INDICES

Subject

Mathematics

Prepared By

[Instructor Name]

Grade Level

5

Overview

This lesson plan covers teaching content for;

1. Describing numbers written in Index form
2. Translate numbers into index form
3. Understanding the meaning of zero index and negative indices
4. Calculating numbers written in index forms

Objectives

Students should be able to;

1. Describe numbers written in index form.
2. Translate numbers into index form.
3. Understand the meaning of zero index and negative indices.
4. Calculate numbers written in index form.

Activity Starter/Instruction

1. Introduce students to the terms power, index, indices and exponent.
2. A power is the product of multiplying a number by itself. A power usually has a base number (what number is being multiplied) and an exponent, which tells how many times the base number is being multiplied.
3. For example 5^6 is said as "five to the sixth power" and 5 is the base, while 6 is the exponent. Which can be solved as $5 \times 5 \times 5 \times 5 \times 5 \times 5 = 15,625$ or with the aid of a calculator.
4. Laws of Indices:

   $x^0 = 1$

   $x^m \times x^n = x^{m+n}$

   $x^m / x^n = x^{m-n}$

   $(x^m)^n = x^{mn}$

   $x^{-m} = 1 / x^m$

   $x^{m\,n} = \sqrt[n]{x^m} = (\sqrt[n]{x})^m$

Teacher Guide

Day 1/ Lesson 1: 20mins

1. A power (or index number or exponent) is a useful way of writing repeated multiplication.

- $7^3 = 7 \times 7 \times 7$
- $9^5 = 9 \times 9 \times 9 \times 9 \times 9 \times$
- $a^2 = a \times a$
- The plural of index number is indices.

2. Special rule 1: Any number to the power of 1 is the same as the original number. $5^1 = 5$, $(-8)^1 = -8$, $0.41^1 = 0.41$ $1,000,000^1 = 1,000,000$.

3. Special rule 2: Any number to the power of 0 is equal to 1. $19^0 = 1$, $0.61^0 = 0.61$, $(-13)^0 = 1$, $1,000,000^0 = 1$.

4. Multiplying numbers in index form

- Simplify $8^3 \times 8^4$

  $= 8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8$

  $= 8^7$

- This only works for numbers with the same base.
- A quicker way of doing this, is to add the powers. When you multiply powers with the

Materials Required

- Card set A – Pairs activity
- Card set B - Indices
- White Board
- Marker

Additional Resources

- https://www.tes.com/teaching-resource/laws-of-indic 11007993
- http://www.ultimatemaths.com/powers-and-the-laws indices.htm
- https://www.piximaths.co.uk/laws-of-indices
- https://www.resourceaholic.com/2014/12/indices.htr
- https://www.homeschoolmath.net/worksheets/expor
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Additional Notes

Guided Practice

Day 2/ Lesson 2: 15Mins

1. The class will work in group of three or four. Give each group Card set A – Pairs activity
2. Pupils should place all the card face down on the table. Pupils take it in turns to pick up one card of each color and turn them over so that partners can see them.
3. If they match, the pupil places them face down on the table again. If a learner claims a pair that does not match and is correctly challenged by another member of the group, they have to put the cards back and is a turn.
4. The winner is the pupil who has the most pairs.

Guided Practice

Day 3/ Lesson 3: 15mins

1. Pair up pupils. Give out Card set B – Indices to each pair. These cards move the learning on from numerical indices to algebraic indices.
2. Tell pupils to find at least three pairs of equivalent cards. Write on the board card-pairs that the pupils have found and ask for explanations of why they are equivalent.
3. Next ask pupils to find set of cards such that one card is the product of the rest. Again ask for explanations.
4. Next, ask for sets of three cards such that the first divided by the second is equal to the third. Discuss these.

same base, you add the indices together. $8^3 \times 8^4 = 8^{3+4} = 8^7$

5. Dividing numbers in index form
- Simplify $2^5 \div 2^2$

  $= \dfrac{2 \times 2 \times 2 \times 2 \times 2}{2 \times 2}$

  $= 2^3$
- When you divide powers with the same base number, you subtract the indices. $2^5 \div 2^2 = 2^{5-2} = 2^3$

6. Indices in brackets
- Simplify $(3^3)^3$
- $= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$
- $= 3^{15}$
- When you have indices inside brackets, you multiply the two indices together. $(3^5)^3 = 3^{5*3} = 3^{15}$

7. Give pupils activities to try it out.

Summary

- Invite learners to write out one of their calculations on the board and say what it tells them about indices.

Assessment Activity

Assess if students can

1. Calculate numbers written in index form, and understand the laws correctly.

Assessment Activity

Check that they understand negative, fractional and zero indices by asking some of them to evaluate some questions.