Guided Practice 1.3.3

Example 1

Find the product of $(2x - 1)(x + 18)$.

1. Distribute the first polynomial over the second.

   Ensure that any negative signs are included in the products where appropriate.

   $(2x - 1)(x + 18)$

   $= 2x \bullet x + 2x \bullet 18 + (-1) \bullet x + (-1) \bullet 18$

2. Use properties of exponents to simplify any expressions.

   x is x to the first power, or x^1.

   $2x \bullet x$

   $= 2x^1 \bullet x^1$

   $= 2x^{1+1}$

   $= 2x^2$

   Rewrite the expression, substituting $2x^2$ for $2x \bullet x$.

   $2x \bullet x + 2x \bullet 18 + (-1) \bullet x + (-1) \bullet 18$

   $= 2x^2 + 2x \bullet 18 + (-1) \bullet x + (-1) \bullet 18$

3. Simplify any remaining products.

   The coefficient of a term can be multiplied by a number: $ax \bullet b = abx$.

   $2x^2 + 2x \bullet 18 + (-1) \bullet x + (-1) \bullet 18$

   $= 2x^2 + 36x - x - 18$

4. Combine any like terms.

   $2x^2 + 36x - x - 18$

   $= 2x^2 + 35x - 18$

   The result of $(2x - 1)(x + 18)$ is $2x^2 + 35x - 18$.

Example 2

Find the product of $(x^3 + 9x)(-x^2 + 11)$.

1. Distribute the first polynomial over the second.

   Ensure that any negatives are included in the products where appropriate.

   $(x^3 + 9x)(-x^2 + 11)$

   $= x^3 \bullet (-x^2) + x^3 \bullet 11 + 9x \bullet (-x^2) + 9x \bullet 11$

2. Use properties of exponents to simplify like exponential expressions.

   To multiply terms that have the same base (in this case, x), keep this base and add the exponents: $x^m \bullet x^n = x^{(m+n)}$.

   $= x^3 \bullet (-x^2) + x^3 \bullet 11 + 9x \bullet (-x^2) + 9x \bullet 11$

   $= -x^{3+2} + x^3 \bullet 11 - 9x^{1+2} + 9x \bullet 11$

   $= -x^5 + x^3 \bullet 11 - 9x^3 + 9x \bullet 11$

3. Simplify any remaining products.

   The coefficient of a term can be multiplied by a number: $ax \bullet b = abx$.

   $-x^5 + 11 \bullet x^3 - 9x^3 + 9x \bullet 11$

   $= -x^5 + 11x^3 - 9x^3 + 99x$

4. Combine any like terms.

   $-x^5 + 11x^3 - 9x^3 + 99x$

   $= -x^5 + 2x^3 + 99x$

   The result of $(x^3 + 9x)(-x^2 + 11)$ is $-x^5 + 2x^3 + 99x$.

Example 3

Find the product of $(3x + 4)(x^2 + 6x + 10)$.

1. Distribute the first polynomial over the second.

   Multiply each term in the first polynomial by each term in the second polynomial.

   $(3x + 4)(x^2 + 6x + 10)$

   $= 3x \bullet x^2 + 3x \bullet 6x + 3x \bullet 10 + 4 \bullet x^2 + 4 \bullet 6x + 4 \bullet 10$

2. Use properties of exponents to simplify any expressions.

   $3x \bullet x^2 + 3x \bullet 6x + 3x \bullet 10 + 4 \bullet x^2 + 4 \bullet 6x + 4 \bullet 10$

   $= 3x^3 + 18x^2 + 3x \bullet 10 + 4 \bullet x^2 + 4 \bullet 6x + 4 \bullet 10$

3. Simplify any remaining products.

   $3x^3 + 18x^2 + 3x \bullet 10 + 4 \bullet x^2 + 4 \bullet 6x + 4 \bullet 10$

   $= 3x^3 + 18x^2 + 30x + 4x^2 + 24x + 40$

4. Combine any like terms.

   Only terms with the same variable raised to the same power can be combined.

   The sum can first be rewritten with the exponents in descending order.

   $3x^3 + 18x^2 + 30x + 4x^2 + 24x + 40$

   $= 3x^3 + 18x^2 + 4x^2 + 30x + 24x + 40$

   $= 3x^3 + 22x^2 + 54x + 40$

   The result of $(3x + 4)(x^2 + 6x + 10)$ is $3x^3 + 22x^2 + 54x + 40$.

Example 4

Find the product of $(x + y + 1)(x^2 + 4y - 5)$.

1. Distribute the first polynomial over the second.

   Multiply each term in the first polynomial by each term in the second polynomial.

   $(x + y + 1)(x^2 + 4y - 5)$

   $= x \bullet x^2 + x \bullet 4y + x \bullet (-5) + y \bullet x^2 + y \bullet 4y + y \bullet (-5) + 1 \bullet x^2 + 1 \bullet 4y + 1 \bullet (-5)$

2. Use properties of exponents to simplify any expressions.

   $x \bullet x^2 + x \bullet 4y + x \bullet (-5) + y \bullet x^2 + y \bullet 4y + y \bullet (-5) + 1 \bullet x^2 + 1 \bullet 4y + 1 \bullet (-5)$

   $= x^3 + x \bullet 4y + x \bullet (-5) + y \bullet x^2 + 4y^2 + y \bullet (-5) + 1 \bullet x^2 + 1 \bullet 4y + 1 \bullet (-5)$

3. Simplify any remaining products.

   $x^3 + x \bullet 4y + x \bullet (-5) + y \bullet x^2 + 4y^2 + y \bullet (-5) + 1 \bullet x^2 + 1 \bullet 4y + 1 \bullet (-5)$

   $= x^3 + 4xy - 5x + x^2y + 4y^2 - 5y + x^2 + 4y - 5$

4. Combine any like terms.

   Only terms with the same variable raised to the same power can be combined.

   The sum can first be rewritten with the exponents in descending order.

   When two variables are in a term, such as $x^n y^m$, both n and m, the powers of the two variables, must be the same to combine the terms.

   $x^3 + 4xy - 5x + x^2y + 4y^2 - 5y + x^2 + 4y - 5$

   $= x^3 + x^2 + x^2y - 5x + 4xy + 4y^2 - 5y + 4y - 5$

   $= x^3 + x^2 + x^2y - 5x + 4xy + 4y^2 - y - 5$

   The result of $(x + y + 1)(x^2 + 4y - 5)$ is $x^3 + x^2 + x^2y - 5x + 4xy + 4y^2 - y - 5$.