Let $G = U(20) = \{1, 3, 7, 9, 11, 13, 17, 19\}$ and $H = \{1, 9\}$.

1. Find all the left and right cosets of H.
2. For what values of a is $aH = H$?
3. For what values of a is aH a subgroup of G?
4. For what values of a and b is $aH \bigcap bH \neq \emptyset$? In those cases, what is $aH \bigcap bH$?

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