MATHEMATICS · GRADES 10-12

Complex fractions

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you simplify a fraction that has fractions inside it. A recipe ratio written as a fraction over a fraction looks messy, but tidying the top and bottom first turns it into an ordinary fraction. It is the same simplify-first habit that makes every other fraction problem easier.



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Worked examples

EXAMPLE 1

Q Simplify $\dfrac{1 + \dfrac{1}{x}}{1 - \dfrac{1}{x}}$

SOLUTION

Simplify the top: $1 + \frac{1}{x} = \frac{(x + 1)}{x}$

Simplify the bottom: $1 - \frac{1}{x} = \frac{(x - 1)}{x}$

Divide: $(\frac{(x + 1)}{x}) \times (\frac{x}{(x - 1)}) = \frac{(x + 1)}{(x - 1)}$, with x not 0 and x not 1.

EXAMPLE 2

Q Simplify $\dfrac{1 + \dfrac{1}{x}}{x}$

SOLUTION

Simplify the top: $1 + \frac{1}{x} = \frac{(x + 1)}{x}$

Divide by x: $\frac{(x + 1)}{x} \div x = \frac{(x + 1)}{x^2}$

So the result is $\frac{(x + 1)}{x^2}$, with x not 0.

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Practice questions

1 Simplify $(\frac{1}{2}) \div (\frac{1}{4})$.

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2 Simplify $(\frac{2}{3}) \div (\frac{4}{9})$.

A $\frac{2}{3}$

B $\frac{3}{2}$

C $\frac{8}{27}$

D $\frac{9}{4}$

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3 Simplify $(\frac{1}{x}) \div (\frac{1}{x^2})$.

- **A** $\frac{1}{x}$
- **B** x^2
- **C** x
- **D** 1

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4 Simplify $(\frac{3}{x}) \div (\frac{x}{3})$.

- **A** 1
- **B** $\frac{9}{x}$
- **C** $\frac{9}{x^2}$
- **D** $\frac{x^2}{9}$

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5 Simplify $(1 + \frac{2}{x}) \div (1 - \frac{2}{x})$.

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

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

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

D $\frac{x}{(x - 2)}$

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

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

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

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

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

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7 Simplify $(\frac{1}{2}) \div (\frac{1}{x})$.

- **A** $\frac{x}{2}$
- **B** $\frac{2}{x}$
- **C** $2x$
- **D** x

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8 For which value of x is $(\frac{1}{x}) \div (\frac{1}{x^2})$ undefined?

- **A** $x = 0$
- **B** $x = 1$
- **C** $x = -1$
- **D** $x = 2$

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9 Simplify $(1 + \frac{1}{2}) \div (1 - \frac{1}{4})$.

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10 Simplify $((\frac{2}{x}) + 1) \div 2$.

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

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

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

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

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ANSWER KEY

1. 2

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

3. x

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

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

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

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

8. $x = 0$

9. 2

10. $\frac{(x + 2)}{(2x)}$

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