

Simplifying Rational Expressions – Intermediate Algebra

To simplify a rational expression:

1. Factor the numerator and denominator (if possible).
2. Divide out any common factors.
3. Leave in factored form or multiply remaining factors together.

$$\frac{3}{6} = \frac{\cancel{3}(1)}{\cancel{3}(2)} = \frac{1}{2}$$

Examples: Simplify

$$1. \frac{40x^3}{12x} = \frac{\cancel{4} \cdot 10 \cdot \cancel{x} \cdot x^2}{\cancel{4} \cdot 3 \cdot \cancel{x}} = \frac{10x^2}{3}$$

$$40 = 4 \cdot 10 = 4 \cdot 2 \cdot 5$$

$$12 = 4 \cdot 3$$

$$2. \frac{(a+5)(a+7)}{(a-2)(a+5)} = \frac{a+7}{a-2}$$

P
E
M
A
S

$$3. \frac{h^2 + 6h - 16}{h^2 - 4h + 4} = \frac{(h+8)(h-2)}{(h-2)(h-2)} = \frac{h+8}{h-2}$$

$$h^2 + 6h - 16 = (h+8)(h-2)$$

$$h^2 - 4h + 4 = (h-2)(h-2)$$

$$4. \frac{(a-2)+8}{(a-2)(a-5)}$$

$(a-2)$ is not being mult. in numerator
 so is not a factor therefore, $a-2$ cannot
 be cancelled.

$$\frac{a+6}{(a-2)(a-5)}$$

$$5. \frac{12x^2 - 19x - 21}{15x^3 + 25x^2 - 140x} = \frac{(4x+3)(3x-7)}{5x(3x-7)(x+4)} = \frac{4x+3}{5x(x+4)}$$

$$12x^2 - 19x - 21 = \frac{12x^2 + 9x - 28x - 21}{}$$

$$= 3x(4x+3) - 7(4x+3)$$

$$= (4x+3)(3x-7)$$

$$15x^3 + 25x^2 - 140x$$

$$= 5x(3x^2 + 5x - 28)$$

$$= 5x(3x-7)(x+4)$$

$$12(-21) = -252 \quad | \quad -19$$

$$\frac{-252}{12-21} = \frac{-252}{-9} = 28$$

$$6. \frac{3(x-4)}{5(4-x)} = \frac{3(x-4)}{-1(x-4)} = \frac{3}{-1} = -3$$

$$4-x = -1(-4+x) = -1(x-4)$$

factor out a -1 to reverse subtraction order