

Rational Expressions

Name: _____ Date: _____ Score: _____ / 18

Quick Review and Helpful Hints

A *rational expression* is a fraction whose top and bottom are polynomials. Simplify by factoring both parts and canceling common factors. It is *undefined* wherever the denominator equals 0, so those x -values must be excluded.

▶ **Example:** Simplify $\frac{x^2 - 9}{x + 3}$. **Work:** Factor the top: $\frac{(x + 3)(x - 3)}{x + 3}$.
 Cancel the common $(x + 3)$. **★ Answer:** $x - 3$ ($x \neq -3$)

$$\frac{\cancel{(x + 3)}(x - 3)}{\cancel{(x + 3)}} = x - 3$$

Cancel common factors.

Practice Problems

Simplify each expression (or answer as directed).

- | | | | |
|---------------------------------|-------|---|-------|
| 1. $\frac{2x}{4}$ | _____ | 8. $\frac{x^2 - 16}{x - 4}$ | _____ |
| 2. $\frac{6x^2}{3x}$ | _____ | 9. $\frac{5x^2}{10x}$ | _____ |
| 3. $\frac{x^2 - 4}{x - 2}$ | _____ | 10. $\frac{x^2 + 7x + 10}{x + 5}$ | _____ |
| 4. $\frac{x^2 - 9}{x + 3}$ | _____ | 11. $\frac{x^2 - 25}{x + 5}$ | _____ |
| 5. $\frac{x^2 + 5x + 6}{x + 2}$ | _____ | 12. $\frac{4x + 8}{x + 2}$ | _____ |
| 6. $\frac{x^2 - x - 6}{x - 3}$ | _____ | 13. $\frac{x^2 - 1}{x - 1}$ | _____ |
| 7. $\frac{3x + 6}{3}$ | _____ | 14. $\frac{1}{x - 3}$ is undefined when $x =$ | _____ |

Word Problems

15. A rectangle has area $x^2 - 36$ and one side length $x + 6$. Simplify $\frac{x^2 - 36}{x + 6}$ to represent the other side length. _____
16. Where is $\frac{5}{x - 2}$ undefined? _____
17. A batch recipe has total ingredient amount $2x^2 + 4x$ split evenly across $2x$ containers. Simplify $\frac{2x^2 + 4x}{2x}$ for the amount per container. _____
18. A rectangular garden has area $x^2 + 8x + 15$ and one side $x + 3$. Simplify $\frac{x^2 + 8x + 15}{x + 3}$ for the missing side. _____



Answer Keys

1. $\frac{x}{2}$

2. $2x$

3. $x + 2$

4. $x - 3$

5. $x + 3$

6. $x + 2$

7. $x + 2$

8. $x + 4$

9. $\frac{x}{2}$

10. $x + 2$

11. $x - 5$

12. 4

13. $x + 1$

14. 3

15. $x - 6$

16. $x = 2$

17. $x + 2$

18. $x + 5$

Step-by-Step Explanations

1. Start by naming the process: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is Divide top and bottom by 2: $\frac{x}{2}$. So the final answer is $\frac{x}{2}$.

2. A good way to think about this is: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{6x^2}{3x} = 2x$. So the final answer is $2x$.

3. Step by step: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x-2)(x+2)}{x-2} = x+2$. So the final answer is $x+2$.

4. Take it one move at a time: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x+3)(x-3)}{x+3} = x-3$. So the final answer is $x-3$.

5. Start by naming the process: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x+2)(x+3)}{x+2} = x+3$. So the final answer is $x+3$.

6. A good way to think about this is: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x-3)(x+2)}{x-3} = x+2$. So the final answer is $x+2$.

7. Step by step: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{3(x+2)}{3} = x+2$. So the final answer is $x+2$.

8. Take it one move at a time: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x-4)(x+4)}{x-4} = x+4$. So the final answer is $x+4$.

9. Start by naming the process: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{5x^2}{10x} = \frac{x}{2}$. So the final answer is $\frac{x}{2}$.

10. A good way to think about this is: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x+5)(x+2)}{x+5} = x+2$. So the final answer is $x+2$.

11. Step by step: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x-5)(x+5)}{x+5} = x-5$. So the final answer is $x-5$.

12. Take it one move at a time: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{4(x+2)}{x+2} = 4$. So the final answer is 4.

13. Start by naming the process: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x-1)(x+1)}{x-1} = x+1$. So the final answer is $x+1$.

14. A good way to think about this is: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is The bottom is 0 when $x = 3$. So the final answer is 3.

15. Step by step: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x-6)(x+6)}{x+6} = x-6$. So the final answer is $x-6$.

16. Take it one move at a time: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is The denominator is 0 at $x = 2$. So the final answer is $x = 2$.

17. Start by naming the process: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{2x(x+2)}{2x} = x+2$. So the final answer is $x+2$.

18. A good way to think about this is: For a rational expression, factor first when possible, then cancel only common factors from the top and bottom. The setup/work is $\frac{(x+3)(x+5)}{x+3} = x+5$. So the final answer is $x+5$.



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