1. Suppose $V \subset \mathbb{R}^n$ is a collection of vectors such that

$$2\,\frac{v \cdot w}{v \cdot v} \in \mathbb{Z}$$

for all elements $v, w \in V$. *($\mathbb{Z}$ denotes the integers; $\cdot$ denotes the usual dot product.)*

(a) What are the possible angles between v and w?

(b) What are the possible ratios of $|v|$ to $|w|$?
You may assume $|v| \leq |w|$.