

Algebra 2 - Rational Expressions - Answer Key

Common Core A-APR.D.7, A-SSE.A.2 · maths-pdf.fr/en/

Every worksheet problem on rational expressions is solved here, one step at a time. Compare your method as well as your final answer, because the steps show where canceling terms instead of factors can go wrong. Final answers appear in bold so you can find them quickly when you only need a check.

Algebra 2 · Common Core State Standards: **A-APR.D.7, A-SSE.A.2**

Exercise 1 - Excluded values

Set the denominator to 0: $x^2 - 5x + 6 = (x - 2)(x - 3) = 0$.

$x \neq 2$ and $x \neq 3$

Exercise 2 - Simplify a monomial quotient

Factor: $\frac{2x(x+3)}{4x} = \frac{x+3}{2}$.

$\frac{x+3}{2}$, $x \neq 0$

Exercise 3 - Simplify, trinomial denominator

$\frac{(x-3)(x+3)}{(x+3)(x-2)}$. Cancel $x+3$.

$\frac{x-3}{x-2}$, $x \neq -3, 2$

Exercise 4 - Simplify, common factor $x - 2$

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

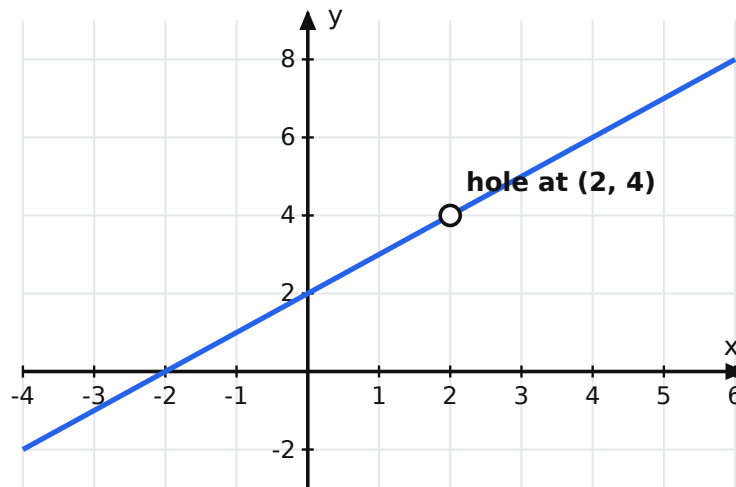
$\frac{x-3}{x+2}$, $x \neq \pm 2$

Exercise 5 - Perfect square denominator

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

$$\frac{x-4}{x+4}, x \neq -4$$

Exercise 6 - Hole in a graph



$y = (x^2 - 4)/(x - 2)$ is the line $y = x + 2$ with a hole at $x = 2$.

$$\frac{(x-2)(x+2)}{x-2} = x+2 \text{ for } x \neq 2.$$

The function is not defined at $x = 2$, so there is a hole at (2,4), where the line $y = x+2$ would have been.

$f(x) = x + 2$ for $x \neq 2$; hole at (2, 4)

Exercise 7 - Multiply

$$x^2 - 16 = (x-4)(x+4). \text{ Cancel } x+3 \text{ and } x-4.$$

$$x+4$$

Exercise 8 - Multiply, factor first

$$\frac{(x-1)(x+1)}{x+3} \cdot \frac{x(x+3)}{x+1}. \text{ Cancel } x+1 \text{ and } x+3.$$

$$x(x-1), x \neq -3, -1$$

Exercise 9 - Divide

Multiply by the reciprocal: $\frac{(x-5)(x+5)}{x+1} \cdot \frac{(x-1)(x+1)}{x+5}$.

$$(x-5)(x-1)$$

Exercise 10 - Add, unlike denominators

The LCD is $(x+2)(x-1)$.

$$\frac{3(x-1)+5(x+2)}{(x+2)(x-1)} = \frac{3x-3+5x+10}{(x+2)(x-1)}.$$

$$\frac{8x+7}{(x+2)(x-1)}$$

Exercise 11 - Subtract

$$\text{LCD } (x-3)(x+3): \frac{x(x+3)-2(x-3)}{(x-3)(x+3)}.$$

$$\text{Numerator: } x^2+3x-2x+6 = x^2+x+6.$$

$$\frac{x^2+x+6}{x^2-9}$$

Exercise 12 - Add with a factorable denominator

$$x^2-1=(x-1)(x+1), \text{ so the LCD is } (x-1)(x+1).$$

$$\frac{1+(x+1)}{(x-1)(x+1)}.$$

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

Exercise 13 - Subtract and simplify

$$\text{LCD } (x-2)(x+2): \frac{x-(x+2)}{(x-2)(x+2)}.$$

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

Exercise 14 - Complex fraction

Multiply the numerator and denominator by x^2 : $\frac{x^2-4}{x^2-2x} = \frac{(x-2)(x+2)}{x(x-2)}$.

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

Exercise 15 - Use structure

$$16x^4 - 81 = (4x^2)^2 - 9^2 = (4x^2 - 9)(4x^2 + 9).$$

Cancel $4x^2 + 9$.

$$4x^2 - 9 = (2x - 3)(2x + 3)$$

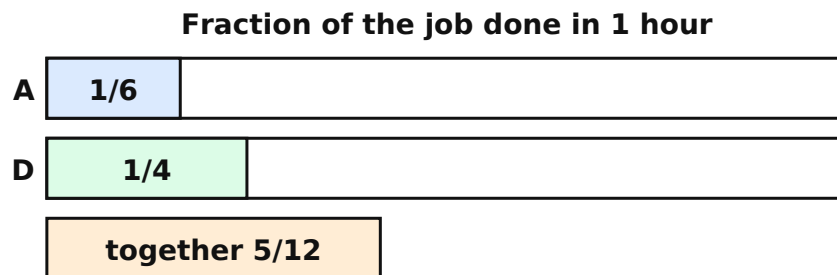
Exercise 16 - Find the error

Only common factors cancel, not terms. The 3 in the numerator is added to x .

At $x = 6$: $\frac{6+3}{3} = 3$ but $6+1 = 7$. The expression cannot be simplified further.

Mei is wrong; $(x + 3)/3$ is already simplified

Exercise 17 - Painting together



Aisha paints $1/6$ of the fence per hour and Diego $1/4$ per hour: together $5/12$.

Rates: $\frac{1}{6}$ and $\frac{1}{4}$ of the fence per hour.

Combined: $\frac{1}{6} + \frac{1}{4} = \frac{2}{12} + \frac{3}{12} = \frac{5}{12}$.

Time: $1 \div \frac{5}{12} = \frac{12}{5}$ hours.

2.4 hours (2 hours 24 minutes)

Exercise 18 - Average speed

Times: $\frac{60}{40} = 1.5$ hours and $\frac{60}{60} = 1$ hour.

Average speed = $\frac{120}{2.5} = 48$ mph, not the simple average 50.

48 mph

Exercise 19 - Lens equation

$$\frac{1}{f} = \frac{1}{4} + \frac{1}{12} = \frac{3}{12} + \frac{1}{12} = \frac{4}{12} = \frac{1}{3}.$$

$$f = 3 \text{ cm}$$

Exercise 20 - Average cost

Items x	50	100	250
A(x)	30	25	22

Average cost approaches 20.

$$A(50) = \frac{500 + 1000}{50} = 30; A(100) = \frac{2500}{100} = 25; A(250) = \frac{5500}{250} = 22.$$

\$30, \$25, \$22

Exercise 21 - Equivalent expressions

$$\frac{x^2-9}{x-3} = \frac{(x-3)(x+3)}{x-3} = x+3 \text{ for } x \neq 3.$$

At $x=3$ the first expression has a denominator of 0 and is undefined, while $x+3=6$.

Equal except at $x = 3$, where the first is undefined