

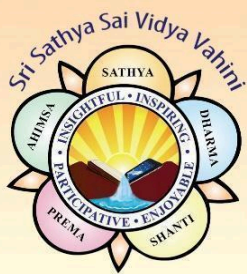
॥ Aum Sri Sai Ram ॥

Sri Sathya Sai
VIDYA VAHINI
श्री सत्यसाई विद्या वाहिनी



TOPIC	Exponents and Powers
SUB-TOPIC	Laws of exponents
DURATION	35 minutes

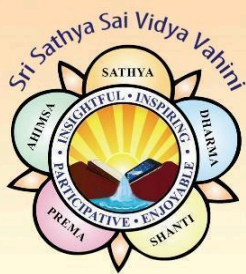
CURRICULAR GOALS	CG- 1 (Understands numbers and sets of numbers (whole numbers, fractions, integers, rational numbers, and real numbers), looks for patterns, and appreciates relationships between numbers)	
COMPETENCIES AS PER NCF/NIPUN BHARAT	Remember	
	Understand	
	Apply	
	Analyse	C-1.1 -Develops a sense for and an ability to manipulate (e.g., read, write, form, compare, estimate, and apply operations) and name (in words) large whole numbers of up to 20 digits, and expresses them in scientific notation using exponents and powers
	Evaluate	
	Create	



Strategies As Per NEP	NA
Learner Centric Techniques used	Jigsaw Technique
Teacher's Tool Kit	NA
SDG(Sustainable Development Goals)	SDG 4 : Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
Inter/Multidisciplinary elements	NA

Technology aids	NA
Teaching Learning Materials (TLM)	NA
Learning Aids	EM_LA_Worksheet_Exponents And Powers
Assessment (As, For, Of)	AOL Teacher-led
References	NA

Previous Knowledge required	Decimal number system
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Brief Description:

This module explains how the **Jigsaw method(Learner Centric Technique)** can be used to facilitate students to determine the Laws of Exponents, thus enabling **Participative Learning**.

1) SA_Laws of Exponents

Specific Learning Outcome: Students will be able to determine the Laws of Exponents(Fulfills Competency Code C-1.1)

Duration : 35 minutes

Aim: To derive the Laws of Exponents

[Note to the teacher: Prior to the activity, the teacher may make sure that the students know that

$$a^m = a \times a \times a \dots m \text{ times, where } a \text{ is a non - zero integer and } m \text{ is a positive integer.}]$$

The students will be deriving the following laws of exponents:

For any two non - zero integers a , b and whole numbers m , n

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

$$(b) a^m \div a^n = a^{(m-n)}, m > n$$

$$(c) (a^m)^n = a^{mn}$$

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

$$(e) a^m \div b^m = (a \div b)^m$$

$$(f) a^0 = 1$$

$$(g) (-1)^{\text{even number}} = 1, (-1)^{\text{odd number}} = -1$$

Role of the teacher: Facilitator

The teacher may facilitate the students to derive the laws of exponents through the Jigsaw teaching technique as explained below:

- Group the 7 laws of exponents into 3 sub-groups as follows:

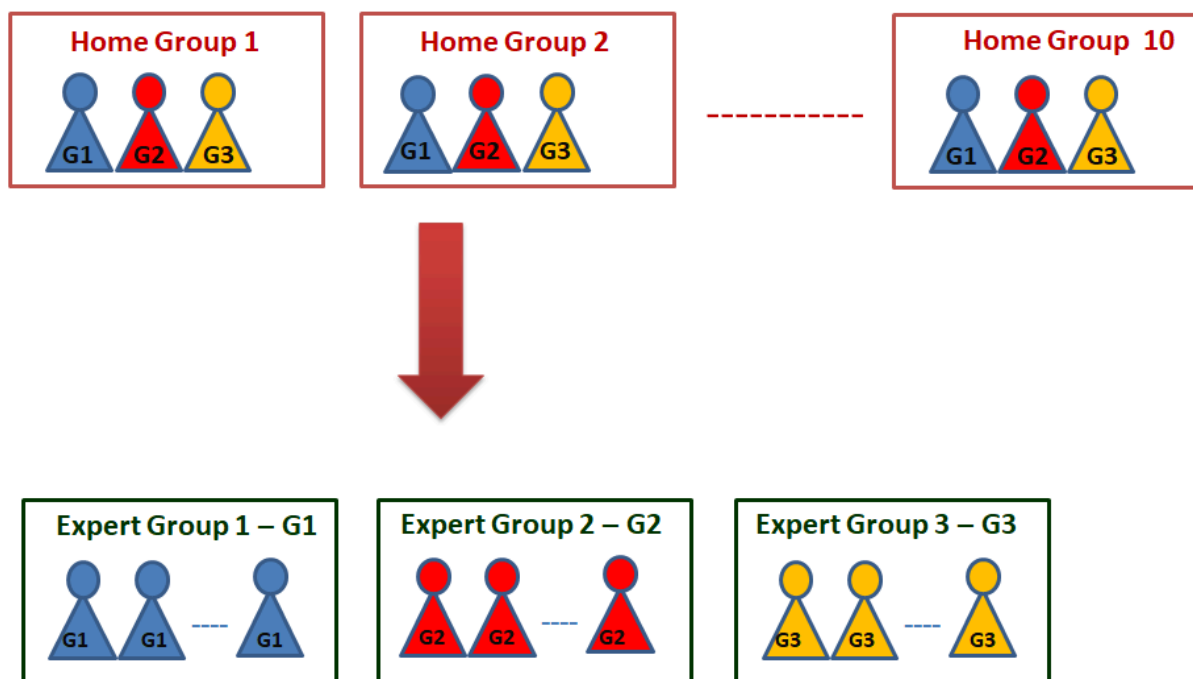
$$G1: a^m \times a^n = a^{(m+n)}, a^m \div a^n = a^{(m-n)}, m > n \text{ and } a^0 = 1.$$

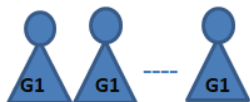


$$G2: a^m \times b^m = (ab)^m, a^m \div b^m = (a \div b)^m$$

$$G3: (a^m)^n = a^{mn}, (-1)^{\text{even number}} = 1 \text{ and } (-1)^{\text{odd number}} = -1$$

- Divide the students of the class into groups of 3 students and allocate each student within the group with one sub-group of laws of exponents(G1, G2 and G3). (If the class strength is 30, make 10 groups. Each group should have a minimum of 3 students. If the strength of the class is not divisible by 3, few groups may have 4 students with 2 students for any case) These are **Home Groups**.
- Instruct each of the Home Group members to come out of their groups and form groups of the same formulae sub-group i.e.G1, G2 and G3. These are **Expert Groups**.





Represents students allocated with formulae sub-group G1.

$$G1: a^m \times a^n = a^{(m+n)}, a^m \div a^n = a^{(m-n)}, m > n \text{ and } a^0 = 1.$$



Represents students allocated with formulae sub-group G2.

$$G2: a^m \times b^m = (ab)^m, a^m \div b^m = (a \div b)^m$$



Represents students allocated with formulae sub-group G3.

$$G3: (a^m)^n = a^{mn}, (-1)^{\text{even number}} = 1 \text{ and } (-1)^{\text{odd number}} = -1$$

- Oversee that each expert group derives the formulae given to them by taking random numbers for a, b, m and n and then arrives at a generalisation for the formula. They may refer to their textbook to understand the derivation.
- Give 15 minutes time for this task. Ask students to come back to their original home groups and exchange what they had learnt in the expert groups with other members of the home group.
- Ensure that each and every member of all groups has a thorough knowledge about how to solve problems using the different laws of exponentiation that they have learnt.
- Pick at random a few students and ask them to solve a problem each on the blackboard.

[Note to the teacher: The time required may vary according to the number of students in the class. The teacher may use an extra period if required]

2) QA_Summative on Laws of Exponents(Home Assignment)

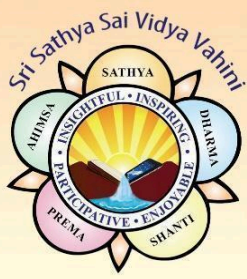
Specific Learning Outcome: Students will be able to apply the laws of exponents to solve the problems

Note to the teacher:

Questions for practice and assessment are given in the document 'EM_LA_Worksheet_Exponents And Powers.pdf'.

Note to the teacher:

Provide the attached "EM_LA_Worksheet_Exponents And Powers.pdf" to the students as a take-home assignment to reinforce their understanding of Laws of Exponents. It can also be taken up in the next period to assess the understanding.



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