multiplication ( )

Lesson 3- Exponents & Square Roots

Short way of writing multiply a number by itself

2^5 also means = $2\times2\times2\times2\times2 = 2\cdot2\cdot2\cdot2\cdot2 = 32$

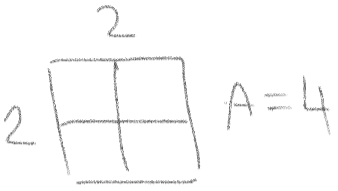
2 is the Base: tells us which number we're using to multiply

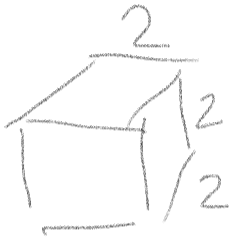
"5" is the exponent:
- tells us how many times we repeat the multiplication of the base

REMEMBER:
Exponent 0 = answer is ALWAYS 1

Exponent 2 = square

Exponent 3 = cube





$V = 2\cdot2\cdot2 = 8$

Tricks for Word Problems:

Examples:

A) 3^2 = 9

B) 6^5 = 7776

C) 4^1 = 4

D) 5^3 = 125

E) 1^5 = 1

F) 2^0 = 1

Square Root:

"Square": Using the answer of a squared number, work backwards

Ex: The square of 5 = 5^2 = 25 so $\sqrt{25} = 5$

Symbol: $\sqrt{\ }$

Examples:

$\sqrt{64}$ = 8

$\sqrt{16}$ = 4

$\sqrt{1}$ = 1

$\sqrt{16/64} = \frac{1}{2} = 0.5$

$\sqrt{\frac{16}{64}} = \frac{\sqrt{16}}{\sqrt{64}} = \frac{4}{8}$

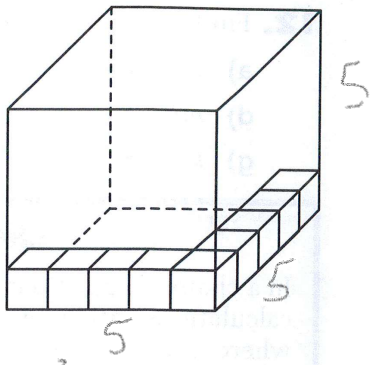
WB P 27 (2-11), P 29 (17-21)

16 ÷ 64 = 0.25

√0.25

P27

2. Consider the cube represented in the adjacent diagram.



a) How many cubes 1cm per side could be placed inside this cube?

125 cm³

b) Find the numerical expression corresponding to the volume of this cube, then calculate this volume.

_____

c) Use exponential notation to express this volume. _____

3. Write the following products using exponential notation.

a) $3 \times 3 =$ 3^2 b) $2 \times 2 \times 2 =$ 2^3

c) $5 \times 5 \times 5 \times 5 \times 5 =$ 5^5 d) $7 \times 7 \times 7 \times 7 \times 7 \times 7 =$ _____

4. Express the following powers as a product of factors equal to the base and then calculate the product.

a) $2^5 =$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ 32 b) $3^4 =$ _____ c) $5^2 =$ _____

5. Express each of the following numbers as a power of 2.

base of 2

a) $8 =$ 2^3 b) $16 =$ 2^4 c) $32 =$ 2^5

d) $128 =$ 2^7 e) $256 =$ _____ f) $512 =$ _____

6. Express each of the following numbers as a power of 3.

a) $9 =$ 3^2 b) $81 =$ _____ c) $243 =$ _____

7. Express each of the following numbers as a power of 10.

a) $100 =$ _____ b) $10\,000 =$ _____ c) $1\,000\,000 =$ _____

8. Write the number 64 as a power of a ~~natural~~ whole number. Give all possible answers.

_____

9. A number is a perfect square if it is the square of a natural number. Give the sequence of perfect squares less than or equal to 100.

_____

10. A number is a perfect cube if it is the cube of a natural number. Give the sequence of perfect cubes less than or equal to 1 000.

_____

11. Evaluate the following powers.

a) $2^4 =$ _____ b) $3^2 =$ _____ c) $5^3 =$ _____

d) $7^2 =$ _____ e) $11^0 =$ _____ f) $17^1 =$ _____

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17. Determine the value of a in each case below.

a) $a^3 \times 5 + 3^2 = 49$ _____ b) $5 + 3 \times 2^a = 53$ _____

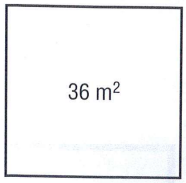
c) $a \times 2^3 + 5^2 = 65$ _____ d) $3^2 + 2 \times a^2 = 107$ _____

e) $5 \times a^2 - 3 \times 2 = 39$ _____ f) $(3 + a^2) \times 5 = 95$ _____

g) $20 - 2 \times 3^a = 2$ _____ h) $3 + 2 \times a^5 = 5$ _____

ACTIVITY 3 Land to fence

Mr. Black wants to put up a fence around his square property. The area of his property is 36 m^2.



a) What measure would enable us to determine the perimeter of the property?

_____

b) If the fence costs \$15 per metre, what will be the total cost to completely fence in Mr. Black's property? _____

SQUARE ROOT

The **square root** of a natural number a is the unique number b, such that b squared is equal to a. The square root of a is denoted: $\sqrt{a}$

Ex.: $\sqrt{25} = 5$ since $5^2 = 25$ $\quad \sqrt{8} \notin \mathbb{N}$

18. Determine the value of the following square roots.

a) $\sqrt{49} =$ _____ b) $\sqrt{81} =$ _____ c) $\sqrt{0} =$ _____

d) $\sqrt{1} =$ _____ e) $\sqrt{100} =$ _____ f) $\sqrt{225} =$ _____

19. Determine the value of the natural number a in each of the following cases.

a) $a^2 = 4$ _____ b) $a^2 = 16$ _____ c) $\sqrt{10\,000} = a$ _____

d) $a = \sqrt{400}$ _____ e) $a^2 = 0$ _____ f) $a^2 = 144$ _____

20. a) Determine the value of each expression below.

1. $(\sqrt{9})^2$ _____ 2. $(\sqrt{25})^2$ _____ 3. $(\sqrt{100})^2$ _____

b) What is the value of $(\sqrt{a})^2$? _____

21. a) Calculate

1. $\sqrt{16} + \sqrt{9} =$ _____ 2. $\sqrt{16+9} =$ _____

b) Fill in the blank with the appropriate symbol = or ≠. $\sqrt{a} + \sqrt{b}$ __ $\sqrt{a+b}$

c) Calculate

1. $\sqrt{16} \times \sqrt{9} =$ _____ 2. $\sqrt{16 \times 9} =$ _____

d) Fill in the blank with the appropriate symbol, = ou ≠. $\sqrt{a} \times \sqrt{b}$ __ $\sqrt{a \times b}$?

e) Calculate $\sqrt{5^2}$ _____

f) If a is a natural number, is it true that $\sqrt{a^2} = a$? _____

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