1. Find all generators of the cyclic group $G = \langle g \rangle$ if:

   (a) $|g| = 5$ (b) $|g| = 10$ (c) $|G| = 16$ (d) $|G| = 20$

2. Find all generators of:

   (a) $\mathbb{Z}_5$ (b) $\mathbb{Z}_{10}$ (c) $\mathbb{Z}_{16}$ (d) $\mathbb{Z}_{20}$

3. In each case determine whether G is cyclic.

   (a) $G = U(7)$ (b) $G = U(12)$ (c) $G = U(16)$ (d) $G = U(11)$

4. Let $|g| = 20$ in a group G. Compute:

   (a) $|g^2|$ (b) $|g^8|$ (c) $|g^5|$ (d) $|g^3|$

5. In each case find all the subgroups of $G = \langle g \rangle$ and draw the lattice diagram.

   (a) $|g| = 8$ (b) $|g| = 10$ (c) $|g| = 18$

   (d) $|g| = p^3$, where p is prime.

   (e) $|g| = pq$, where p and q are distinct primes.

   (f) $|g| = p^2q$, where p and q are distinct primes.

6. In each case, find the subgroup $H = \langle x, y \rangle$ of G.

   (a) $G = \langle a \rangle$ is cyclic, $x = a^4$, $y = a^3$.

   (b) $G = \langle a \rangle$ is cyclic, $x = a^6$, $y = a^8$.

   (c) $G = \langle a \rangle$ is cyclic, $x = a^m$, $y = a^k$, $\gcd(m, k) = d$.

   (d) $G = S(3)$, $x = (1, 2)$, $y = (2, 3)$.