GET DIRECTORATE

MATHEMATICS LESSON
GRADE 7: EXPONENTS

Quality learning @home

DATE: ………………….

CONCEPTS & SKILLS TO BE ACHIEVED: **By the end of the lesson learners should know and be able to:** • The meaning of conceptual exponential notation, power, base and exponent, index • Calculate squares and cubes; square roots and cube roots	

RESOURCES:	DBE Workbook 1, Sasol-Inzalo book, Textbooks,
ONLINE RESOURCES	https://drive.google.com/open?id=1Qw6gZzmSxQ-ypsHmqx1LHnVbA2HsKX79 https://www.thelearningtrust.org/asp-treasure-box

DAY 1

INTRODUCTION :

WHY DO WE NEED EXPONENTS?

Exponents enable us to write repeated multiplication in a shorthand way, called the exponential form. Ensure that learners can distinguish between the two concepts – i.e. repeated multiplication and repeated addition.
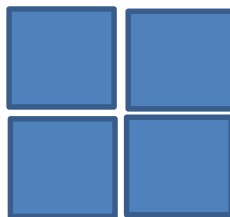
LESSON DEVELOPMENT

CLASSWORK: SQUARES AND SQUARE ROOTS:

Activity 1:

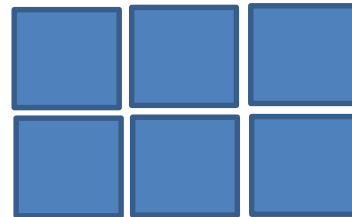1. **Work through the following activity and complete the answers in your classwork book.**

Pic 1	Pic 2	pic 3

a. Draw picture 4 and 5 in your classwork book:

b. Copy and complete the table

Picture number	1	2	3	4	5	6	8	10	12
Number of small squares	1	4	9						

c. How many squares do you think will there be in picture 20? Explain your answer.

YOU MUST REMEMBER THE FOLLOWING IMPORTANT FACTS NOW:
Numbers that make a square pattern when we multiply them, are called square numbers – squares. In the table we multiplied the number of the picture with itself and got a square number. This process is called "squaring a number". Eg. 2 x 2 = 4; 3 x 3 = 9. This can be written in a shorter notation that we call exponential notation: 2^2 ; 3^2 etc.

Activity 2: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

1. Write the following in short notation/ square notation/ exponential notation
a. 3 x 3
b. 5 x 5
c. 10 x 10

2. Expand and calculate eg. 4^2 = 4 x 4 = 16
a. 5^2
b. 7^2
c. 11^2

3. Complete:
a. 3^2 =
b. $\square$ = 10^2
c. 16 = $\square^2$

No. 3c is a very interesting example: You calculate which 2 numbers multiplied will give you 16. This calculation we call SQUARE ROOT OF 16.
We use a specific symbol for this calculation called square root: $\sqrt{}$; thus $\sqrt{16}$ = 4;
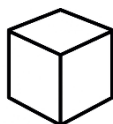
4. Calculate the following
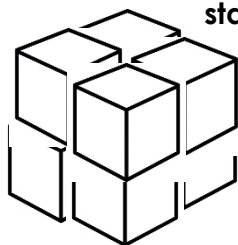a. $\sqrt{25}$
b. $\sqrt{49}$

CUBE AND CUBE ROOTS

Activity 3: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

1. Cubes are stacked:

Stack 1   **stack 2**

In stack 1 we used 1 cube, In stack 2 we used 8 cubes and we will use 27 in stack 3

a. Copy the table in your workbook and complete:

Picture number	1	2	3	4	5	6	8	10	12
Number of small cube blocks	1	8	27						

b. Explain how you calculate the numbers to complete the table.

YOU MUST REMEMBER THE FOLLOWING IMPORTANT FACTS NOW:

The numbers of blocks in each stack are called cubes. Thus numbers used to calculate are called cubic numbers because when we multiply them, we can form a "cubic stack". In the table we multiplied the number of the picture with itself twice and got a cube number. Eg. 2 x 2x 2 = 8; 3 x 3 x 3 = 27. This can be written in a shorter notation that we call exponential notation: 2^3 ; 3^3 etc.

2. Write in exponential notation:

a. 4 x 4 x 4

b. 5 x 5 x 5

3. Calculate:

a. 4^3

b. 1^3

4. Complete:

a. $5^3 = \square$

b. $\square^3 = 8$

No. 3b is a very interesting example: You calculate which number multiplied 3 times with itself, will give you 8. This calculation we call CUBE ROOT OF 8.

We use a specific symbol for this calculation called CUBE root $\sqrt[3]{}$: thus $\sqrt[3]{8}$ = 2;

5. Calculate:

a. $\sqrt[3]{125}$

b. $\sqrt[3]{216}$

HOMEWORK: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

Activity 4:

1. Write the following in exponential notation
a. 6 x 6
b. 11 x 11
c. 20 x 20

2. Expand and calculate
a. 9^2
b. 12^2
c. 15^2

3. Complete:
a. $7^2 =$
b. □ $= 14^2$
c. $36 = □^2$

4. Calculate the following
a. $\sqrt{49}$
b. $\sqrt{121}$

5. Write in exponential notation:
a. 4 x 4 x 4
b. 6 x 6 x 6

6. Calculate:
a. 2^3
b. 6^3

7. Calculate:
a. $\sqrt[3]{125}$
b. $\sqrt[3]{343}$

MEMORANDUM : DAY 1

Activity 1
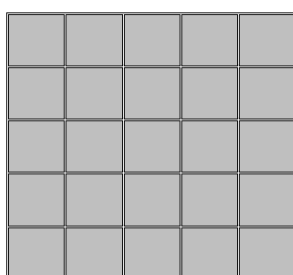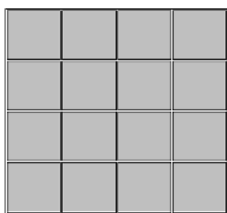
b.

Figure no.	1	2	3	4	5	6	8	10	12
Number of small squares	1	4	9	16	25	36	64	100	144

Activity 2

Number 1

a. $3 \times 3 = 3^2$

b. $5 \times 5 = 5^2$

c. $10 \times 10 = 10^2$

Number 2

a. $5^2 = 5 \times 5$

b. $7^2 = 7 \times 7$

c. $11^2 = 11 \times 11$

Number 3

a. $3^2 = 9$

b. $100 = 10^2$

c. $16 = 4^2$

Number 4

a. $\sqrt{25} = 5$

b. $\sqrt{49} = 7$

Activity 3:

1a.

Stack	1	2	3	4	5	6	8	10	12
Number of small cubes	1	8	27	64	125	216	512	1 000	1 728

b. Multiply the number of the stack 2 times with itself; 3 x 3 x 3

2.
a. 4 x 4 x 4 = 4^3
b. 5 x 5 x 5 = 5^3

3.
a. 4^3 = 64
b. 1^3 = 1

4.
a. 5^3 = 125
b. 2^3 = 8

5.
a. $\sqrt[3]{125}$ = 5
b. $\sqrt[3]{216}$ = 6

Activity 4:

1.
a. 6 x 6 = 36
b. 11 x 11 = 121
c. 20 x 20 = 400

2.
a. 9^2 = 9 x 9 = 81
b. 12^2 = 12 x 12 = 144
c. 15^2 = 15 x 15 = 225

3.
a. 7^2 = 49
b. 196 = 14^2
c. 36 = 6^2

4.
a. $\sqrt{49}$ = 7
b. $\sqrt{121}$ = 11

5.
a. 4 x 4 x 4 = 4^3
b. 6 x 6 x 6 = 6^3

6.
a. 2^3 = 8
b. 6^3 = 216

7.
a. $\sqrt[3]{125}$ = 5
b. $\sqrt[3]{343}$ = 7

DAY 2		

LESSON DEVELOPMENT

<u>REVISION</u>
EXPONENTS IS A SHORTHAND FORM OF THE WRITING REPEATED MULTIPLICATION.

CLASSWORK:
Work through the following activity and complete the answers in your classwork book.

Activity 1:

1. Express each number below as a product of prime factors.
Example: 250 = 2 × 5 × 5 × 5: ***5 is a repeated factor of 250***
(a) 35   (b) 70   (c) 140

A number that can be expressed as a product of one repeated factor is called a power of that number.
Examples: 32 is a power of 2, because 32 = 2 × 2 × 2 × 2 × 2
10 000 is a power of 10, because 10 × 10 × 10 × 10 = 10 000

2. Express each number as a power of 2, 3, 5 or 10. Eg. 8 = 2^3
 (a) 125   (b) 64

(2 x 2 x 2 = 8 as the base and it has been multiplied thrice.   Answer: 2^3

exponent
base 2^3

CONSOLIDATION

YOU SHOULD REMEMBER FROM TODAY'S WORK THAT:
1. **Numbers in exponential notation comprises of a base and powers or exponents.**
2. **The base represents the factors while the exponents tells us how many times the base was multiplied by itself.**

HOMEWORK: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

Activity 2: Copy and complete the following table

		1 × 1	9 × 9		
	7^2		9^2	3^2	
11 squared				3 squared	
121					36

MEMORANDUM DAY 2:

Activity 1:

11 x 11	7 x 7	1 × 1	9 × 9	3 x 3	6 x 6
11^2	7^2	1^2	9^2	3^2	6^2
11 squared	7 squared	1 squared	9 squared	3 squared	6 squared
121	49	1	81	9	36

DAY 3

INTRODUCTION

- **Numbers in exponential notation comprises of a base and powers or exponents.**
- **The base represents the factors while the exponents tells us how many times the base was multiplied by itself.**
- **We use a specific symbol for this calculation called square root: $\sqrt{}$**

CLASSWORK: THE SQUARE ROOT

The INVERSE to finding the SQUARE OF A NUMBER is to find its SQUARE ROOT.
The question, "What is the square root of 25?" is the same as the question, "What number, when squared, equals 25?"
The answer to the question is 5 because 5 × 5 = 25.

Activity 1: Work through the exercises and complete in your classwork book

1 a. What number, when squared, equals 9? Explain.
  b. What is the square root of 49? Explain.
  c. What number, when squared, equals 81? Explain.
  d. What number, when squared, equals 225? Explain.
  e. What is the square root of 121? Explain.
  f. What number must be squared to get 169? Explain.

HOMEWORK: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

Activity 2: Copy and complete the table:

Number	Square root	Check your answer
9	3	3 x 3 = 9
1 600		
144		
196		
625		

MEMORANDUM DAY 3:

Activity 1:

a. 3   3 x 3 = 9

  b. 7 $\sqrt{49}$ = 7   7 x 7 = 49.

  c. 9   9 x 9 = 81.

  d. 15   15 x 15 = 2= 25

  e. 11 $\sqrt{121}$ = 11   11 x 11=121

  f. 13   13 x 13 = 169

Activity 2:

Number	Square root	Check your answer
9	3	3 x 3 = 9
1 600	40	40 x 40 = 1 600
144	12	12 x 12 = 144
196	13	13 x 13 = 169
625	25	25 x 25 = 625

DAY 4

INTRODUCTION:
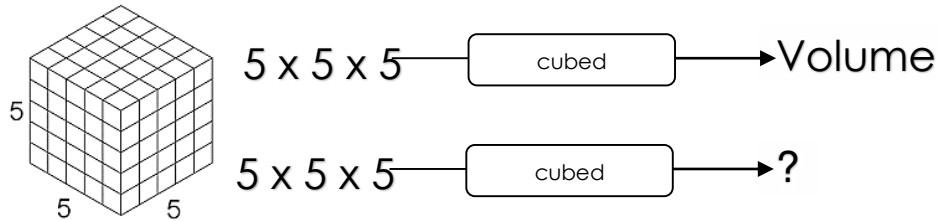
- **number multiplied 3 times with itself,**
- **we use a specific symbol for this calculation called CUBE root $\sqrt[3]{}$:**

CLASSWORK: CUBES

Activity 1

Perfect Cubes-

$5 \times 5 \times 5$ → cubed → Volume

$5 \times 5 \times 5$ → cubed → ?

1. Copy and complete the table below.

Expanded notation	Exponent notation
1 x 1 x 1 = 1	1^3
2 x 2 x 2 = 8	2^3
3 x 3 x 3 = 27	3^3

CONSOLIDATION

HOMEWORK: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

Activity 2:
1. From the list of numbers: 3; 6; 8; 14; 16; 28; 41; 64

   (a) Write down all the cube numbers:

   (b) Which two numbers when subtracted will have an answer which is a cube number?

   (c) Write down the value of:

      (a) 10^3

      (b) ten cubed

      (c) 5^3

      (d) six cubed

   (d) Write down a cube numbers that are greater than 100 and less than 200.

MEMORANDUM DAY 4:

Activity 1:

Expanded notation	Exponent notation
1 x 1 x 1 = 1	1^3
2 x 2 x 2 = 8	2^3
3 x 3 x 3 = 27	3^3
4 x 4 x 4 = 64	4^3
5 x 5 x 5 = 125	5^3
6 x 6 x 6 = 216	6^3
7 x 7 x 7 = 343	7^3

Activity 2:

   a) 8 ; 64

   b) 41 – 14 = 27   (27 = 3 x 3 x 3)

   c) 1 000

   d) 1 000 10^3

   e) 5^3 = 5 x 5 x 5 = 125

   f) 6^3 = 6 x 6 x 6 = 216

   g) 125

DAY 5

INTRODUCTION: Calculating cubes
- **A cube is any number which is the product of three identical factors. It means that a number is multiplied by itself thrice. $5 \times 5 \times 5 = 5^3$**
- **5^3 can be read as five cubed or five to the power three.**

CLASSWORK:

THE INVERSE operation to finding the CUBE OF A NUMBER is to find its CUBE ROOT.

The question, "What number, when cubed, equals 125?" is the same as the question, "What is the cube root of 125?"

The answer to the question above is 5 because $125 = 5 \times 5 \times 5$.

2 a. What number, when cubed, equals 27? Explain.
  b. What is the cube root of 343? Explain.
  c. What number, when cubed, equals 8? Explain.
  d. What is the cube root of 1 000? Explain.
  e. What number, when cubed, equals 512? Explain.
  f. What number produces the same answer when it is squared and when it is cubed

HOMEWORK: DO THE FOLLOWING IN YOUR EXERCISE BOOK AND CHECK YOUR ANSWERS IN THE MEMORANDUM BELOW TODAYS LESSON

Activity 2: Copy and complete the table:

Number	Cube root	Check your answer
8	2	2 x 2 x 2 = 8
27		
64		
125		
216		
1 331		
1 000		

MEMORANDUM DAY 5:

Activity 1:

a. 3   3 X 3 X 3 = 27
b. 7   7 X 7 X 7 = 27 $\sqrt[3]{343}$ = 7
c. 2   2 X 2 X 2 = 8
d. 10
e. 8   8 X 8 X 8 = 512
f. 1 X 1 = 1 X 1 X 1

Activity 2:

Number	Cubed	Check your answer
8	2	2 x 2 x 2 = 8
27	3	3 x 3 x 3 = 37
64	4	4 x 4 x 4 = 64
125	5	5 x 5 x 5 = 125
216	6	6 x 6 x 6 = 216
1 331	11	11 x 11 x 11 = 1 331
1 000	10	10 x 10 x 10 = 1 000