Properties of Subtraction of Rational Numbers

A. Write the Missing Terms to Complete the Sentences:

- 1. Subtraction of rational numbers is ______ under subtraction.
- 2. The subtraction of a rational number is not _____, i.e., $a b \neq b a$ in general.
- 3. The additive inverse of a rational number $\frac{a}{b}$ is _____.
- 4. Subtracting a number is the same as adding its ______.
- 5. In rational numbers, $a b = a + (______ of b)$.

B. Figure out the answers to these questions:

- 1. Write the expanded form of the number 6,307 and explain each part of the expansion.
- 2. What is the expanded form of 8,506? Write each place value clearly.
- 3. Convert 4,892 into expanded form and explain the place values.
- 4. The number is 1,654. Write it in expanded form and show how the digits are broken down.
- 5. Convert 2,709 into expanded form and explain why each number represents its place value.

C. Mark each sentence with a True (✔) or False (★):

- 1. Rational numbers are closed under subtraction.
- 2. Subtraction of rational numbers is commutative.
- 3. For any rational number a, a 0 = a.
- 4. Subtraction of rational numbers is associative.
- 5. The inverse of subtraction can be found by adding the additive inverse.

D. Challenge yourself with these questions:

1. Ria says subtraction of rational numbers is associative. Her friend Amrit disagrees. Who is correct? Justify your answer with an example.

2. Simplify the expression: $\left(\frac{5}{6} - \frac{1}{3}\right) - \frac{1}{2}$ and show whether the result is the same as $\frac{5}{6} - \left(\frac{1}{3} - \frac{1}{2}\right)$. What property does this demonstrate?

- 3. A shopkeeper earns $\frac{3}{4}$ of his daily income in the morning and loses $\frac{2}{5}$ of that amount due to an error. Use subtraction to find the actual earning.
 - 4. Use the property a b = a + (–b) to simplify and solve: $\frac{2}{3} (-\frac{4}{5})$.
 - 5. Is the result of $\left(-\frac{3}{7} \frac{1}{2}\right)$ equal to $\left(\frac{1}{2} \left(-\frac{3}{7}\right)\right)$? Use this to verify the commutative property for subtraction of rational numbers.