Let F be a non-archimedean linearly ordered field, and C and H be the field of complex numbers and the division algebra of quaternions over F, respectively. In this paper, a class of directed partial orders on C are constructed directly and concretely using additive subgroup of F^+. This class of directed partial orders includes those given in Rump and Wang (J. Algebra **400**, 1–7, 2014), and Yang (J. Algebra **295**(2), 452–457, 2006) as special cases and we conjecture that it covers all directed partial orders on C such that $1 > 0$. It turns out that this construction also works very well on H. We note that none of these directed partial orders is a lattice order on C or H.