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. $\frac{2x}{4}$ _____
2. $\frac{6x^2}{3x}$ _____
3. $\frac{x^2-4}{x-2}$ _____
4. $\frac{x^2-9}{x+3}$ _____
5. $\frac{x^2+5x+6}{x+2}$ _____
6. $\frac{x^2-x-6}{x-3}$ _____
7. $\frac{3x+6}{3}$ _____
8. $\frac{x^2-16}{x-4}$ _____
9. $\frac{5x^2}{10x}$ _____
10. $\frac{x^2+7x+10}{x+5}$ _____
11. $\frac{x^2-25}{x+5}$ _____
12. $\frac{4x+8}{x+2}$ _____
13. $\frac{x^2-1}{x-1}$ _____
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. $\boxed{\frac{x}{2}}$
2. $\boxed{2x}$
3. $\boxed{x+2}$
4. $\boxed{x-3}$
5. $\boxed{x+3}$
6. $\boxed{x+2}$
7. $\boxed{x+2}$
8. $\boxed{x+4}$
9. $\boxed{\frac{x}{2}}$
10. $\boxed{x+2}$
11. $\boxed{x-5}$
12. $\boxed{4}$
13. $\boxed{x+1}$
14. $\boxed{3}$
15. $\boxed{x-6}$
16. $\boxed{x=2}$
17. $\boxed{x+2}$
18. $\boxed{x+5}$

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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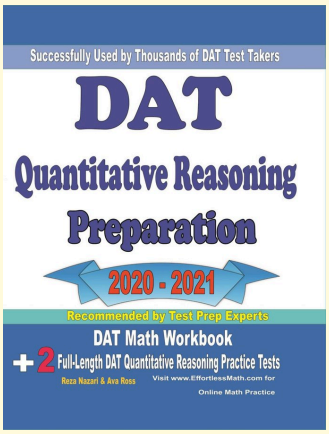

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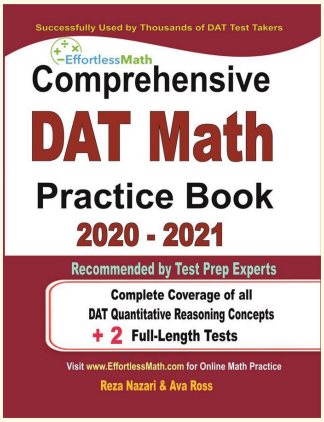

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