Positive Integral Exponents of a Rational Number

Understanding of Positive Integral Exponents of a Rational Number

- A rational number is a number that can be expressed as a fraction $\frac{p}{q}$ where p and q are integers and q ≠ 0.
- A positive integral exponent means the exponent is a positive whole number like 1, 2, 3, etc.
- When a rational number is raised to a positive integral exponent, we multiply the rational number by itself as many times as the exponent says.

Important Points

- a^m = a × a × a × ... × a (m times) where m is a positive integer.
- $\left(\frac{p}{q}\right)^m = \frac{p^m}{q^m}$
- Always simplify the final answer if possible.
- If the base is negative and exponent is even, the result is positive.
- If the base is negative and exponent is odd, the result is negative.

Examples with Solutions

Example: Simple Rational Number with Positive Exponent

➢ **Find $\left(\frac{2}{3}\right)^2$.**

Solution: $\left(\frac{2}{3}\right)^2 = \frac{2 \times 2}{3 \times 3} = \frac{4}{9}$

Example: Larger Exponent

➢ **Find $\left(\frac{5}{7}\right)^3$.**

Solution: $\left(\frac{5}{7}\right)^3 = \frac{5 \times 5 \times 5}{7 \times 7 \times 7} = \frac{125}{343}$

Example: Negative Rational Base

➢ **Find $\left(-\frac{2}{5}\right)^3$.**

Solution: $\left(-\frac{2}{5}\right)^3 = \frac{-2 \times -2 \times -2}{5 \times 5 \times 5} = -\frac{8}{125}$

Example: Simplify After Applying Exponent

➢ **Find $\left(\frac{3}{4}\right)^2$.**

Solution: $\left(\frac{3}{4}\right)^2 = \frac{3 \times 3}{4 \times 4} = \frac{9}{16}$

Example: Fractional Value with Higher Power

➢ **Find $\left(\frac{1}{2}\right)^4$.**

Solution: $\left(\frac{1}{2}\right)^4 = \frac{1 \times 1 \times 1 \times 1}{2 \times 2 \times 2 \times 2} = \frac{1}{16}$

Summary Points

- Positive integral exponent means multiplying the number by itself repeatedly.
- For rational numbers $\left(\frac{p}{q}\right)^m = \frac{p^m}{q^m}$.
- Simplify the result after applying the exponent.
- Pay attention to negative signs when base is negative.
- Always express the answer in its simplest fractional form.