MATHEMATICS · GRADES 10-12

Dividing rational expressions

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you divide one fraction made of formulas by another. Rates often come from two changing quantities, like distance over time where both are formulas, and dividing them gives you the rate. You flip the second fraction and multiply, just like with ordinary fractions. The result is a simpler rate you can actually use.



Rule

Dividing rational expressions: flip the second fraction and multiply, just like dividing ordinary fractions.

Then cancel any factors shared by the top and the bottom. Remember the values that would make any denominator zero are excluded.

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Worked examples

EXAMPLE 1

Q Divide $\left(\frac{(x+2)}{x}\right)$ by $\left(\frac{(x+2)}{(x-1)}\right)$

SOLUTION

Flip the divisor and change to multiplication: $\left(\frac{(x+2)}{x}\right) \times \left(\frac{(x-1)}{(x+2)}\right)$.

Note the excluded values: x is not 0, x is not -2, and x is not 1.

Cancel the shared bracket $(x+2)$: $\frac{(x-1)}{x}$.

EXAMPLE 2

Q Divide $\left(\frac{6}{x}\right)$ by $\left(\frac{3}{x^2}\right)$

SOLUTION

Flip the divisor: $\left(\frac{6}{x}\right) \times \left(\frac{x^2}{3}\right)$.

Cancel: $\frac{6}{3} = 2$ and $\frac{x^2}{x} = x$.

Multiply: $2x$, with x not 0.

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Practice questions

1 A rope of length $\frac{4}{x}$ m is cut into pieces of length $\frac{2}{x}$ m. How many pieces are there?

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2 A gardener splits a plot of $\frac{x}{3}$ m² into beds of $\frac{x}{6}$ m². How many beds is that?

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3 A wire of length $\frac{10}{x^2}$ m is cut into pieces of length $\frac{5}{x}$ m. What is $\frac{10}{x^2} \div \frac{5}{x}$?

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4 Two ribbons measure $\frac{(x + 1)}{2}$ m and $\frac{(x + 1)}{4}$ m. How many times does the shorter fit into the longer?

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5 A baker divides $\frac{8x}{3}$ cups of flour into bags of $\frac{4x}{9}$ cups. How many bags does she fill?

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6 **A tank holds $\frac{1}{x}$ litres. A cup holds $\frac{1}{x^2}$ litres. How many cups fill the tank?**

A $\frac{1}{x}$

B x

C x^2

D $2x$

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7 A trail of length $\frac{(x - 3)}{x}$ km is split into sections of $\frac{(x - 3)}{(x + 2)}$ km. How many sections are there?

A $\frac{(x - 3)}{x}$

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

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

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

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8 Simplify $\frac{12}{x} \div \frac{4}{x^3}$

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

B $3x^3$

C $3x^2$

D $\frac{3}{x}$

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9 A field of area $\frac{5x}{2}$ is split into plots of $\frac{x}{4}$. How many plots are there?

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10 A cake of size $\frac{9}{(x+1)}$ is shared into portions of $\frac{3}{(x+1)}$. How many portions are there?

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ANSWER KEY

1. 2

2. 2

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

4. 2

5. 6

6. x

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

8. $3x^2$

9. 10

10. 3

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