

# Solving Rational Equations And Inequalities Answer Key Textbook

**Solving rational equations and inequalities answer key** is an essential skill in algebra that helps students understand how to work with fractions involving variables. Mastering these concepts is crucial for progressing in mathematics, especially as they form the foundation for more advanced topics like calculus and algebraic modeling. In this article, we will explore step-by-step methods for solving rational equations and inequalities, provide tips for handling common challenges, and emphasize the importance of an answer key for practice and validation.

## Understanding Rational Equations and Inequalities

### What Are Rational Equations?

Rational equations are equations that involve rational expressions—fractions where the numerator and/or denominator contains variables. A typical rational equation might look like:

$$\frac{ax + b}{cx + d} = e$$

where  $(a, b, c, d, e)$  are constants, and  $(x)$  is the variable.

Key characteristics:

- They involve fractions with variables in the numerator, denominator, or both.
- Solutions must satisfy the original equation while not making any denominator zero.

### What Are Rational Inequalities?

Rational inequalities involve inequalities ( $>$ ,  $<$ ,  $\geq$ ,  $\leq$ ), such as:

$$\frac{x - 3}{x + 2} > 0$$

Important considerations:

- The solution set includes all  $(x)$  values that make the inequality true.
- Denominators cannot be zero, so any solutions that make the denominator zero are excluded.

## Methods for Solving Rational Equations

### Step-by-Step Process

Solving rational equations typically involves clearing denominators and solving the resulting polynomial equation. Here are the steps:

- **Identify restrictions:** Determine values that make any denominator zero. These are excluded from the solution set.
- **Clear the denominators:** Multiply both sides of the equation by the least common denominator (LCD) to eliminate fractions.
- **Solve the resulting polynomial equation:** Simplify and solve for the variable using algebraic methods.
- **Check for extraneous solutions:** Substitute solutions back into the original equation to verify they do not make any denominator zero or violate the original equation.

### Example: Solve $\frac{2x + 3}{x - 1} = 4$

Step 1: Identify restrictions:

- Denominator  $(x - 1 \neq 0 \Rightarrow x \neq 1)$ .

Step 2: Multiply both sides by  $(x - 1)$ :

$$(\frac{2x + 3}{x - 1}) \times (x - 1) = 4 \times (x - 1)$$

Which simplifies to:

$$(2x + 3 = 4(x - 1))$$

Step 3: Expand and solve:

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

Bring all to one side:

$$-(2x + 3 - 4x + 4 = 0)$$

Simplify:

$$-(-2x + 7 = 0)$$

Solve:

$$-(-2x = -7)$$

$$-(x = \frac{7}{2})$$

Step 4: Check the solution:

- Is  $(x = \frac{7}{2})$  equal to 1? No, so it's valid.

Answer:  $(x = \frac{7}{2})$

## Methods for Solving Rational Inequalities

### Step-by-Step Approach

Solving rational inequalities involves analyzing the sign of the rational expression across different intervals determined by critical points.

- **Find critical points:** Set numerator and denominator equal to zero and solve for  $(x)$ . These points partition the number line.
- **Determine the domain:** Exclude points where the denominator is zero.
- **Test intervals:** Choose a test value in each interval and evaluate the sign of the rational expression.
- **Write the solution set:** Based on the inequality ( $>$ ,

### Example: Solve $(\frac{x - 2}{x + 3} > 0)$

Step 1: Find critical points:

$$-(x - 2 = 0 \rightarrow x = 2)$$

$$-(x + 3 = 0 \Rightarrow x = -3)$$

Step 2: Domain:

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

Step 3: Sign analysis:

- Pick test points:

- For  $(x$

$$\left(\frac{-4 - 2}{-4 + 3} = \frac{-6}{-1} = 6 > 0\right) ? \text{ satisfies } (> 0).$$

- For  $(-3$

$$\left(\frac{0 - 2}{0 + 3} = \frac{-2}{3}\right)$$

- For  $(x > 2)$ , say  $(x=3)$ :

$$\left(\frac{3 - 2}{3 + 3} = \frac{1}{6} > 0\right) ? \text{ satisfies.}$$

Step 4: Write solution:

-  $(x > 2)$ . Since the inequality is strict ( $>$ ), boundary points are not included.

Answer:

$$-\left((-\infty, -3) \cup (2, \infty)\right)$$

## Common Challenges and Tips

### Handling Extraneous Solutions

Extraneous solutions can arise when multiplying both sides of an equation by an expression containing variables. Always verify solutions by substituting back into the original equation.

## Dealing with Undefined Values

Remember to exclude any solutions that make denominators zero. This is crucial for both equations and inequalities.

## Using the Answer Key Effectively

An answer key provides correct solutions for practice problems. Use it to:

- Confirm your solutions.
- Understand the reasoning behind each solution.
- Identify patterns and common pitfalls.

## Practice Problems and Their Answer Keys

### Practice Problem 1:

Solve  $\frac{x + 4}{x - 2} = 3$ .

Answer Key:

- $x \neq 2$
- Multiply both sides by  $(x - 2)$ :  $x + 4 = 3(x - 2)$
- Expand:  $x + 4 = 3x - 6$
- Rearrange:  $x + 4 - 3x + 6 = 0 \rightarrow -2x + 10 = 0$
- $x = 5$
- Verify:  $x \neq 2$ , so solution is  $x=5$

### Practice Problem 2:

Solve  $\frac{2x - 1}{x + 4} \leq 0$ .

Answer Key:

- Critical points:
- Numerator zero:  $2x - 1 = 0 \rightarrow x = \frac{1}{2}$
- Denominator zero:  $x + 4 = 0 \rightarrow x = -4$
- Domain:  $x \neq -4$

- Sign analysis:
- For  $x$

$$\left(\frac{2(-5) - 1}{-5 + 4}\right) = \frac{-10 - 1}{-1} = \frac{-11}{-1} = 11 > 0$$

- For  $x = -4$

$$\left(\frac{-1}{4}\right)$$

- For  $x > \frac{1}{2}$ , pick  $x = 1$ :

$$\left(\frac{2(1) - 1}{1 + 4}\right) = \frac{1}{5} > 0$$

- Inequality  $(\leq 0)$  holds where numerator is less than or equal to zero:
- At  $x = \frac{1}{2}$ , numerator zero ? included
- Exclude  $x = -4$  (denominator zero)
- Solution:
- $x < -4$

Final answer:

- $(-4, \frac{1}{2})$

## Conclusion: The Importance of the Answer Key

Having an answer key for solving rational equations and inequalities is invaluable. It not only helps verify your solutions but also enhances understanding of problem-solving strategies. Regular practice with answer keys solidifies skills, reduces errors, and prepares students for more complex algebraic challenges.

By mastering the techniques outlined above and consistently checking your work

### Solving Rational Equations and Inequalities Answer Key: A Comprehensive Guide

When it comes to algebra, understanding how to solve rational equations and inequalities is a fundamental skill that forms the backbone of more advanced mathematical concepts. The phrase solving rational equations and inequalities answer key often appears in educational contexts, especially in textbooks, homework help sites, and exam preparation materials. Mastering these

topics not only enhances your algebraic fluency but also prepares you for tackling complex problems in calculus, physics, and engineering. This article offers an in-depth exploration of methods, strategies, and best practices for solving rational equations and inequalities, supplemented with an answer key to facilitate self-assessment and learning.

## Understanding Rational Equations

Rational equations are equations involving ratios of polynomials. A typical rational equation has the form:

$$\frac{P(x)}{Q(x)} = R(x)$$

where  $P(x)$ ,  $Q(x)$ , and  $R(x)$  are polynomials, and  $Q(x) \neq 0$ .

## Key Concepts in Rational Equations

- Domain restrictions: Since division by zero is undefined, solutions must exclude any values that make the denominator zero.
- Cross-multiplication: A common method to clear fractions, especially when denominators are rational expressions.
- Checking solutions: Always verify solutions in the original equation to avoid extraneous solutions introduced during algebraic manipulations.

## Step-by-Step Approach to Solving Rational Equations

- Identify the denominators and note the values that make them zero.
- Multiply through by the least common denominator (LCD) to clear fractions.
- Simplify the resulting equation to a polynomial or simpler rational form.
- Solve the resulting equation using algebraic methods like factoring, quadratic formula, or other appropriate techniques.
- Check potential solutions against the original equation to ensure they are valid.

## Example Problem and Solution

Solve:

$$\frac{2x + 3}{x - 1} = 4$$

Solution:

- Domain restriction:  $(x \neq 1)$

- Multiply both sides by  $(x - 1)$ :

$$[ 2x + 3 = 4(x - 1) ]$$

- Simplify:

$$[ 2x + 3 = 4x - 4 ]$$

- Rearrange:

$$[ 3 + 4 = 4x - 2x ]$$

$$[ 7 = 2x ]$$

$$[ x = \frac{7}{2} ]$$

- Check the solution:

Since  $(x = \frac{7}{2} \neq 1)$ , it is valid.

Answer:  $(x = \frac{7}{2})$

## Understanding Rational Inequalities

Rational inequalities involve expressions with rational functions and comparison operators such as  $( < )$ , or  $( \geq )$ .

A typical rational inequality looks like:

$$[ \frac{P(x)}{Q(x)} > 0 ]$$

or similar forms.

## Key Concepts in Rational Inequalities



- Critical points: Values where numerator or denominator equals zero, which divide the real number line into intervals.
- Sign analysis: Determining where the rational expression is positive or negative by testing intervals.
- Domain restrictions: Exclude points where the denominator is zero.

## Method for Solving Rational Inequalities

- Rewrite the inequality in a standard form.
- Find zeros of numerator and denominator to identify critical points.
- Create a sign chart dividing the real line into intervals based on these critical points.
- Test each interval to determine the sign of the rational expression.
- Select intervals that satisfy the inequality (e.g., where the expression is positive).
- Express the solution set in interval notation, considering strict or inclusive inequalities.

## Example Problem and Solution

Solve:

$$\lfloor \frac{x - 2}{x + 3} \rfloor \leq 0 \rfloor$$

Solution:

- Critical points:
  - Numerator zero at  $(x = 2)$
  - Denominator zero at  $(x = -3)$  (excluded from domain)
- Sign chart:
- Intervals:  $(-\infty, -3)$ ,  $(-3, 2)$ ,  $(2, \infty)$
- Test points:

-  $(x = -4)$ :

$$\left[ \frac{-4 - 2}{-4 + 3} = \frac{-6}{-1} = 6 > 0 \right]$$

-  $(x = 0)$ :

$$\left[ \frac{0 - 2}{0 + 3} = \frac{-2}{3} \right]$$

-  $(x = 3)$ :

$$\left[ \frac{3 - 2}{3 + 3} = \frac{1}{6} > 0 \right]$$

- Solution:

- The expression is less than or equal to zero where the numerator is less than or equal to zero, and the entire expression is defined.

- From the sign chart, the intervals where the expression is  $(\leq 0)$ :

-  $(-\infty, -3)$ , where the expression is positive (discarded)

-  $(-3, 2]$ , where the expression is negative or zero (since numerator zero at  $(x=2)$ )

- At  $(x=2)$ , the expression equals zero, so included.

- Final solution set:

$$[-3, 2]$$

## Answer Key and Practice Resources

An answer key is invaluable for students and educators to verify solutions quickly, identify errors, and reinforce understanding. Many textbooks and online platforms provide detailed answer keys for

rational equations and inequalities, often including step-by-step solutions and explanations.

## Features of Effective Answer Keys

- Step-by-step solutions: Clarify each algebraic manipulation.
- Domain considerations: Highlight restrictions due to denominators.
- Graphical interpretations: Visual aids to understand solution intervals.
- Common mistakes: Tips to avoid typical errors like extraneous solutions or sign miscalculations.

## Advantages of Using Answer Keys

- Facilitates self-assessment and independent learning.
- Enhances understanding by comparing your work with correct solutions.
- Builds confidence in problem-solving skills.
- Serves as a resource for teachers and tutors in preparing lesson plans.

## Limitations and Cautions

- Over-reliance may hinder the development of problem-solving skills.
- Should be used as a supplement, not a substitute for understanding.
- Some answer keys may omit detailed explanations, so always seek comprehensive solutions when possible.

## Additional Tips for Mastering Rational Equations and Inequalities

- Always check for extraneous solutions introduced during multiplication or other algebraic steps.
- Be cautious with domain restrictions, especially when multiplying both sides of an inequality.
- Practice diverse problems to become comfortable with different types of rational equations and inequalities.
- Use graphing tools to visualize the solution sets, especially for inequalities.
- Review properties of inequalities, including how multiplying or dividing both sides by a negative reverses the inequality sign.

## Conclusion

Mastering solving rational equations and inequalities answer key is essential for progressing in algebra and beyond. By understanding the foundational concepts, employing systematic solving

methods, and utilizing answer keys effectively, students can develop confidence and accuracy in their mathematical problem-solving. Remember to always verify solutions within the original domain, practice a wide variety of problems, and leverage answer keys as learning tools to deepen your understanding. With consistent effort and strategic study, solving rational equations and inequalities will become an intuitive and rewarding aspect of your mathematical toolkit.

**Question** What are the steps to solve a rational equation? To solve a rational equation, first find the least common denominator (LCD), multiply both sides of the equation by the LCD to clear fractions, simplify the resulting equation, solve for the variable, and check for extraneous solutions by substituting back into the original equation. How do you solve rational inequalities? Solve rational inequalities by first rewriting them as a single fraction inequality, find critical points where numerator or denominator equals zero, test intervals around these points to determine where the inequality holds, and include boundary points if the inequality is non-strict. What is an extraneous solution, and how do you identify it in rational equations? An extraneous solution is a solution that emerges from the algebraic process but does not satisfy the original equation. To identify it, substitute the solution back into the original equation and check if both sides are equal; discard any solutions that make the denominator zero or do not satisfy the original equation. Can rational inequalities have solutions where the denominator is zero? No, solutions where the denominator equals zero are undefined for the expression and are therefore not included in the solution set. These points are critical points and are usually excluded from the solution interval. What is the importance of critical points in solving rational inequalities? Critical points are values where the numerator or denominator equals zero, which partition the number line into intervals. Testing these intervals helps determine where the inequality holds true, making them essential in solving rational inequalities. How do you handle inequalities involving rational expressions with different signs? Identify critical points, divide the number line into intervals, select test points in each interval, evaluate the rational expression at these points, and determine whether the inequality is satisfied in each interval based on the sign of the expression. What common mistakes should be avoided when solving rational equations and inequalities? Common mistakes include forgetting to exclude points where the denominator is zero, not checking for extraneous solutions, misinterpreting the inequality direction after multiplying by negative numbers, and neglecting to test all intervals around critical points. Are there special considerations when solving rational inequalities involving absolute values? Yes, when absolute values are involved, split the inequality into separate cases based on the definition of absolute value, solve each case separately, and then combine the solutions, ensuring all solutions satisfy the original inequality. Where can I find reliable answer keys for practicing solving rational equations and inequalities? Reliable answer keys can be found in reputable math textbooks, educational websites like Khan Academy, Mathway, or Paul's Online Math Notes, and through instructor-provided resources. Always verify solutions by substitution to ensure accuracy.

**Related keywords:** rational equations, solving rational inequalities, answer key, algebra, math solutions, equation solving steps, inequality solutions, rational expressions, math practice, solution

guide

## Rational number multiple choice questions with answers

**rational number multiple choice questions with answers** are essential tools for students and educators aiming to master the concepts of rational numbers. These questions not only reinforce fundamental mathematical skills but also enhance problem-solving abilities, making them a vital part of mathematics education. Whether preparing for exams, quizzes, or competitive tests, practicing multiple choice questions (MCQs) on rational numbers can significantly boost confidence and understanding. This comprehensive guide explores various facets of rational number MCQs, provides sample questions with detailed answers, and offers tips for mastering this important topic.

## Understanding Rational Numbers

### What Are Rational Numbers?

Rational numbers are numbers that can be expressed as the quotient or fraction of two integers, where the denominator is not zero. In simple terms, any number that can be written as  $\frac{p}{q}$ , with  $p$  and  $q$  being integers and  $q \neq 0$ , qualifies as a rational number.

Key characteristics of rational numbers:

- They include fractions like  $\frac{3}{4}$ ,  $-\frac{7}{2}$ , and whole numbers like 5 (which can be written as  $\frac{5}{1}$ )
- Rational numbers are dense on the number line, meaning between any two rational numbers, there exists another rational number.
- They are either terminating or repeating decimals when expressed in decimal form.

### Examples of Rational Numbers

- $\frac{2}{3}$
- $-\frac{5}{8}$
- 0 (which is  $\frac{0}{1}$ )
- 7 (which can be written as  $\frac{7}{1}$ )
- 0.75 (which is  $\frac{3}{4}$ )
- $0.\overline{3}$  (which is  $\frac{1}{3}$ )

## Importance of Rational Number Multiple Choice Questions (MCQs)

MCQs on rational numbers serve multiple educational purposes:

- Assessment of understanding: They test students' grasp of key concepts.
- Preparation for exams: Many standardized tests include MCQs on rational numbers.
- Practice problem-solving: They help students develop quick and accurate calculation skills.
- Identifying misconceptions: Well-crafted MCQs can reveal common errors and misconceptions.

## Key Topics Covered in Rational Number MCQs

To excel in rational number MCQs, students should familiarize themselves with the following topics:

- Properties of rational numbers
- Simplification of fractions
- Comparing and ordering rational numbers
- Operations with rational numbers (addition, subtraction, multiplication, division)
- Rational numbers and their decimal equivalents
- Converting between mixed numbers, improper fractions, and decimals
- Rationalizing denominators
- Solving word problems involving rational numbers

## Sample Rational Number Multiple Choice Questions with Answers

Below are some representative MCQs covering various difficulty levels, along with detailed explanations.

### 1. Which of the following is a rational number?

- a)  $\sqrt{2}$
- b)  $\pi$
- c)  $\frac{4}{5}$
- d)  $e$

Answer: c)  $\frac{4}{5}$

Explanation:  $\frac{4}{5}$  is a fraction of two integers with a non-zero denominator, hence a rational number. The others are irrational numbers.

## 2. Simplify $\frac{18}{24}$ to its lowest terms.

- a)  $\frac{3}{4}$
- b)  $\frac{9}{12}$
- c)  $\frac{6}{8}$
- d)  $\frac{2}{3}$

Answer: a)  $\frac{3}{4}$

Explanation: Divide numerator and denominator by their greatest common divisor, 6:  $\frac{18 \div 6}{24 \div 6} = \frac{3}{4}$ .

## 3. Which of the following is the greatest rational number?

- a)  $\frac{3}{4}$
- b)  $\frac{5}{8}$
- c)  $\frac{7}{10}$
- d)  $\frac{9}{12}$

Answer: a)  $\frac{3}{4}$

Explanation: Convert to decimals:  $\frac{3}{4} = 0.75$ ,  $\frac{5}{8} = 0.625$ ,  $\frac{7}{10} = 0.7$ ,  $\frac{9}{12} = 0.75$ . Both  $\frac{3}{4}$  and  $\frac{9}{12}$  are 0.75, but since  $\frac{3}{4}$  is in simplest form, it is considered the greatest.

## 4. Which of these is an irrational number?

- a)  $\frac{22}{7}$
- b)  $\sqrt{3}$
- c)  $-\frac{4}{9}$

d) 0.125

Answer: b)  $\sqrt[3]{2}$

Explanation:  $\sqrt[3]{2}$  cannot be expressed as a fraction of two integers and is non-terminating, non-repeating decimal, making it irrational.

### 5. Add $\frac{2}{3}$ and $\frac{4}{5}$ . What is the sum?

a)  $\frac{22}{15}$

b)  $\frac{8}{15}$

c)  $\frac{6}{8}$

d)  $\frac{18}{15}$

Answer: a)  $\frac{22}{15}$

Explanation: Find common denominator: 15.

$\frac{2}{3} = \frac{10}{15}$ ,  $\frac{4}{5} = \frac{12}{15}$ .

Sum:  $\frac{10}{15} + \frac{12}{15} = \frac{22}{15}$ .

## Strategies for Solving Rational Number MCQs

To excel in multiple choice questions related to rational numbers, consider the following strategies:

- **Understand the concepts:** Know the definitions, properties, and types of rational numbers.
- **Practice regularly:** Solve a variety of questions to improve speed and accuracy.
- **Eliminate incorrect options:** Use logical reasoning to narrow down choices.
- **Convert as needed:** Be comfortable converting between fractions, decimals, and percentages.
- **Review common mistakes:** Avoid errors like incorrect simplification or wrong comparison.

## Additional Tips for Mastering Rational Number MCQs

- Memorize key fractions and their decimal equivalents for quick recognition.
- Familiarize yourself with number line representations to visualize comparisons.



- Practice mental math to save time during exams.
- Use online quizzes and practice papers to simulate test conditions.
- Review explanations for questions you get wrong to avoid repeating mistakes.

## Conclusion

Mastering rational number multiple choice questions with answers is a crucial step toward becoming proficient in mathematics. By understanding the fundamental concepts, practicing diverse questions, and adopting effective strategies, students can confidently tackle any MCQ related to rational numbers. Remember, consistent practice and thorough understanding are key to excelling in this topic. Whether for school exams, competitive tests, or personal learning, this comprehensive approach ensures that you are well-equipped to handle rational number MCQs with ease and accuracy.

Keywords for SEO Optimization:

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## Rational Number Multiple Choice Questions with Answers: An In-Depth Review

Understanding rational numbers and their properties is fundamental to mastering mathematics at various educational levels. For students preparing for exams, practicing multiple choice questions (MCQs) related to rational numbers is an effective strategy to strengthen conceptual clarity and improve problem-solving speed. This detailed review explores the nature of rational number MCQs, their significance, types, strategies for solving, and provides a comprehensive collection of sample questions with answers to aid learners and educators alike.

## Understanding Rational Numbers

Before delving into MCQs, it is essential to revisit what rational numbers are.

## Definition and Properties

- Rational Numbers are numbers that can be expressed as the quotient or fraction of two integers, where the denominator is not zero.

- Form:  $\frac{p}{q}$ , where  $p, q \in \mathbb{Z}$  and  $q \neq 0$ .

- Examples:  $\frac{3}{4}$ ,  $-\frac{7}{2}$ ,  $0$ ,  $1$ ,  $-5$ .

Key properties:

- Rational numbers are closed under addition, subtraction, multiplication, and division (except division by zero).

- They are dense on the number line, meaning between any two rational numbers, there exists another rational number.

- Rational numbers can be terminating or repeating decimals when expressed in decimal form.

## The Significance of Multiple Choice Questions (MCQs) on Rational Numbers

MCQs serve multiple educational purposes:

- Assessment of Conceptual Understanding: They test a student's grasp of the definitions, properties, and operations involving rational numbers.

- Quick Revision: Multiple choice format allows for rapid review of multiple concepts in a single exam session.

- Exam Preparation: They simulate the question style found in competitive exams, school tests, and standardized assessments.

- Identify Weak Areas: Immediate feedback on incorrect options helps students identify misconceptions.

## Types of Rational Number MCQs

Rational number MCQs can be classified based on the concepts they target:

### 1. Basic Conceptual MCQs

- Define rational numbers.
- Identify whether a given number is rational or not.
- Recognize properties of rational numbers.

### 2. Operations involving Rational Numbers

- Simplification of sums, differences, products, and quotients.
- Determining the result of operations involving rational numbers.

### 3. Decimal Expansions

- Identifying terminating and repeating decimals.
- Converting fractions to decimal form and vice versa.

### 4. Comparison and Ordering

- Comparing two rational numbers.
- Ordering several rational numbers from least to greatest.

### 5. Word Problems

- Applying rational numbers in real-life contexts.
- Problems involving ratios, fractions, and proportions.

## Strategies for Solving Rational Number MCQs

To excel in answering rational number MCQs, students should adopt specific strategies:

- Understand the question carefully: Identify what is being asked?whether it's about properties, operations, or conversions.
- Recall fundamental definitions: Remember what constitutes a rational number and its properties.
- Simplify first: Before choosing an answer, simplify expressions or convert options into comparable forms.
- Eliminate incorrect options: Use logical reasoning to discard obviously wrong choices, narrowing down to the correct answer.
- Estimate and approximate: When dealing with decimals, approximate to verify the plausibility of options.
- Practice regularly: Familiarity with common question types enhances speed and accuracy.

## Sample Multiple Choice Questions on Rational Numbers with Answers

Below is a curated list of MCQs designed to challenge and reinforce understanding of rational

numbers. Each question is accompanied by the correct answer and a brief explanation.

### Question 1:

What is the sum of  $\frac{2}{3}$  and  $-\frac{5}{6}$ ?

- a)  $-\frac{1}{6}$
- b)  $\frac{1}{6}$
- c)  $-\frac{7}{6}$
- d)  $\frac{7}{6}$

Answer: a)  $-\frac{1}{6}$

Explanation:

$$\frac{2}{3} = \frac{4}{6}$$

Adding  $-\frac{5}{6}$  gives:  $\frac{4}{6} - \frac{5}{6} = -\frac{1}{6}$ .

### Question 2:

Which of the following is NOT a rational number?

- a)  $\frac{22}{7}$
- b)  $-\frac{3}{4}$
- c)  $\sqrt{2}$
- d) 0.75

Answer: c)  $\sqrt{2}$

Explanation:

$\sqrt{2}$  is an irrational number because it cannot be expressed as a fraction of two integers; its decimal expansion is non-terminating and non-repeating.

### Question 3:

Convert  $\frac{7}{8}$  to a decimal.

- a) 0.875
- b) 0.8
- c) 0.78
- d) 0.888

Answer: a) 0.875

Explanation:

Divide numerator by denominator:  $(7 \div 8 = 0.875)$ .

### Question 4:

Which of the following is a terminating decimal?

- a)  $\frac{1}{3}$
- b)  $\frac{2}{5}$
- c)  $\frac{1}{6}$
- d)  $\frac{1}{7}$

Answer: b)  $\frac{2}{5}$

Explanation:

$\frac{2}{5} = 0.4$ , which terminates.

Other options are repeating decimals:  $\frac{1}{3} = 0.\overline{3}$ ,  $\frac{1}{6} = 0.1\overline{6}$ ,  $\frac{1}{7}$  is non-terminating repeating.

### Question 5:

Arrange the following rational numbers in increasing order:  $\frac{3}{4}$ ,  $\frac{2}{3}$ ,  $\frac{5}{6}$ .

- a)  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$
- b)  $\frac{3}{4}$ ,  $\frac{2}{3}$ ,  $\frac{5}{6}$
- c)  $\frac{2}{3}$ ,  $\frac{5}{6}$ ,  $\frac{3}{4}$
- d)  $\frac{5}{6}$ ,  $\frac{3}{4}$ ,  $\frac{2}{3}$

Answer: a)  $\frac{2}{3}$ ,  $\frac{3}{4}$ ,  $\frac{5}{6}$

Explanation:

Convert all to decimals:

$$\frac{2}{3} \approx 0.666\dots$$

$$\frac{3}{4} = 0.75$$

$$\frac{5}{6} \approx 0.833\dots$$

Order:  $(0.666\dots)$ ,  $(0.75)$ ,  $(0.833\dots)$

### Question 6:

If  $\frac{p}{q}$  is a rational number and  $\frac{p}{q} > 1$ , which of the following must be true?

- a)  $p > q$
- b)  $p$
- c)  $p = q$
- d)  $p \leq q$

Answer: a)  $p > q$

Explanation:

For  $\frac{p}{q} > 1$ , numerator must be greater than denominator.

### Question 7:

What is the reciprocal of  $\frac{4}{9}$ ?

- a)  $\frac{9}{4}$
- b)  $\frac{4}{9}$
- c)  $-\frac{9}{4}$
- d)  $-\frac{4}{9}$

Answer: a)  $\frac{9}{4}$

Explanation:

Reciprocal of a fraction  $\frac{p}{q}$  is  $\frac{q}{p}$ .

### Question 8:

Which of the following statements is TRUE?

- a) The sum of two rational numbers is always rational.
- b) The product of two rational numbers is always irrational.
- c) Rational numbers are only positive.
- d) Zero is not a rational number.

Answer: a) The sum of two rational numbers is always rational.

Explanation:

Sum and product of rational numbers are always rational. Zero is rational because  $\frac{0}{1} = 0$ .

## Advanced and Conceptual MCQs

To deepen understanding, here are some advanced questions involving rational numbers:

Question: Which of the following is a rational number? A)  $\sqrt{2}$  B) 0.75 C)  $\sqrt{3}$  D)  $e$   
 Answer: B) 0.75  
 Question: What is the decimal form of the rational number  $\frac{3}{4}$ ? A) 0.75 B) 0.7 C) 0.75 D) 0.75  
 Answer: A) 0.75  
 Question: Which of these is NOT a rational number? A)  $-\frac{2}{5}$  B)  $\sqrt{16}$  C)  $\sqrt{3}$  D)  $\sqrt{9}$   
 Answer: C)  $\sqrt{3}$   
 Question: If  $\frac{a}{b}$  is a rational number, which of the following must be true? Both a and b are integers, and  $b \neq 0$ .  
 Answer: Both a and b are integers, and  $b \neq 0$ .  
 Question: Which decimal expansion represents a rational number? 0.333... (repeating 3)  
 Answer: 0.333... (repeating 3)  
 Question: Is the number 0.121212... a rational number? Yes, because it has a repeating decimal expansion.  
 Answer: Yes, because it has a repeating decimal expansion.  
 Question: Which of the following fractions is equivalent to 0.6? A)  $\frac{3}{5}$  B)  $\frac{2}{5}$  C)  $\frac{1}{5}$  D)  $\frac{4}{5}$   
 Answer: A)  $\frac{3}{5}$   
 Question: When is a number considered rational?  
 Answer: When it can be expressed as the quotient of two integers, with a non-zero denominator.

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