Me and Anthony were talking about it and we came up with some conditions on the existence of non-degenerate (bilinear) semi-inner products (where a semi-inner product is defined as an inner product minus the condition of non-negativity because it makes no sense) in $\mathbb{F}_p \cong \mathbb{Z}/p\mathbb{Z}$ for prime p.
Let V be a vector space over $\mathbb{F}_p$ with $n := \dim(V)$.
Assume there exists semi-inner product $\langle \cdot, \cdot \rangle : V \times V \to \mathbb{F}$
We can still construct an orthonormal basis of the vector space $\mathcal{L}$ without nonnegativity.
Then consider $\langle x, x \rangle$ for $x = \sum_{i=1}^{n} \alpha_i \mathcal{L}_i$

$$\begin{aligned} \langle x, x \rangle &= \sum_{i=1}^{n} \sum_{j=1}^{n} \alpha_i \alpha_j \langle \mathcal{L}_i, \mathcal{L}_j \rangle \\ &= \sum_{i=1}^{n} \alpha_i^2 \end{aligned}$$

Thus it's degenerate if (letting S be the set of quadratic residues in the field) there exists a list $\mathcal{J} \subseteq S$ with $|\mathcal{J}| \leq d$ and $\sum_{i=1}^{|\mathcal{J}|} \mathcal{J}_i \equiv 0 \pmod{p}$.
In any dimension greater than or equal to the modulus it is trivially degenerate, let all coefficients be the additive identity.
Additionally in $\dim(V) = 1$ it is never degenerate,gbecause this would mean $\exists a \neq 0, a^2 = 0$, which contradicts the existence of modular multiplicative inverses.
Using Lagrange's four square theorem we see that $\forall p \in \mathbb{N}, \exists a, b, c, d \in \mathbb{N}$

$$p = a^2 + b^2 + c^2 + d^2$$

Thus, $0 \equiv a^2 + b^2 + c^2 + d^2 \pmod{p}$, and it's degenerate in $\deg(V) \geq 4$
Thus we can only be nondegenerate if our dimension is less than or equal to 3, we now look at Legendre's three square theorem, which states that $\neg \exists a, b \in \mathbb{N}, p = 4^a(8b + 7) \Leftrightarrow p = \exists x, y, z \in \mathbb{N}, x^2 + y^2 + z^2$, this condition is equivalent by irreducability of p to $p \equiv 7 \pmod{8}$, so if that is the case then it becomes degenerate in $\dim(V) \geq 3$.
In $\dim(V) = 2$, we have that they are degenerate if and only if the modulus is a pythagoren triple.
Its trivial to see that the latter implies the former.
We have by Fermat's theorem on sums of squares that the latter for a prime is equivalent to $p \equiv 1 \pmod{4}$.
Thus we only need to prove $p \not\equiv 1 \pmod{4}$, obviously the only possibility is $p \equiv 3 \pmod{4}$.
Consider, using Euler's criterion

$$a^{(p-1)/2} - (p - a)^{(p-1)/2}$$

This will be congruent to 0 if a and $p - a$ are both quadratic residues, but we have that

$$(p - a)^{(p-1)/2} \equiv (-a)^{(p-1)/2} \equiv -a^{(p-1)/2}$$

Thus they cannot both be quadratic residues and it's nondegenerate.