

Rational Expressions & Equations - Engaging Resources

RF SO1-3 - Rational Expressions & Equations Concept Summary Sheets

(Download: [Rationals Concept Maps.pdf](#))

These concept charts may help students see this topic as a whole and assist them in keeping the various strategies straight.

Rational Expressions

C1 SIMPLIFY / NPV's

- Factor numerators and denominators.
 - Greatest common factor (GCF)
 - Difference of squares $a^2 - b^2 = (a-b)(a+b)$
- State NPV's.
 - Make each factor in the denominator equal to zero and solve.
- Cancel common factors in the numerator and denominator.

Example:

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

NPV's: $x \neq 0, x+2 \neq 0, x \neq -2$

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

C2 MULTIPLY

- Factor numerators and denominators, and state NPV's.
- Cancel common factors in the numerator and denominator.
- Simplify. Multiply numerators and multiply denominators.

Example:

$$\frac{x^2 - 9}{6x} \times \frac{4x}{x-3}$$

NPV's: $x \neq 0, x \neq 3$

$$\frac{(x-3)(x+3)}{2x(x-3)} \times \frac{(2x)(2x)}{x-3}$$

$$\frac{2x(x-3)}{3} \times \frac{A}{B} = \frac{AC}{BD}$$

NPV's

C3 DIVIDE

- Factor numerators and denominators.
- State NPV's. **Use both denominators and numerator of the second fraction to find NPV's.**
- Multiply by the reciprocal of the second term.
- Simplify.

Example:

$$\frac{12}{2x+5} \div \frac{4x-12}{6x+15}$$

$$\frac{12}{2x+5} \times \frac{4(x-3)}{3(2x+5)}$$

NPV's: $x \neq 3, x \neq -\frac{5}{2}$

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

$$\frac{3 \times 3}{x-3} = \frac{9}{x-3}$$

NPV's

C4 ADD / SUBTRACT

- Factor and state NPV's. Simplify each term if possible.
- Get common denominator. Remember, you must multiply the denominator and numerator by the same number.
- Add numerators. Denominator does not change.

Example:

$$\frac{7}{x^2 + 2x} - \frac{6}{2x + 4}$$

$$\frac{7}{x(x+2)} - \frac{6}{2(x+2)}$$

NPV's: $x \neq -2, x \neq 0$

$$\frac{7 \times 2}{2x(x+2)} - \frac{6x}{2x(x+2)}$$

$$\frac{14 - 6x}{2x(x+2)}$$

Rational Equations

Review: Solve Linear and Quadratic Equations

↳ Solve Linear Equations (Degree = 1)

- Expand and combine like terms
- Isolate variable

eg. $3(x+2) - 1 = 5x$

$$3x + 6 - 1 = 5x$$

$$3x + 5 = 5x$$

$$-2x = -5$$

$$x = \frac{5}{2}$$

↳ Solve Quadratic Equations (Degree = 2)

- To solve $ax^2 + bx + c = 0$, use

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

or Factor!

Solve Rational Equations

- Factor and state NPV's. Simplify, if possible.
- Write each term with a lowest common denominator (LCD)
- Eliminate denominators by multiplying both sides of the equation by LCD.
- Solve resulting equation (Linear or Quadratic)
- Check solution(s) in original equation.

Contextual Problems

- Use information from ? to assign variables and create an equation. (A chart is often useful)
- Solve equation from previous step.
- Check solution(s) and see if they make sense.

Common Problems

- Time Working Together / Inversely**

Time (unit)	Fraction done in 1 unit
#1	$\frac{x}{x+10}$
#2	$\frac{1}{x}$
Together	$\frac{1}{90}$

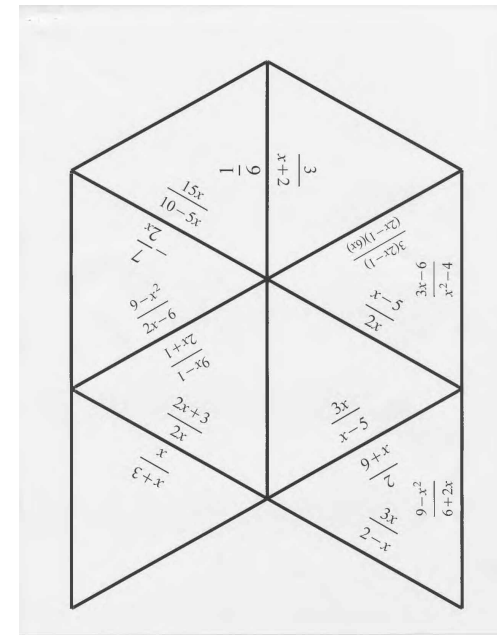
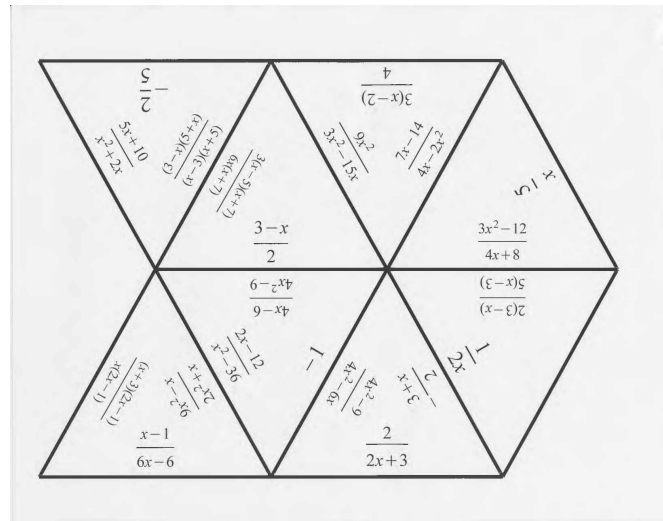
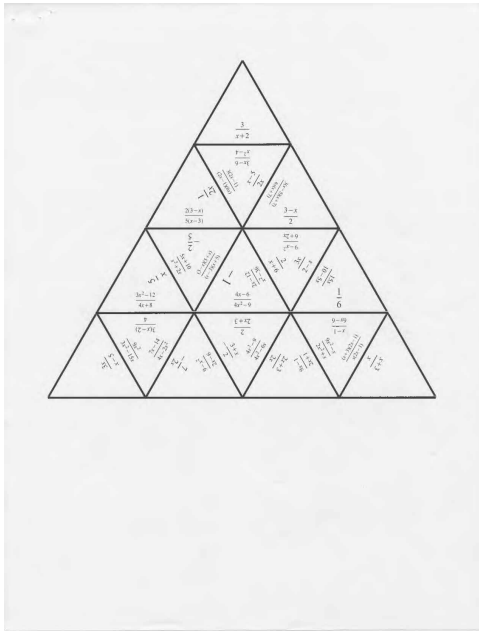
$$\frac{1}{x+10} + \frac{1}{x} = \frac{1}{90}$$
- Speed-Distance-Time**

Speed	Distance	Time
#1		$s = \frac{d}{t}$
#2		$t = \frac{d}{s}$
		$d = st$
- Profit** → Profit = Revenue - Expenses

RF SO1,2 - Rational Expressions Tarsia Puzzles

(Download: [Tarsia-Simplify Rationals.pdf](#) , [Tarsia-Simplify Rationals2.pdf](#))

Tarsia puzzles promote student practice, cooperation and communication and also serve as a formative assessment tool. The first Tarsia focuses on simplifying simple rational expressions and the second Tarsia adds some multiplication and division of rational expressions. The first page of each file is the solution and the following pages are the pieces to cut out.



RF SO3 - Rational Equations Row Game

(Download: [RG-Rational Equations.docx](#))

Rational Equations Row Game

One partner completes the exercises in column A while the other partner completes those in column B. When you compare answers, they should match. If not, work together to discover and correct the error.

Student A _____ Algebraically solve the following rational equation. 1. $\frac{1}{3x^2} = \frac{x+3}{2x^2} - \frac{1}{6x^2}$	Student B _____ Algebraically solve the following rational equation. 1. $\frac{3n+15}{4n^2} = \frac{1}{n^2} - \frac{n-3}{4n^2}$
Student A _____ Algebraically solve the following rational equation. 2. $\frac{4}{n^2} = \frac{5}{n} - \frac{1}{n^2}$	Student B _____ Algebraically solve the following rational equation. 2. $\frac{x+2}{x} = \frac{x-1}{x} - \frac{4x+2}{x^2-3x}$
Student A _____ Algebraically solve the following rational equation. 3. $\frac{1}{x^2-3x} + \frac{1}{x-3} = \frac{3}{x^2-3x}$	Student B _____ Algebraically solve the following using a rational equation. 3. The cold water tap can fill a container two hours faster than the hot water tap. The two taps together can fill the container in 80 min. How long does it