z)$

    $-2(x + 2y + 3z)$

11. $cba + bxa + xyb$

    $b(ac) + b(ax) + b(xy)$

    $b(ac + ax + xy)$

12. $-x^3 - x^2 - x$

    $(-x)(x^2) + (-x)(x) + (-x)(1)$

    $-x(x^2 + x + 1)$