Factoring polynomials by common factors

A polynomial is factored when it is expressed as a product of 2 or more polynomials.

The distributive property of integers and algebra, $P(Q + R) = PQ + PR$ is the greatest aide in factoring. For the purposes of factoring we generally write the property in reverse order $PQ + PR = P(Q + R)$. In this way we can see that P and $(Q + R)$ are the factors of $PQ + PR$.

Example:

Factor $5x + 30$ by common factors
Since $5x = 5 * x$ and $30 = 5 * 6$, 5 is the common factor
$5x + 30 = (5 * x) + (5 * 30)$
$5x + 30 = 5(x + 30)$ by reverse distributive law.

Procedure to factor by common factors.

1. Find the common factor in all the terms
2. Write each term as a product using the common factor found in step 1
3. Use reverse distributive law to factor out the common factor

Example:

Factor $5y^3 + 25y$
The common factor in the terms is $5y$
$5y^3 + 25y = 5y(y^2) + 5y(5)$
so $5y^3 + 25y = 5y(y^2 + 5)$

Example:

Factor $18h^5 + 12h^4 – 21h^3$
The common factor is $3h^3$
$18h^5 = 3h^3(6h^2)$
$12h^4 = 3h^3(4h)$
$21h^3 = 3h^3(7)$
so $18h^5 + 12h^4 – 21h^3 = 3h^3(6h^2) + 3h^3(4h) - 21h^3 - 3h^3(7)$
$18h^5 + 12h^4 – 21h^3 = 3h^3(6h^2 + 4h – 7)$

Example:

Factor $4a^7b^5c + 10a^3b^8 – 16a^4b^6 + 18a^5b^7$

The common factor is $2a^3b^5$, note c is not in all terms

$4a^7b^5c = 2a^3b^5(2a^4c)$

$10a^3b^8 = 2a^3b^5(5b^3)$

$16a^4b^6 = 2a^3b^5(8ab)$

$18a^5b^7 = 2a^3b^5\ (9a^2b^2)$

so $4a^7b^5c + 10a^3b^8 – 16a^4b^6 + 18a^5b^7 =$

$2a^3b^5(2a^4c) + 2a^3b^5(5b^3) - 2a^3b^5(8ab) + 2a^3b^5(9a^2b^2)$

$4a^7b^5c + 10a^3b^8 – 16a^4b^6 + 18a^5b^7 = 2a^3b^5(2a^4c + 5b^3 - 8ab + 9a^2b^2)$