VIRTUAL NUMBER ATOMS

~~#~~ $\emptyset, 1, 3$ SYMBOLS

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(I GOT A LOT OF HELP IN SMATH, DISCORD) DISCORD SMATH

IF EACH VIRTUAL PARTICLE (NUMBER) HAD A 'MASS'

LETS THINK OF THIS (BEAR_W_TA_TK DISCORD)

TRIANGLE WITH VERTICES $z_1, z_2, z_3 \in \mathbb{C}$

IF  SHOW:

$$\underbrace{z_1^2 + z_2^2 + z_3^2}_{\boxed{\text{LHS}}} = \underbrace{z_1 z_2 + z_2 z_3 + z_1 z_3}_{\boxed{\text{RHS}}}$$

$$\boxed{\sum_{n=1}^{m} z_n^2 = E} \qquad \boxed{E = mc^2}$$

GENERALIZE FOR ~~...~~ m-gon

$$\boxed{z_n = c + r\zeta^{n-1}} \quad m\text{-gon}$$

$c, r \in \mathbb{C}$ (COMPLEX CONSTANTS / VARIABLES)

$$\boxed{c = |c|e^{i\theta_c} = c_r + ic_i} \qquad \boxed{\zeta = e^{\frac{2\pi i}{m}}}$$

AND $\zeta^{~~max~~} = e^{i\frac{2\pi}{n}} = e^{i\frac{2\pi}{m}}$

$n \in \mathbb{N} \to 1, 2, 3, \dots, m$

$\boxed{\text{LHS}}$ $$\sum_{n=1}^{m} z_n^2 = \sum_{n=1}^{m}\left(c^2 + 2cr\zeta^{n-1} + r^2\zeta^{2n-2}\right)$$

$$= mc^2 + 2cr\left(\zeta^0 + \zeta^1 + \zeta^2 + \dots + \zeta^{m-1}\right) + \dots$$

$$\dots r^2\left(\zeta^0 + \zeta^2 + \zeta^4 + \dots + \zeta^{2m-2}\right)$$

$$\sum_{n=1}^{m} z_n^2 = mc^2 + 2cr\underbrace{\sum_{k=0}^{m-1}\zeta^k} + \underbrace{r^2\sum_{k=0}^{m-1}\zeta^{2k}}$$

USING SYMMETRY YOU SEE BOTH SUMS OF ROOTS OF UNITY ARE ZERO $\to \boxed{\sum_{n=1}^{m} z_n^2 = mc^2}$

$\boxed{\text{RHS}}$ $$\sum_{n=1}^{m} z_n z_{n+1}$$

NOTE THAT $z_{m+1} = z_1$

$z_n = c + r\zeta^{n-1}$

$z_{n+1} = c + r\zeta^{n}$

$$\sum_{n=1}^{m} z_n z_{n+1} = \sum_{n=1}^{m} (c + r\xi^{n-1})(c + r\xi^{n})$$

$$= \sum_{n=1}^{m} (c^2 + cr\xi^{n} + cr\xi^{n-1} + r^2\xi^{2n-1})$$

$$= \sum_{n=1}^{m} (c^2 + cr\xi^{n-1}(\xi+1) + r^2\xi^{2n-1}$$

SO

$$\sum_{n=1}^{m} z_n z_{n+1} = mc^2 + \sum_{n=1}^{m} (cr\xi^{n-1}(\xi+1) + r^2\xi^{2n-1})$$

$$= mc^2 + cr(\xi+1)(\xi^0 + \xi^1 + \xi^2 + \dots + \xi^{m-1}) + \dots$$

$$\dots + r^2(\xi^1 + \xi^3 + \xi^5 + \dots + \xi^{2m-1})$$

$$\sum_{n=1}^{m} z_n z_{n+1} = mc^2 + \underbrace{cr(\xi+1)\sum_{k=0}^{m-1}\xi^k}_{\sum_k \xi^k = 0} + \underbrace{r^2\sum_{k=1}^{m}\xi^{2k-1}}_{\sum_k \xi^k = 0}$$

AGAIN YOU CAN CHECK
BY SYMMETRY THAT
THIS EQUMS OF
ROOTS OF UNITY
ARE ZERO

SO RHS IS:

$$\boxed{\sum_{n=1}^{m} z_n z_{n+1} = mc^2} \rightarrow$$

SO IF m COMPLEX NUMBERS FORM AN m-gon, IN COUNTER-CLOCKWISE ORDER THEY SATISFY A

$$E = \sum_{n=1}^{m} z_n$$

$$\boxed{E = mc^2}$$

$$\sum_{n=1}^{m} z_n^2 = \sum_{n=1}^{m} z_n \cdot z_{n+1} \quad \text{A}$$

SO IF m NUMBERS ARE USED AS A DISCRETE TIME INDEX, AND EACH NUMBER IS THOUGHT OF AS A 'MONAD' OR FUNDAMENTAL PARTICLE WITH A PROPERTY WE CAN CALL 'MASS'

WE ARRIVE TO THE FAMOUS $\boxed{E = mc^2}$ FOR NUMBERS (BEING c A COMPLEX ~~[illegible]~~ CONSTANT/VARIABLE)
? ?

$$\boxed{E = \sum_{n=1}^{m} z_n^2}$$

$m \in \mathbb{N}$

$c, z_n \in \mathbb{C}$

$$\boxed{\begin{aligned} c &= |c| e^{j\varphi_c} \\ z_n &= |z_n| e^{j\varphi_{z_n}} \end{aligned}}$$

$$\boxed{f = e^{\frac{2\pi i}{m}}}$$