Class 8 Rational Numbers Worksheet

By Thinking Juggernaut

Class: 8th Standard **Subject:** Mathematics **Total Questions:** 24 **Total Marks:** 24

Understanding Rational Numbers

What are Rational Numbers?

A rational number is any number that can be expressed in the form p/q, where p and q are integers and q ≠ 0.

Examples: 3/4, -5/7, 2 (can be written as 2/1), 0 (can be written as 0/1), -3, 0.5 (= 1/2)

Important Concepts:

1. Closure Property

The sum, difference, and product of two rational numbers is always a rational number.

Example: 1/2 + 1/3 = 5/6 (rational)

2. Commutative Property

Addition: a + b = b + a

Multiplication: a × b = b × a

Example: 2/3 + 1/4 = 1/4 + 2/3

3. Associative Property

Addition: (a + b) + c = a + (b + c)

Multiplication: (a × b) × c = a × (b × c)

4. Additive Identity

a + 0 = a (Zero is the additive identity)

Example: 3/5 + 0 = 3/5

5. Multiplicative Identity

a × 1 = a (One is the multiplicative identity)

Example: 4/7 × 1 = 4/7

6. Additive Inverse

For every rational number a/b, there exists -(a/b) such that a/b + (-(a/b)) = 0

Example: 3/4 + (-3/4) = 0

7. Multiplicative Inverse (Reciprocal)

For every non-zero rational number a/b, there exists b/a such that a/b × b/a = 1

Example: 2/3 × 3/2 = 1

8. Distributive Property

a × (b + c) = (a × b) + (a × c)

Example: 2 × (1/3 + 1/4) = (2 × 1/3) + (2 × 1/4)

Operations on Rational Numbers:

- **Addition/Subtraction:** Find LCM of denominators, convert to like fractions, then add/subtract numerators
- **Multiplication:** Multiply numerators and multiply denominators: (a/b) × (c/d) = (a×c)/(b×d)
- **Division:** Multiply by reciprocal: (a/b) ÷ (c/d) = (a/b) × (d/c)

Rational Numbers on Number Line:

Every rational number can be represented on a number line. Between any two rational numbers, there are infinitely many rational numbers.

📝 Sample Problem with Visual Explanation

Problem: Find: -2/3 + 5/6 - 1/2

Step-by-Step Solution

Step 1: Find LCM of denominators (3, 6, 2)
LCM(3, 6, 2) = 6
We need to convert all fractions to have denominator 6

Step 2: Convert to equivalent fractions with denominator 6
-2/3 = (-2 × 2)/(3 × 2) = -4/6
5/6 = 5/6 (already has denominator 6)
-1/2 = (-1 × 3)/(2 × 3) = -3/6

Step 3: Add/Subtract numerators (keep same denominator)
-4/6 + 5/6 - 3/6 = (-4 + 5 - 3)/6
= -2/6

Step 4: Simplify to lowest terms
-2/6 = -1/3

Key Points to Remember:

- Always find LCM of denominators first when adding/subtracting
- Convert each fraction to equivalent fraction with LCM as denominator
- Add or subtract only the numerators, keep the denominator same
- Always simplify your answer to the lowest terms
- Verification: -1/3 = -2/6 = (-4 + 5 - 3)/6 ✓

Part A: Warm-up Practice

☆ Easy Level - 8 Questions

Q1. Write three rational numbers between 1 and 2.

Q2. Find: 1/4 + 1/4

Q3. What is the additive inverse of -3/7?

Q4. Find the multiplicative inverse (reciprocal) of 5/8.

Q5. Fill in the blank: -2/5 × _____ = 1

Q6. Simplify: 3/4 - 1/4

Q7. True or False: Between any two rational numbers, there are infinitely many rational numbers.

Q8. Find: 2/3 × 3/2

Part B: Practice Zone

☆☆ Medium Level - 10 Questions

Q9. Find: 3/5 + (-2/3)

Q10. Simplify: -5/6 - 7/9

Q11. Find: (-2/5) × (3/7) × (-5/6)

Q12. Match the properties with their examples:

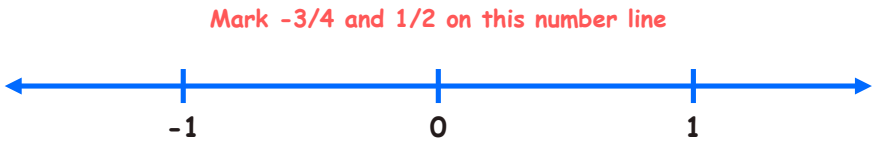
Column A	Column B
(i) Commutative Property	(a) 2/3 × 1 = 2/3
(ii) Associative Property	(b) 1/2 + 1/3 = 1/3 + 1/2
(iii) Multiplicative Identity	(c) (1/4 + 1/5) + 1/6 = 1/4 + (1/5 + 1/6)

Write your answers: (i) → ____, (ii) → ____, (iii) → ____

Q13. **Word Problem:** Rani ate 1/4 of a pizza and Raj ate 1/3 of the same pizza. What fraction of the pizza did they eat together?

Q14. Divide: 5/6 ÷ (-2/3)

Q15. **Picture-based Problem:** Represent -3/4 and 1/2 on the number line below.



Q16. Find five rational numbers between -1/2 and -1/3.

Q17. Simplify: (2/3 + 1/6) - (3/4 - 1/2)

Q18. **Real-life Problem:** A water tank is 3/4 full. If 1/6 of the water is used, what fraction of the tank is still filled?

Part C: Challenge Yourself!

⭐⭐⭐ Hard Level - 6 Questions

Q19. Simplify using distributive property: -3/5 × (7/2 - 2/3)

Q20. The sum of two rational numbers is -3/5. If one of them is 2/3, find the other.

Q21. Find the value of: [(2/3 + 3/4) ÷ (5/6 - 1/2)] × 2/5

Q22. **Complex Problem:** A rectangular field is 7/4 km long and 3/2 km wide. Find its area in square kilometers. If the cost of fencing is ₹150 per km, what is the total cost of fencing the field?

Q23. Verify the distributive property for: a = 1/2, b = -2/3, c = 3/4
Show that: a × (b + c) = (a × b) + (a × c)

Q24. Challenge Problem: Three friends Amit, Priya, and Kabir shared a cake. Amit ate 2/5 of the cake, Priya ate 1/4 of the remaining cake, and Kabir ate 1/2 of what was left after Priya. What fraction of the original cake is still remaining?

🔑 Answer Key

Part A: Warm-up Practice (Easy)

Q1. Any three rational numbers like: 3/2, 4/3, 5/4 (or 1.1, 1.2, 1.5, etc.)

Q2. 1/4 + 1/4 = 2/4 = 1/2

Q3. Additive inverse of -3/7 is 3/7

Q4. Multiplicative inverse of 5/8 is 8/5

Q5. -2/5 × (-5/2) = 1, so answer is -5/2

Q6. 3/4 - 1/4 = 2/4 = 1/2

Q7. True

Q8. 2/3 × 3/2 = 6/6 = 1

Part B: Practice Zone (Medium)

Q9. 3/5 + (-2/3) = 9/15 - 10/15 = -1/15

Q10. -5/6 - 7/9
LCM(6,9) = 18
= -15/18 - 14/18 = -29/18

Q11. (-2/5) × (3/7) × (-5/6) = ((-2) × 3 × (-5))/(5 × 7 × 6) = 30/210 = 1/7

Q12. (i) → (b), (ii) → (c), (iii) → (a)

Q13. 1/4 + 1/3 = 3/12 + 4/12 = 7/12 of the pizza

Q14. 5/6 ÷ (-2/3) = 5/6 × (-3/2) = -15/12 = -5/4

Q15. -3/4 is at -0.75 (between -1 and 0, closer to -1)
1/2 is at 0.5 (between 0 and 1, exactly in the middle)

Q16. Method: Convert to like denominators or use mean
-1/2 = -15/30, -1/3 = -10/30
Five numbers: -14/30, -13/30, -12/30, -11/30, -11/31 (or any equivalent fractions)

Q17. (2/3 + 1/6) - (3/4 - 1/2)
= (4/6 + 1/6) - (3/4 - 2/4)
= 5/6 - 1/4 = 10/12 - 3/12 = 7/12

Q18. Water used = 1/6 of full tank
Water remaining = 3/4 - 1/6 = 9/12 - 2/12 = 7/12 of the tank

Part C: Challenge Questions (Hard)

Q19. -3/5 × (7/2 - 2/3)
= (-3/5 × 7/2) - (-3/5 × 2/3)
= -21/10 + 6/15 = -63/30 + 12/30 = -51/30 = -17/10

Q20. Let the other number be x
2/3 + x = -3/5
x = -3/5 - 2/3 = -9/15 - 10/15 = -19/15

Q21. [(2/3 + 3/4) ÷ (5/6 - 1/2)] × 2/5
= [(8/12 + 9/12) ÷ (5/6 - 3/6)] × 2/5
= [17/12 ÷ 2/6] × 2/5
= [17/12 × 6/2] × 2/5
= (17/4) × 2/5 = 34/20 = 17/10

Q22. Area = length × width = 7/4 × 3/2 = 21/8 km²
Perimeter = 2(length + width) = 2(7/4 + 3/2) = 2(7/4 + 6/4) = 2 × 13/4 = 13/2 km
Cost = 13/2 × 150 = ₹975

Q23. LHS: a × (b + c) = 1/2 × (-2/3 + 3/4) = 1/2 × (-8/12 + 9/12) = 1/2 × 1/12 = 1/24
RHS: (a × b) + (a × c) = (1/2 × -2/3) + (1/2 × 3/4) = -2/6 + 3/8 = -8/24 + 9/24 = 1/24
LHS = RHS, hence verified ✓

Q24. Amit ate: 2/5
Remaining after Amit: 1 - 2/5 = 3/5
Priya ate: 1/4 of 3/5 = 3/20
Remaining after Priya: 3/5 - 3/20 = 12/20 - 3/20 = 9/20
Kabir ate: 1/2 of 9/20 = 9/40
Final remaining: 9/20 - 9/40 = 18/40 - 9/40 = 9/40 of the cake

📊 Scoring Guide

Total Questions: 24 | Total Marks: 24

Score Range	Performance Level	What to Do Next
20-24	⭐⭐⭐ Excellent!	Outstanding! You've mastered rational numbers. Move on to linear equations in one variable, algebraic expressions, and advanced fraction problems.
15-19	⭐⭐ Very Good!	Great work! Practice more complex word problems and mixed operations. Focus on problems requiring multiple steps and property verification.
10-14	⭐ Good Effort!	Keep practicing! Memorize all properties with examples. Practice finding LCM for addition/subtraction and converting to reciprocals for division. Do 15 problems daily.

0-9	Keep Trying!	Review the concept section carefully. Start with addition of simple fractions with same denominators, then different denominators. Master one operation before moving to the next.

📝 Tips for Improvement:

- **Master LCM:** Quick LCM finding is essential for adding/subtracting rational numbers
- **Remember reciprocals:** Division means multiply by reciprocal (flip the second fraction)
- **Simplify always:** Always reduce your answer to the lowest terms (divide by HCF)
- **Sign rules:** Negative × Negative = Positive; Negative × Positive = Negative
- **Property cards:** Create flashcards for all 8 properties with examples
- **Number line practice:** Draw number lines and mark fractions to visualize better
- **Word problems:** Identify the operation needed (together = add, left = subtract, of = multiply, per/each = divide)

🎯 Common Mistakes to Avoid:

- ❌ Adding/subtracting numerators AND denominators (WRONG: 1/2 + 1/3 ≠ 2/5)
- ❌ Forgetting to find LCM before adding/subtracting unlike fractions
- ❌ Not simplifying the final answer to lowest terms
- ❌ Confusing additive inverse with multiplicative inverse (reciprocal)
- ❌ Wrong signs: forgetting that -(-a) = +a
- ❌ In division, multiplying by the same fraction instead of its reciprocal
- ❌ In word problems: "of" means multiply, not add!
- ❌ Thinking 0 has a multiplicative inverse (it doesn't - can't divide by 0!)

✨ Great Job Completing This Worksheet! ✨

Keep practicing rational numbers and you'll master it in no time!

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