

ACTIVITY

2



Title

Laws of Exponents.



Objective

To learn about the laws of exponents for rational bases.



Prerequisite knowledge

1. Concept of base and exponent *i.e.*, In x^n , x is the base and n is the exponent.
2. Knowledge of multiplication

i.e.,
$$x^n = \underbrace{x \times x \times x \dots \times x}_{n \text{ times}}$$



Materials required

A thin white paper, a scale, colour pencils and an eraser.



Procedure

1. Take a thin white paper and divide it into three equal parts vertically. Colour them differently on both sides and fold it as shown.

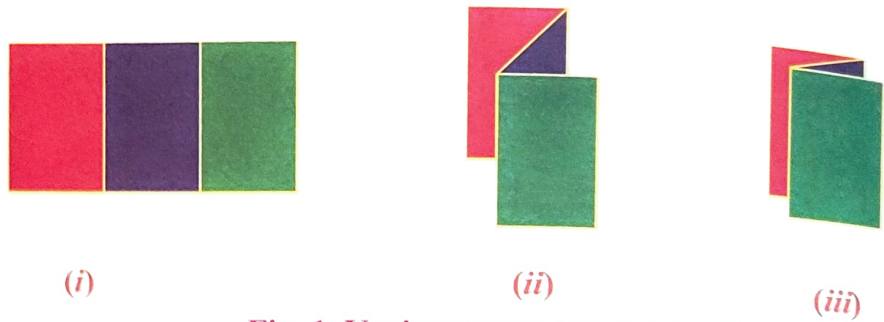


Fig. 1. Various stages to obtain 3^1 .

2. Take the folded paper as obtained in Fig. 1(iii) and divide it further into three equal parts horizontally by paper folding, press it and then unfold it.

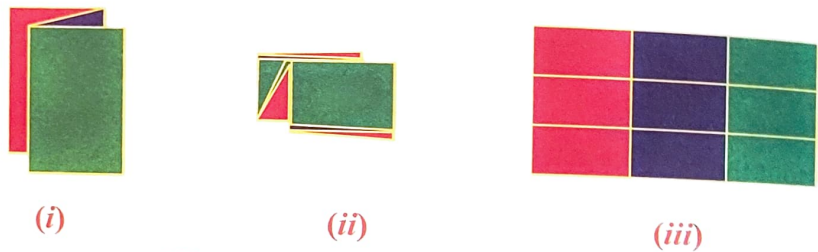


Fig. 2. Various stages to obtain 3^2 .

3. From Fig. 2(iii) we can say $3^2 = 9$.
 4. Again take a thin white paper. Divide it into two equal parts as shown. Colour them differently and fold it.



Fig. 3. Various stages to obtain 2^1 .

5. Take the folded paper as obtained in Fig. 3(ii) and divide it further into two equal parts horizontally by folding, press it and then unfold it.



Fig. 4. Various stages to obtain 2^2 .

6. From Fig. 4(iii), we can say $2^2 = 4$.

Thus, we have $\frac{3^2}{2^2} = \frac{9}{4}$.

Let us find the value of $\left(\frac{3}{2}\right)^2$

We know $\left(\frac{3}{2}\right)^2 = \frac{3}{2} \times \frac{3}{2}$

7. Take a square paper. Fold it twice first vertically from middle and then horizontally from the middle as shown, press it and unfold to form 4 small squares. Let each square be of dimension 1 unit by 1 unit. Draw lines on the crease so formed.

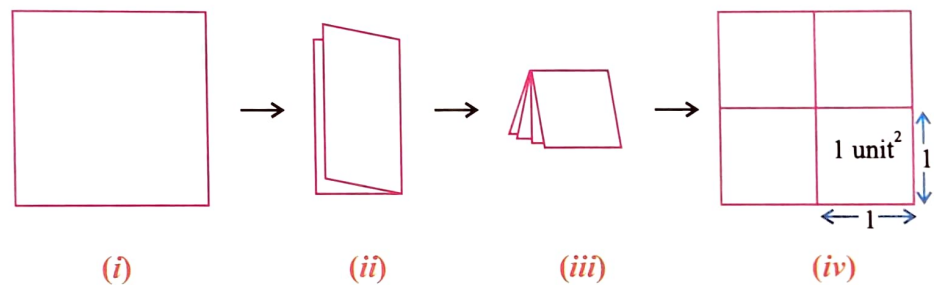
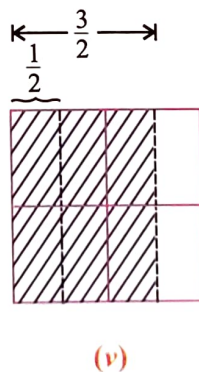
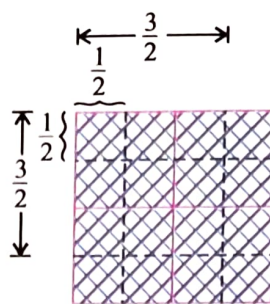


Fig. 5.

Now divide each small square into two equal parts by drawing broken vertical lines as shown in Fig. (v).



Shade three of these four equal parts to denote $\frac{3}{2}$. Again draw two broken horizontal lines and shade three of these horizontal parts to denote $\frac{3}{2}$ as shown in Fig. (vi).



(vi)

Now the double shaded region consists of 9 of these fourths i.e., $\frac{9}{4}$.

Thus we conclude $\left(\frac{3}{2}\right)^2 = \frac{3}{2} \times \frac{3}{2} = \frac{9}{4}$.



Observation

We have observed that $\frac{3^2}{2^2} = \left(\frac{3}{2}\right)^2$



Result

Our conclusion is $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ where a and b are non zero integers and n is any integer.



Learning outcome

After performing this activity, students can learn how to evaluate a rational number raised to an integral power.



Activity time

By activity method show the following results are true.

For any non zero integer a and b and any integer n .

(i) $a^m \times a^n = a^{m+n}$

(ii) $\frac{a^m}{a^n} = a^{m-n}$

(iii) $a^m \times b^m = (ab)^m$