

Expression Operations Lab

Simplify rational expressions with every operation.

HIGH SCHOOL • MA.912.AR.1.10

MA.912.AR.1.10 "Solve mathematical and real-world problems involving addition, subtraction, multiplication or division of rational algebraic expressions."

NAME _____

DATE _____

COMBINE, FACTOR, SIMPLIFY

To add or subtract rational expressions, rewrite each term with a common denominator. To multiply, factor and cancel common factors before multiplying. To divide, multiply by the reciprocal, then state values that make an original denominator zero or make a divisor equal zero.

WORKED EXAMPLE

Simplify: $x/11 + 2/13$

1. The least common denominator is 143.
2. Rewrite the terms: $x/11 = 13x/143$ and $2/13 = 22/143$.
3. Add the numerators: $(13x + 22)/143$.

Answer: $(13x + 22)/143$

PRACTICE 6 problems

1 Simplify: $(5x/7)(21/(15x))$

ANSWER _____

2 Simplify: $7/(x + 4) - 3/(x + 4)$

ANSWER _____

3 Simplify: $x/6 + 5/8$

ANSWER _____

4 Simplify: $((x^2 - 16)/(x + 3)) / ((x - 4)/(x + 3))$

ANSWER _____

5 Simplify: $4/(x - 3) + 5/(x + 3)$

ANSWER _____

6 Simplify: $7x/(x^2 - 1) - 4/(x - 1)$

ANSWER _____

APPLY IT Show your work

- 1** A school music club rents a recording studio. The cost per student is $120/x$ dollars when x students attend. A sponsor discount lowers the cost by $3/x$ dollars per student. Write and simplify the new cost per student.

WORK SPACE

ANSWER _____

- 2** A game update has two parts. At a download speed of x megabytes per minute, the first part takes $48/x$ minutes. After the speed improves by 3 megabytes per minute, the second part takes $30/(x + 3)$ minutes. Write the total download time as one rational expression.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Simplify: $(3/(x - 4) + 5/(x + 4)) / ((8x + 6)/(x^2 - 16))$

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simplify: $(5x/7)(21/(15x))$	1, $x \neq 0$
2	Simplify: $7/(x + 4) - 3/(x + 4)$	$4/(x + 4)$, $x \neq -4$
3	Simplify: $x/6 + 5/8$	$(4x + 15)/24$
4	Simplify: $((x^2 - 16)/(x + 3)) / ((x - 4)/(x + 3))$	$x + 4$, $x \neq -3, 4$
5	Simplify: $4/(x - 3) + 5/(x + 3)$	$(9x - 3)/(x^2 - 9)$, $x \neq -3, 3$
6	Simplify: $7x/(x^2 - 1) - 4/(x - 1)$	$(3x - 4)/(x^2 - 1)$, $x \neq -1, 1$

PART 2 · APPLY IT

- 117/x dollars per student, $x > 0$** Subtract the rational expressions because both terms have denominator x . The new cost is $(120 - 3)/x$.
- $(78x + 144)/(x(x + 3))$ minutes, $x > 0$** Add $48/x$ and $30/(x + 3)$ using $x(x + 3)$ as the common denominator. Combine the numerators and simplify.

CHALLENGE

$(4x - 4)/(4x + 3)$, $x \neq -4, 4, -3/4$

Accept equivalent simplified forms when all required restrictions from the original expression are included. Do not accept a canceled form if it omits a value that made an original denominator zero or made a divisor equal zero.