BASIC 8

WEEKLY LESSON PLAN – WEEK 4

Strand:	Number		**Sub-Strand:**	Number Operations	
Content Standard:	B8.1.2.3 Demonstrate understanding and the use the laws of indices in solving problems (including real life problems) involving powers of natural numbers				
Indicator (s)	B8.1.2.3.1 Identify and explain the laws of indices B8.1.2.3.2 Apply the laws of indices to simplify and evaluate numbers involving powers of numbers. (PEDMAS) B8.1.2.3.3 Solve exponential equations B8.1.2.3.4 Solve real life problems involving powers of natural numbers.		**Performance Indicator:** Learners can apply the law of indicies.		
Week Ending	21-07-2023				
Class	B.S.8	**Class Size:**		**Duration:**	
Subject	Mathematics				
Reference	Mathematics Curriculum, Teachers Resource Pack, Learners Resource Pack, Textbook.				
Teaching / Learning Resources	Charts, Poster, Pictures.		**Core Competencies:**	• Analyze and make distinct judgment about viewpoints expressed in an argument • Ability to effectively define goals towards solving a problem	

DAYS	**PHASE 1 : STARTER**	**PHASE 2: MAIN**	**PHASE 3: REFLECTION**
MONDAY	Using a Chart, explain the law of indices.	1. Discuss with Learners on the three laws of indices and their examples. 2. Assist Learners to use the laws of indices to solve problems involving powers of number. 3. Learners brainstorm to simplify and evaluate expressions applying the laws of indices.	Reflect on the applying the laws of indices. **Exercise;** 1. Determine the numerical value for each of the following (not

Laws of Indices or Exponents

a, b are real numbers (>0, ≠ 1) and m, n are real numbers

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

(ii) $a^{-m} = \frac{1}{a^m}$

(iii) $\frac{a^m}{a^n} = a^{m-n} = \frac{1}{a^{m-n}}$

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

(v) $(ab)^n = a^n \cdot b^n$

(vi) $a^0 = 1$

(vii) if $a^m = a^n$ then m = n.

(viii) if $a^n = b^n$, $a \neq b$ then n = 0.

1. **Powers, or indices**

We write the expression 3 × 3 × 3 × 3 as 3^4 We read this as 'three to the power four'. Similarly z × z × z = $z^{3.}$ We read this as 'z to the power three' or 'z cubed'. In the expression b c , the index is c and the number b is called the base. Your calculator will probably have a button to evaluate powers of numbers. It may be marked x y .

The laws of indices To manipulate expressions involving indices we use rules known as the laws of indices. The laws should be used precisely as they are stated - do not be tempted to make up variations of your own! The three most important laws are given here:

First law $a^m \times a^n = a^{m+n}$ When expressions with the same base are multiplied, the indices are added. **Example**

We can write 7 6 × 7 4 = 76+4 = 710 You could verify this by evaluating both sides separately.

Second Law

$A^m / a^n = A^{m-n}$ When expressions with the same base are divided, the indices are subtracted. Example We can write 8 5 8 3 = 85−3 = 82 and similarly z 7 z 4 = z 7−4 = z 3

Third law (a^m) n = a^{mn} Note that m and n have been multiplied to yield the new index mn.

Example;

2 = 64×2 = 68 and (e x) y = e xy It will also be useful to note the following important results: a 0 = 1, a1 = a

containing exponents):

(i) 6^4

(ii) $(-5)^{-4}$

(iii) 9^0

(iv) $(1414)^{-5}$

2. In each case choose an appropriate law to simplify the expression: a) 53 × 5 13 b) 813 ÷ 8 5 c) x 6 × x 5 d) (a 3) 4 , e) y 7 y 3 , f) x 8 x7 . 2. Use one of the laws to simplify, if possible, a 6 × b 5 .

TUESDAY	Discuss with Learners on the three methods of solving an exponential equation	1. Learners brainstorm to identify 5 examples of exponential equations. 2. Discuss the basic formulas of exponentiation with the Learners. 3. Assist Learners to explain the types of exponential. **How to Solve Exponential Equations** • 1 Equating Two Exponents with the Same Base. • 2 Equating an Exponent and a Whole Number. • 3 Using Logs for Terms without the Same Base. **Rule or special case** **Formula** **Example** Power of a product (xy)a=xaya 36=62=(2·3)2=22·32 Power of one x1=x 21=2 Power of zero x0=1 20=1 Power of negative one x−1=1x 2−1=12	Through questions and answers, conclude the lesson.
THURSDAY	Review Learners knowledge on the previous lesso.1.	1. Assist Learners to solve real-life problems involving powers of natural numbers. 2. Learners brainstorm to apply word problem strategies to solve word Problems involving pawers of natural numbers. **EXAMPLE** Solve 5x+2=4x In general we can solve exponential equations whose terms do not have like bases in the following way: 1. Apply the logarithm to both sides of the equation. • If one of the terms in the equation has base 1010, use the common logarithm. • If none of the terms in the equation has base 1010, use the natural logarithm. 2. Use the rules of logarithms to solve for the unknown. **EXAMPLE** Solve 100=20e2t 100=20e2t5=e2t Divide by the coefficient of the base raised to a power.ln5=2tTake ln of both sides. Use the fact that ln(x) and ex are inverse functions.t=ln52Divide by the coefficient of t. **EXAMPLE** Solve 4e2x+5=124.	Through questions and answers, conclude the lesson.

		4e2x+5=124e2x=7 Combine like terms.e2x=74Divide by the coefficient of the base raised to a power.2x=ln(74)Take ln of both sides.x=12ln(74)Solve for x. **EXAMPLE** Solve e2x−ex=56 e2x−ex=56e2x−ex−56=0Get one side of the equation equal to zero.(ex+7)(ex−8)=0Factor by the FOIL method.ex+7=0 or ex−8=0If a product is zero, then one factor must be zero.ex=−7 or ex=8Isolate the exponentials.ex=8Reject the equation in which the power equals a negative number.x=ln8Solve the equation by taking the natural log of both sides.	

Name of Teacher: ***School:*** ***District:***