Find the product.

\[(5x - 7)^2\]

\[= (5x - 7)(5x - 7)\]

\[= 25x^2 - 35x - 35x + 49\]

\[= 25x^2 - 70x + 49\]
Factoring Polynomials
Using a GCF (Greatest Common Factor)

Review! Simplify the following:

\[ a(3a^1 + 7) = 3a^2 + 7a \]

\[ -2m(m^2 + 6m - 1) = -2m^3 - 12m^2 + 2m \]

\[ 5xy(x - 2y) = 5x^2y - 10xy^2 \]
What is factoring?
The process of separating a polynomial back into a product.

Polynomials that cannot be factored are called ________________.

There will be several ways to factor; the approach we will take depends on the polynomial. Today, we will start by using the greatest common factor (GCF) of the polynomial.
Examples: Factor the following polynomials by finding the greatest common factor. 
Check your answers by re-distributing.

1. \( \frac{3x+12}{3} = \frac{3(x+4)}{3} = 3x+12 \)

3. \( \frac{5x+30y}{5} = \frac{5(x+6y)}{5} = 5x+30y \)

6. \( \frac{4y^4-24y}{4y} = \frac{4y(y-6)}{4y} = 4y^3-24y \)

9. \( \frac{15a^2b-30ab}{15ab} = \frac{15ab(a-2)}{15ab} = a^2b-30ab \)

13. \( \frac{18a^2bc^2-48abc^3}{6abc^2} = \frac{6abc^2(3a-8c)}{6abc^2} = 3a-8c \)

19. \( \frac{14gh^2+28gh+14h}{14h} = \frac{14h(gh+2g+1)}{14h} = gh+2g+1 \)

\( \sqrt{14gh^2+28gh+14h} \)
Recap – Rules for finding a GCF of a polynomial:

1) Look at coefficients first.

2) A variable must be common to all terms to be a GCF.

3) If a variable is common to all terms, take the one with the smallest exponent.

4) Divide all terms by the GCF to get the remainder in parentheses.
Factoring Polynomials

Difference of Squares

Review! Simplify the following:

\[(x + 4)(x - 4) = x^2 - 4x + 4x - 16 = x^2 - 16\]

\[(5x + 1)(5x - 1) = 25x^2 - 5x + 5x - 1 = 25x^2 - 1\]

\[(2a + 3b)(2a - 3b) = 4a^2 - 6ab + 6ab - 9b^2 = 4a^2 - 9b^2\]

This resulting product is called a DIFFERENCE OF SQUARES.
To factor a difference of squares, use the following rule:

\[ a^2 - b^2 = (a+b)(a-b) \]

Examples: Check your answers by FOIL

1. \( \sqrt{a^2 - 4} \)
   \( \frac{\sqrt{a^2}}{\sqrt{4}} \)
   \( \frac{a}{2} \)
   \( (a+2)(a-2) \)

5. \( k^2 - 25 \)
   \( \text{prime} \)

7. \( \sqrt{9b^2 - 100} \)
   \( \frac{\sqrt{9b^2}}{\sqrt{100}} \)
   \( \frac{3b}{10} \)
   \( (3b+10)(3b-10) \)

13. \( x^2y^2 - 1 \)
   \( \frac{\sqrt{x^2y^2}}{\sqrt{1}} \)
   \( xy \)
   \( (xy+1)(xy-1) \)

\[ x^2y^2 - xy + xy - 1 \]
\[ x^2y^2 - 1 \]
Multi-Step Factoring: Look for a GCF first, then factor the difference of squares.

21. \[
\frac{24a^2 - 54b^2}{6} = 6(4a^2 - 9b^2)
\]
   \[= 6(2a+3b)(2a-3b)\]

25. \[
\frac{100b^3 - 36b}{4b} = 4b(25b^2 - 9)
\]
   \[= 4b(5b+3)(5b-3)\]

31. \[
\frac{m^3n - mn}{mn} = mn(m^2 - 1)
\]
   \[= mn(m+1)(m-1)\]