

FACTORS

FACTOR → A # THAT EXACTLY DIVIDES THE GIVEN NUMBER

OR
A # THAT YOU CAN MULTIPLY TO GET THE GIVEN #

EX: 12 → 1, 2, 3, 4, 6, 12

- 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

ALL PERFECT SQUARES HAVE AN ODD NUMBER OF FACTORS.

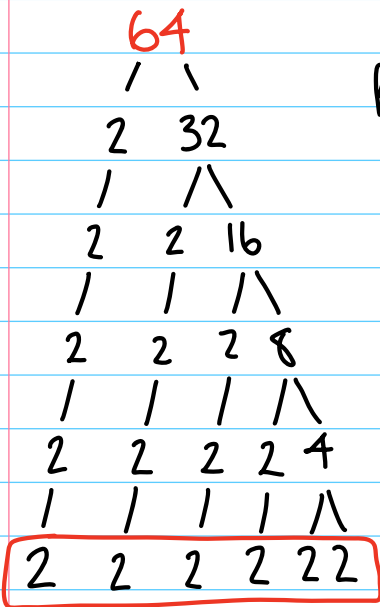
ALL NON-PERFECT SQUARES HAVE AN EVEN NUMBER OF FACTORS.

→ THE # IN THE MIDDLE OF THE "RAINBOW" IS THE SQ ROOT.

36: 1 2 3 4 6 9 12 18 36

$$\sqrt{36} = 6$$

PRIME FACTORIZATION: A # WRITTEN AS THE PRODUCT OF ITS PRIME FACTORS.
↳ of 36: $2^2 \times 3^2$



WE CAN FIND THE SQUARE ROOT OF A PERFECT # USING PRIME FACTORIZATION.

$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$

OR...
 $(2 \times 2) \times (2 \times 2) \times (2 \times 2)$

OR...
 $64 = 2^2 \times 2^2 \times 2^2$

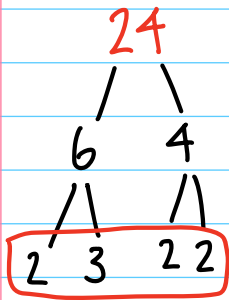
OKAY... BUT HOW DOES THIS HELP ME W/ THE $\sqrt{\quad}$ ROOT?

TAKE 1 # FROM EACH PRIME FACTOR PAIR.

$\sqrt{64} = 2 \times 2 \times 2 = 8$

REALLY? OKAY, PROVE IT!!

ALL PRIME FACTORS MUST HAVE A PAIR OR ELSE THE # IS NOT PERFECT & THERE IS NO WHOLE # SQ. ROOT.



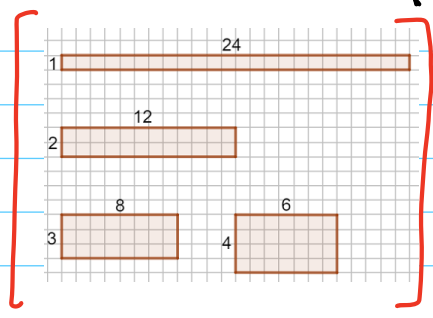
$24 = 2 \times 3 \times 2 \times 2$

OR...
 $2 \times 3 \times 2^2$
 OR
 3×2^3

NO PAIRS FOR ALL PRIME FACTORS.

→ 24 IS NOT A PERFECT #

NO MATTER THE COMBINATION, YOU CANNOT MAKE A SQUARE W/ EQUAL SIDE LENGTHS AND HAVE AN AREA OF 24.



PROVEN VISUALLY

$$\begin{array}{r}
 784 \\
 \swarrow \quad \searrow \\
 4 \quad 196 \\
 \swarrow \quad \searrow \quad \swarrow \quad \searrow \\
 2 \ 2 \quad 4 \ 49 \\
 \swarrow \quad \searrow \quad \swarrow \quad \searrow \\
 2 \ 2 \quad 2 \ 2 \quad 7 \ 7
 \end{array}$$

$$\begin{aligned}
 784 &= \underbrace{2 \times 2} \times \underbrace{2 \times 2} \times \underbrace{7 \times 7} \\
 &= 2^2 \times 2^2 \times 7^2
 \end{aligned}$$

So... THE SQ. ROOT of
784 is...

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

$$\boxed{\sqrt{784} = 28}$$