LESSON MAKER PRO

Rational Expression Remix

Combine expressions and keep track of where they are defined.

HIGH SCHOOL · PC.A.D.19

PC.A.D.19 "Add, subtract, multiply, and divide rational expressions. a. Explain why rational expressions form a system analogous to the rational numbers, which is closed under addition, subtraction, multiplication..."

NAME _____ DATE _____

THE BIG IDEA

Rational expressions are ratios of polynomials, much as rational numbers are ratios of integers. Use a common denominator to add or subtract, multiply across to multiply, and multiply by the reciprocal to divide. The result is another rational expression, but you must exclude values that make an original denominator or the expression you divide by equal to zero.

WORKED EXAMPLE

Simplify (x+11)/(x-13) + 17/(x-13). State the excluded x-value.

1. The denominators match, so combine the numerators: ((x+11)+17)/(x-13).
2. Combine like terms: (x+28)/(x-13).
3. The original denominator is zero at x=13, so exclude x=13.

Answer: (x+28)/(x-13); x ≠ 13

PRACTICE 6 problems

1 Simplify (x+2)/(x-3) + 5/(x-3). State all excluded x-values.

ANSWER _____

2 Simplify 3/(x+4) - 2/(x-4). State all excluded x-values.

ANSWER _____

3 Simplify (x^2-9)/(x+5) × (x+5)/(x-3). State all excluded x-values.

ANSWER _____

4 Simplify (x^2-4)/(x+7) ÷ (x-2)/(x+7). State all excluded x-values.

ANSWER _____

5 Simplify 2/(x-5) + 3/(x+5). State all excluded x-values.

ANSWER _____

6 Simplify (x+8)/(x-2) ÷ (x^2-16)/(x-2). State all excluded x-values.

ANSWER _____

APPLY IT Show your work

1 At an esports event, you download a 12 GB game update at x GB per minute. You then download an 18 GB update at (x+3) GB per minute. Write and simplify the total download time in minutes. Assume x is positive.

WORK SPACE

ANSWER _____

2 Two friend groups split parking costs for a concert. One group of x friends pays $48; another group of x+2 friends pays $60. Write and simplify the second group's cost per person minus the first group's cost per person. Let x be a positive whole number.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Simplify $(x^2-1)/(x^2-4) \div (x-1)/(x+2) - 1/(x-2)$. State all excluded x-values. Then explain in one sentence why the result illustrates closure for rational expressions.

WORK SPACE AND ANSWER

ANSWER KEY

Rational Expression Remix

HIGH SCHOOL · PC.A.D.19

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simplify (x+2)/(x-3) + 5/(x-3). State all excluded x-values.	**(x+7)/(x-3); x ≠ 3**
2	Simplify 3/(x+4) - 2/(x-4). State all excluded x-values.	**(x-20)/((x+4)(x-4)); x ≠ -4, 4**
3	Simplify (x^2-9)/(x+5) × (x+5)/(x-3). State all excluded x-values.	**x+3; x ≠ -5, 3**
4	Simplify (x^2-4)/(x+7) ÷ (x-2)/(x+7). State all excluded x-values.	**x+2; x ≠ -7, 2**
5	Simplify 2/(x-5) + 3/(x+5). State all excluded x-values.	**5(x-1)/((x-5)(x+5)); x ≠ -5, 5**
6	Simplify (x+8)/(x-2) ÷ (x^2-16)/(x-2). State all excluded x-values.	**(x+8)/((x-4)(x+4)); x ≠ -4, 2, 4**

PART 2 · APPLY IT

1. **(30x+36)/(x(x+3)) minutes; x > 0** Add the download times: 12/x + 18/(x+3). A common denominator of x(x+3) gives (12(x+3)+18x)/(x(x+3)) = (30x+36)/(x(x+3)).
2. **12(x-8)/(x(x+2)) dollars; x is a positive whole number** Subtract the per-person costs in the stated order: 60/(x+2) - 48/x. Using the common denominator x(x+2) gives (60x-48(x+2))/(x(x+2)) = 12(x-8)/(x(x+2)).

CHALLENGE

x/(x-2); x ≠ -2, 1, 2. For every allowed x, dividing by a nonzero rational expression and subtracting a rational expression produces another rational expression.

Accept equivalent simplified forms. Require exclusions from the original expressions, even when a factor cancels.