√ SQUARE ROOTS

4^2 → EXPONENT → THE # OF TIMES THE BASE APPEARS IN THE MULTIPLICATION EXPRESSION

BASE → THE # BEING MULTIPLIED

SQUARE ROOT OF A NUMBER → A # THAT CAN BE MULTIPLIED BY ITSELF TO FIND ORIGINAL NUMBER.

$\sqrt{9}$ → "SQUARE ROOT of 9" → EQUALS 3

THE RADICAL

THE BASE

RADICAL ANSWER

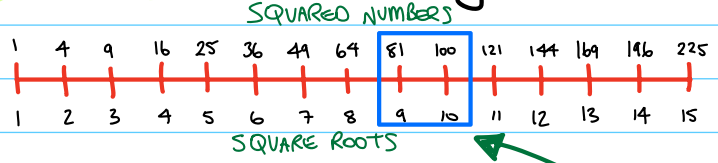
VANS

CAN WE FIND THE SQ. ROOT OF A NEG. NUMBER?

$\sqrt{-9}$ **No** to multiply to (-9) you have (-3)x(3) and those are 2 different (3)x(-3) NUMBERS.

EQUATION	EXPONENT	ANSWER	√ANSWER
1 x 1	1^2	1	$\sqrt{1} = 1$
4 x 4	4^2	16	$\sqrt{16} = 4$

METHOD 1 ESTIMATING SQ. ROOTS



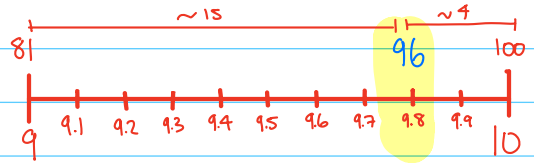
YOU SHOULD KNOW YOUR PERFECT SQUARES FROM 1-15

EX: ESTIMATE $\sqrt{96}$

① WHAT 2 PERFECT SQUARES IS 96 BETWEEN? 81 - 100

SO... THE SQ ROOT WILL BE B/W 9 & 10

(2) WHICH PERFECT SQUARE IS 96 CLOSER TO?



SO... $\sqrt{96} \cong 9.8$

METHOD 2 PRIME FACTORIZATION

FACTOR → A NUMBER THAT DIVIDES ANOTHER NUMBER EVENLY

EX: 12 → 1, 2, 3, 4, 6, 12

PRIME FACTOR → A #, OTHER THAN 1, WHOSE ONLY FACTOR IS 1 AND ITSELF.

- ALL #'s (EXCEPT 1) = 2 FACTORS
- THE FACTOR WILL ALWAYS BE LESS THAN OR EQUAL TO THE #
- 1 IS A FACTOR FOR ALL #'s
- EVERY # IS A FACTOR OF ITSELF.

FACTORS of 30?

1 2 3 5 6 10 15 30 8 FACTORS

FACTORS of 24?

1 2 3 4 6 8 12 24

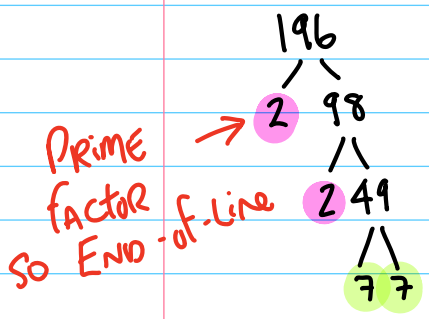
8 FACTORS

FACTORS of 36?

1 2 3 4 6 9 12 18 36 9 FACTORS

FACTORS of 49?

1 7 49 3 FACTORS



(1) BREAK # down into PRIME FACTORS

$2 \times 2 \times 7 \times 7 = 196$

$2^2 \times 7^2 = 196$

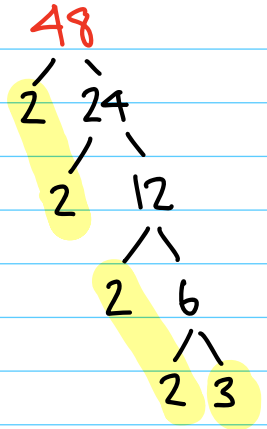
(2) TAKE ONE # FROM EACH SET (OR PAIR) OF PRIME FACTORS AND MULTIPLY.

[IF YOU HAVE 2 2's, TAKE 1 of them. IF YOU HAVE 4 2's, TAKE 2]

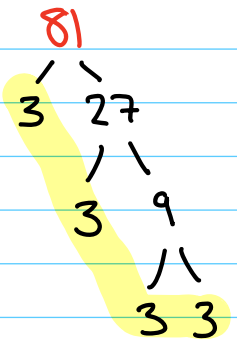
$2 \times 2 \times 7 \times 7 = 196$

$2 \times 7 = \boxed{14}$ → THIS is YOUR SQUARE ROOT

THIS HELPS DETERMINE if A # IS A PERFECT SQUARE



$48 = 2^4 \times 3^1$



$81 = 3^4$

NON-PERFECT SQUARES = ODD EXPONENTS

PERFECT SQUARES = EVEN EXPONENTS