MATHEMATICS · GRADES 10-12

Adding rational expressions

Difficulty level: Advanced

Mathematics: Grades 10-12

This document was made by AI and there may be mistakes. If a question or answer looks wrong, use the Flag a mistake button to let Brett know so he can fix it.

Overview of the concept

This is how you combine two rates into one, like two people painting a room together or two taps filling a tank. Each rate is written as a fraction, and adding them tells you how fast the job gets done together. It is the same idea as adding ordinary fractions, just with rates instead of slices of pizza.



Rule

Adding rational expressions: add them the same way you add fractions.

Get a common denominator, add the numerators, and keep the denominator. Remember the values that would make any denominator zero are excluded.

© 2026 Brett Robbins. All Rights Reserved.

Worked examples

EXAMPLE 1

Q Add $\frac{3}{(x+1)} + \frac{5}{(x+1)}$

SOLUTION

The denominators are already the same, so add the numerators: 3 + 5 = 8

Keep the denominator: $\frac{8}{(x+1)}$

Note the excluded value: x is not -1.

EXAMPLE 2

Q Add $\frac{1}{x} + \frac{1}{(x+1)}$

SOLUTION

Find a common denominator: x(x + 1)

Multiply the top and bottom of $\frac{1}{x}$ by (x + 1): that gives $\frac{(x+1)}{(x(x+1))}$

Multiply the top and bottom of $\frac{1}{x+1}$ by x: that gives $\frac{x}{(x(x+1))}$

Add the numerators: (x + 1) + x = 2x + 1, so the sum is $\frac{(2x+1)}{(x(x+1))}$, with x not 0 and x not -1.

© 2026 Brett Robbins. All Rights Reserved.

Practice questions

1 A recipe uses $\frac{2}{x - 1}$ cups of flour in one bowl and $\frac{3}{x - 1}$ cups in another. How many cups of flour are used in total?

- **A** $\frac{5}{x + 1}$
- **B** $\frac{5}{x - 1}$
- **C** $\frac{5}{2x - 2}$
- **D** $\frac{6}{x - 1}$

Understand It with Pulse | Flag a mistake

2 Add $\frac{1}{x}$ and $\frac{2}{x}$. Give the total as a single fraction.

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

3 Two painters cover $\frac{1}{x+2}$ and $\frac{3}{2x+4}$ of a wall per hour. What fraction of the wall do they cover together in one hour?

A $\frac{5}{2x+4}$

B $\frac{4}{2x+4}$

C $\frac{5}{x+2}$

D $\frac{4}{x+2}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

4 A cyclist rides $\frac{1}{x - 3}$ of a route before lunch and $\frac{1}{x + 3}$ after lunch. What fraction of the route is that in total?

A $\frac{2}{x^2 - 9}$

B $\frac{2x}{x^2 - 9}$

C $\frac{2x}{x^2 + 9}$

D $\frac{1}{x}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

5 A tap fills $\frac{2}{x}$ of a tank per hour and a second tap fills $\frac{1}{x+2}$ per hour. What fraction of the tank do they fill together in one hour?

A $\frac{(3x + 4)}{x(x + 2)}$

B $\frac{(3x + 2)}{x(x + 2)}$

C $\frac{3}{x(x + 2)}$

D $\frac{(3x + 4)}{x + 2}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

6 A tap fills $\frac{2}{x}$ of a tank per hour and a drain empties $\frac{1}{x+2}$ per hour. What fraction of the tank is filled in one hour?

A $\frac{(x+4)}{x(x+2)}$

B $\frac{(3x+4)}{x(x+2)}$

C $\frac{(x+4)}{x+2}$

D $\frac{1}{x(x+2)}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

7 The sum of two fractions is $\frac{3}{x+1}$. One of them is $\frac{1}{x+1}$. What is the other one?

- **A** $\frac{1}{x+1}$
- **B** $\frac{2}{x+1}$
- **C** $\frac{3}{x+1}$
- **D** $\frac{4}{x+1}$

Understand It with Pulse | Flag a mistake

8 Lee adds $\frac{1}{x+2} + \frac{3}{x+2}$ and writes $\frac{4}{2x+4}$. What did Lee do wrong?

- **A** He multiplied the denominators.
- **B** He added the denominators too.
- **C** He forgot to add the numerators.
- **D** He simplified the fraction too early.

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

9 One painter covers $\frac{5}{x+2}$ of a wall per hour and the other covers $\frac{2}{x+2}$ of a wall per hour. How much more of the wall does the first painter cover in one hour?

A $\frac{3}{x+2}$

B $\frac{7}{x+2}$

C $\frac{3}{x-2}$

D $\frac{5}{x+2}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

10 **Which one has a different value from the others?**

A $\frac{1}{x} + \frac{1}{x}$

B $\frac{2}{x}$

C $\frac{1}{x} + \frac{2}{x}$

D $\frac{3}{x} - \frac{1}{x}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

ANSWER KEY

1. $\frac{5}{x - 1}$

2. $\frac{3}{x}$

3. $\frac{5}{2x + 4}$

4. $\frac{2x}{x^2 - 9}$

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

6. $\frac{(x + 4)}{x(x + 2)}$

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

8. He added the denominators too

9. $\frac{3}{x + 2}$

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

© 2026 Brett Robbins. All Rights Reserved.