Strategies for factoring.

① look for the greatest Common factor

② Try grouping terms together

③ identify special cases - x^2+bx+c, ax^2+bx+c, x^2-y^2

④ simplify if possible.

(g) $9-(2x+1)^2 = (3+2x+1)(3-2x-1)$

$= (4+2x)(2-2x)$

(h) $24x^4-16x^3-81x+54$

$8x^3(3x-2)-(27)(3x-2)$

$=(3x-2)(8x^3-27)$

$=(3x-2)(2x-3)(4x^2+6x+9)$

(p) $12x^3y-30x^2y-18xy$

$=3xy(4x^2-10x-6)$

$=6xy(2x^2-5x-3)$

$=6xy(2x^2-6x+1x-3)$

$=6xy(2x(x-3)+(x-3))$

$=6xy(x-3)(2x+1)$

$m+n=-5$

$mn=-6$

$m=-6, n=1$

$128x^4 - 8y^2x^2$

(a) $= 8x^2(16x^2 - y^2)$

$= 8x^2(4x - y)(4x + y)$

$(5x + 7)^2 - 16$

(m) $= (5x + 7 + 4)(5x + 7 - 4)$

$= (5x + 11)(5x + 3)$

$y^2x - 3y^2 - 4x + 12$

(f) $= y^2(x - 3) - 4(x - 3)$

$= (x - 3)(y^2 - 4)$

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

(n) $x^4 - x^2 - 20 = (x^2 + 4)(x^2 - 5) = (x^2 + 4)(x + 5)(x - 5)$.

(q) $8x^4(x - 4) - 27x(x - 4) = x(x - 4)(8x^3 - 27)$

$= x(x - 4)(2x - 3)(4x^2 + 6x + 9)$

(t) $x^6 - 64 = (x^2 - 4)(x^4 + 16x^2 + 16)$

$= (x + 2)(x - 2)(x^4 + 16x^2 + 16)$

(r) $(x + 1)^2 - (x + 1) - 6 = ((x + 1) - 3)(x + 1 + 3)$

$= (x - 2)(x + 4)$

Simplify $\frac{x^2+3x}{x^2+5x}$

$$\frac{x^2+3x}{x^2+5x} = \frac{x(x+3)}{x(x+5)}$$ find gcf

$$= \frac{\cancel{x}}{\cancel{x}}\left(\frac{x+3}{x+5}\right)$$ cancel out common factors

$$= \frac{x+3}{x+5}$$

Steps to simplify

1. Factor numerator and denominator
2. Cancel common factors
3. simplify.

Note $\frac{x+3}{x+5}$ the x's cannot be canceled as they are not common factors

Ex// Simplify $\frac{x^2-9}{x^2+5x+6}$

$$= \frac{(x+3)(x-3)}{(x+2)(x+3)}$$ 1) factor

$$= \frac{\cancel{(x+3)}(x-3)}{(x+2)\cancel{(x+3)}}$$ 2) Cancel Common factors

$$= \frac{x-3}{x+2}$$ 3) Simplify

Ex $\frac{x^4+8x^2+7}{3x^5-3x} = \frac{(x^2+1)(x^2+7)}{3x(x^4-1)} = \frac{(x^2+1)(x^2+7)}{3x(x^2-1)(x^2+1)}$ 1)

$$= \frac{\cancel{(x^2+1)}(x^2+7)}{3x(x^2-1)\cancel{(x^2+1)}}$$ 2)

$$= \frac{x^2+7}{3x(x^2-1)}$$ 3)

Simplify $\frac{5x^2+20xy+20y^2}{x^2-xy-6y^2} = \frac{5(x^2+4yx+4y^2)}{(x-3y)(x+2y)}$

$= \frac{5(x+2y)(x+2y)}{(x-3y)(x+2y)}$

$= \frac{5(x+2y)\cancel{(x+2y)}}{(x-3y)\cancel{(x+2y)}}$

$= \frac{5(x+2y)}{(x-3y)}$

Least common multiple (LCM)

$3z^3-6z^2-9z \qquad 7z^4+21z^3+14z^2$

$= 3z(z^2-2z-3) \qquad 7z^2(z^2+3z+2)$

$= 3z(z+1)(z-3) \qquad 7z^2(z+1)(z+2)$

LCM $\rightarrow 3 \cdot z^2 \cdot (z+1)(z-3) \cdot 7(z+2)$

$= 21z^2(z+1)(z-3)(z+2)$

4: 8, 12, 16, ⋮ 6: 12, 18, 24

$4 = 2 \cdot 2 \qquad 6 = 2 \cdot 3$

LCM$(4,6) = 2 \cdot 2 \cdot 3$

Ex $\frac{a-2}{a+2} - \frac{(a-3)}{a^2+4a+4} \qquad (a+2) \qquad a^2+4a+4 = (a+2)(a+2)$

LCM $\rightarrow (a+2)(a+2)$

$= \frac{(a-2)(a+2)}{(a+2)(a+2)} - \frac{a-3}{(a+2)(a+2)}$

$= \frac{a^2-4-a+3}{(a+2)(a+2)} = \frac{a^2-a-1}{(a+2)(a+2)}$

$\frac{2p+6}{p+5} \div \frac{10}{4p+20} = \frac{2p+6}{p+5} \times \frac{4p+20}{10}$

$= \frac{(2p+6)(4p+20)}{(p+5)(10)}$

$= \frac{2(p+3)\cdot 4\cdot\cancel{(p+5)}}{\cancel{(p+5)}(2\cdot 5)}$

$= \frac{4(p+3)}{5}$

$\frac{a^2-4}{a^2-1} \cdot \frac{a+1}{a+2} = \frac{(a^2-4)(a+1)}{(a^2-1)(a+2)}$

$= \frac{(a+2)(a-2)(a+1)}{(a-1)(a+1)(a+2)}$

$= \frac{a-2}{a-1}$

Ex// $\frac{3x^2y}{2ab} \cdot \frac{14a^2b}{18xy^2} = \frac{3x^2y \cdot 14a^2b}{2ab \cdot 18xy^2}$

$= \frac{7xa}{6y}$

Ex// $\frac{2x^2-3x-20}{2x^2-7x-30} \div \frac{2x^2-5x-12}{4x^2+12x+9} \cdot \frac{x^2-36}{4x^2-9}$

$= \frac{(x-4)(2x+5)}{(2x+5)(x-6)} \times \frac{4x^2+12x+9}{2x^2-5x-12} \cdot \frac{x^2-36}{4x^2-9}$

$= \frac{(x-4)(2x+5)}{(2x+5)(x-6)} \cdot \frac{(2x+3)(2x+3)}{(x-4)(2x+3)} \cdot \frac{(x+6)(x-6)}{(2x+3)(2x-3)}$

$= \frac{(x-4)(2x+5)(2x+3)(2x+3)(x+6)(x-6)}{(2x+5)(x-6)(x-4)(2x+3)(2x+3)(2x-3)}$

$= \frac{x+6}{2x-3}$

$m+n=12 \quad nm=6$

$nm=36$

$4x^2+6x+6x+9$

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

$m+n=-5 \quad -8 \quad 3$

$nm=-24$

$2x^2-8x+3x-12$

$=2x(x-4)+3(x-4)$