

Three types of factoring
 → common
 → trinomial
 → difference of squares

Common Factoring

expanding $3(x+2) = 3x+6$ Factoring

Pre-Practice: Multiply/Divide the following monomials

a) $2x(4x)$
 $= 8x^2$

b) $-5(2x^2)$
 $= -10x^2$

c) $-3x^2(4xy)$
 $= -12x^3y$

(x^2)(x) = (x^3)(x)

d) $\frac{4x^2}{2x}$
 $= 2x^1$

e) $\frac{15x^2}{3x^2}$
 $= 5x^0$
 $= 5$

f) $\frac{24x^2y}{-3xy}$
 $= -8x^1$

Factoring is the mathematical technique of rewriting an expression as a product of multiple expressions. For example: $3x + 6 = 3(x + 2)$
 To common factor, we extract the largest factor from all terms in a polynomial.

For example, consider the following expression

$$6x^2 - 4x^1$$

- What is the greatest common multiple in all coefficients? 2
- What is the smallest exponent on 'x'? 1

So we factor out $2x^1$ from the expression to get... $2x(3x-2)$

Example

Common factor the following expressions

a) $2x + 8$
 $= 2(x+4)$

b) $-10x^3 + 5x^1$
 $= -5x(2x^2-1)$

c) $24x + 8y - 12$
 $= 4(6x+2y-3)$

d) $9x^2 - 6x + 17$
 $= \text{can't common factor}$

← prime (1x17)

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

Practice – Expanding Binomials and Common Factoring

1. Expand the following.

$$\begin{aligned} \text{a) } (x-3)(x+10) \\ &= x^2 + 10x - 3x - 30 \\ &= x^2 + 7x - 30 \end{aligned}$$

$$\begin{aligned} \text{b) } (x+6)(x-8) \\ &= x^2 - 8x + 6x - 48 \\ &= x^2 - 2x - 48 \end{aligned}$$

$$\begin{aligned} \text{c) } (2x-1)(3x+9) \\ &= 6x^2 + 18x - 3x - 9 \\ &= 6x^2 + 15x - 9 \end{aligned}$$

$$\begin{aligned} \text{d) } -2(x-5)(x+6) \\ &= -2(x^2 + 6x - 5x - 30) \\ &= -2(x^2 + x - 30) \\ &= -2x^2 - 2x + 60 \end{aligned}$$

$$\begin{aligned} \text{e) } (x-8)^2 \\ &= (x-8)(x-8) \\ &= x^2 - 8x - 8x + 64 \\ &= x^2 - 16x + 64 \end{aligned}$$

$$\begin{aligned} \text{f) } -3(x-5)^2 \\ &= -3(x-5)(x-5) \\ &= -3(x^2 - 5x - 5x + 25) \\ &= -3(x^2 - 10x + 25) \\ &= -3x^2 + 30x - 75 \end{aligned}$$

2. Common factor the following.

$$\begin{aligned} \text{a) } 5x + 10 \\ &= 5(x+2) \end{aligned}$$

$$\begin{aligned} \text{b) } 8x^2 - 24 \\ &= 8(x^2 - 3) \end{aligned}$$

$$\begin{aligned} \text{c) } 6x + 7x^2 \\ &= x(6 + 7x) \end{aligned}$$

$$\begin{aligned} \text{d) } 3x^2 - 6x \\ &= 3x(x-2) \end{aligned}$$

$$\begin{aligned} \text{e) } -5x^2 + 30x \\ &= -5x(x-6) \end{aligned}$$

$$\begin{aligned} \text{f) } 12a - 18a^2 \\ &= 6a(1-3a) \end{aligned}$$

$$\begin{aligned} \text{g) } 36x^2 + 12x - 6 \\ &= 6(6x^2 + 2x - 1) \end{aligned}$$

$$\begin{aligned} \text{h) } 9x^2 - 3x + 6 \\ &= 3(3x^2 - x + 2) \end{aligned}$$

$$\begin{aligned} \text{i) } x^3 - 10x^2 + 5x \\ &= x(x^2 - 10x + 5) \end{aligned}$$

$$\begin{aligned} \text{j) } -12x^2 + 3x - 18 \\ &= -3(4x^2 - x + 6) \end{aligned}$$

$$\begin{aligned} \text{k) } 8x^2 - 12 \\ &= 4(2x^2 - 3) \end{aligned}$$

$$\begin{aligned} \text{l) } 24x^2 - 12x + 7 \\ &= \text{can't common} \\ &\quad \text{factor} \end{aligned}$$