Example: Divide $\dfrac{x^2-1}{x+2} \div \dfrac{x-1}{3x+6}$

$$\frac{21n^2+72n+60}{3n+6} \div \frac{49n^2+21n-70}{56n^2-56n}$$

① $140 = m \times n$, $24 = m+n$ → $10, 14$

$7n^2 + 14n + 10n + 20$

$7n(n+2) + 10(n+2)$

② $m \times n = -70$, $m+n = 3$ → $10, -7$

$7n^2 - 7n + 10n - 10$

$7n(n-1) + 10(n-1)$

$$\frac{3(7n^2+24n+20)}{3(n+2)} \div \frac{7(7n^2+3n-10)}{56n(n-1)}$$

$$\frac{3(7n+10)(n+2)}{3(n+2)} \div \frac{7(n-1)(7n+10)}{56n(n-1)}, \quad n \neq \{-2, 0, 1\}$$

$$\frac{7n+10}{1} \div \frac{7(7n+10)}{56n}$$

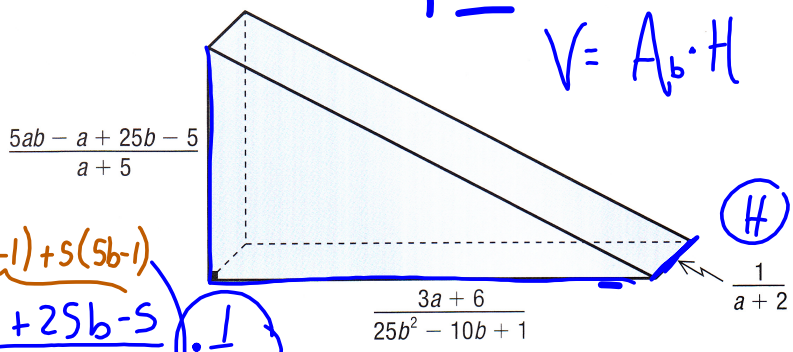
$$\frac{(7n+10)}{1} \times \frac{56n}{7(7n+10)}, \quad n \neq \left\{-2, \frac{-10}{7}, 0, 1\right\}$$

$$\frac{(7n+10)(56n)}{7(7n+10)}$$

$8n$

$7n + 10 = 0$

Determine the simplified algebraic expression that represents the volume of the adjacent right triangular-base prism.



Prism: $V = A_b \cdot H$

$A_b = \frac{b \cdot h}{2}$

$A_b = \left(\frac{3a+6}{25b^2-10b+1}\right)\left(\frac{5ab-a+25b-5}{a+5}\right)\left(\frac{1}{2}\right)$

$a(5b-1)+5(5b-1)$

$= \frac{3(a+2)}{(5b-1)(5b-1)} \cdot \frac{(5b-1)(a+5)}{a+5} \cdot \frac{1}{2}$, $a \neq -5$ $b \neq \frac{1}{5}$

$= \frac{3(a+2)(5b-1)(a+5)}{(5b-1)(5b-1)(a+5)(2)} = \frac{3(a+2)}{2(5b-1)}$

$V = \frac{3(a+2)}{2(5b-1)} \cdot \frac{1}{a+2}$, $a \neq -2$

$V = \frac{3(a+2)}{2(5b-1)(a+2)}$

$V = \frac{3}{2(5b-1)}$ $a \neq \{-5, -2\}$ $b \neq \{\frac{1}{5}\}$

3. Addition and Subtraction

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

Factor wherever possible. ✓

To add fractions, we need a common denominator.

When they don't have a common factor, the common denominator will be the product of the two denominators. c.d. $=(x+1)(x-1)$

$$\left(\frac{x-1}{x-1}\right)\left(\frac{1}{x+1}\right)+\left(\frac{2}{x-1}\right)\left(\frac{x+1}{x+1}\right), \quad x\neq\{-1,1\}$$

Multiply, then add the fractions; be sure to state any restrictions.

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

$$\frac{3x+1}{(x-1)(x+1)} \quad \text{or} \quad \frac{3x+1}{x^2-1} \qquad x \neq \{-1,1\}$$

Example: $\dfrac{x+3}{x-5}-\dfrac{x-1}{x+7}$

1: Factor ✓

2: Common denominator

- no common factor ⇒ cd is their product $(x-5)(x+7)$

$$\frac{(x+7)}{(x+7)}\cdot\frac{(x+3)}{(x-5)}-\frac{(x-1)}{(x+7)}\cdot\frac{(x-5)}{(x-5)}$$

FOIL

$x \neq \{-7, 5\}$

3: State restrictions

$$\frac{(x^2+10x+21)-(x^2-6x+5)}{(x+7)(x-5)}$$

4: Do the 2 multiplications, then subtract the numerators; be sure to subtract each term of the second numerator !

$$\frac{16x+16}{(x+7)(x-5)} \quad \text{or} \quad \frac{16x+16}{x^2+2x-35}$$

$16x+16 = 16(x+1)$

Example: $\dfrac{2x+3}{x+1} - \dfrac{x-4}{x+6}$

Factor(?)

c.d = $(x+1)(x+6)$

$\frac{(x+6)}{(x+6)}\cdot\frac{(2x+3)}{(x+1)} - \frac{(x-4)}{(x+6)}\cdot\frac{(x+1)}{(x+1)}$ (FOIL, FOIL)

$\dfrac{(2x^2+15x+18)}{(x+6)(x+1)} - \dfrac{(x^2-3x-4)}{(x+6)(x+1)}$

$\dfrac{x^2+18x+22}{(x-6)(x+1)}$

factor: $m \times n = 22$, $m+n = 18$ (no)

$x \neq \{-6, -1\}$