Ex 1) Simplify: $\dfrac{x+2}{x-2} \cdot \dfrac{x^2-4}{x^2+x-2}$

When asked to multiply rational expressions, don't multiply (just say NO). Think of it as one rational expression that someone partially factored.
Then follow the steps from our previous lesson:
1) Factor the numerators completely
2) Factor the denominators completely
3) Divide any like FACTORS (not terms)
4) Leave your answer in factored form (usually).

$$\frac{(x+2)(x^2-4)}{(x-2)(x^2+x-2)}$$

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

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

$$\frac{x+2}{x-1}$$

Division Rule for Fractions

Let a, b, c and d be real numbers with $b \neq 0$ and $d \neq 0$

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \bullet \frac{d}{c}$$

Ex 2) Simplify: $\dfrac{x^2-1}{x+1} \div \dfrac{x^2-2x+1}{x+1}$

$$\frac{x^2-1}{x+1} \cdot \frac{x+1}{x^2-2x+1}$$

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

$$\frac{(x+1)(x-1)(x+1)}{(x+1)(x-1)(x-1)}$$

$$\frac{(x+1)(x-1)(x+1)}{(x+1)(x-1)(x-1)}$$

$$\frac{x+1}{x-1}$$

Ex 3) Simplify:

$$\frac{\dfrac{x^3+8}{x^2-4}}{\dfrac{x^2-2x+4}{x^2-4x+4}}$$

$$= \frac{x^3+8}{x^2-4} \div \frac{x^2-2x+4}{x^2-4x+4}$$

$$= \frac{x^3+8}{x^2-4} \cdot \frac{x^2-4x+4}{x^2-2x+4}$$

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

$$= \frac{(x+2)(x^2-2x+4)(x-2)(x-2)}{(x+2)(x-2)(x^2-2x+4)}$$

$$= \frac{(x+2)(x^2-2x+4)(x-2)(x-2)}{(x+2)(x-2)(x^2-2x+4)}$$

$$= x-2$$