1. Let $\phi(n) = 2n$. Then ϕ is onto since the even integer $2n$ is the image of n. ϕ is one-to-one since $2m = 2n$ implies that $m = n$. $\phi(m+n) = 2(m+n) = 2m+2n$ so ϕ is operation preserving.

4. $U(8)$ is not cyclic while $U(10)$ is.

5. Define ϕ from $U(8)$ to $U(12)$ by $\phi(1) = 1$; $\phi(3) = 5$; $\phi(5) = 7$; $\phi(7) = 11$. To see that ϕ is operation preserving we observe that
$\phi(1a) = \phi(a) = \phi(a) \cdot 1 = \phi(a)\phi(1)$ for all a;
$\phi(3 \cdot 5) = \phi(7) = 11 = 5 \cdot 7 = \phi(3)\phi(5)$;
$\phi(3 \cdot 7) = \phi(5) = 7 = 5 \cdot 11 = \phi(3)\phi(7)$;
$\phi(5 \cdot 7) = \phi(3) = 5 = 7 \cdot 11 = \phi(5)\phi(7)$.

6. If β is an isomorphism from G onto H, and α is an isomorphism from H onto K, then $\alpha\beta$ is an isomorphism from G onto K. That $\alpha\beta$ is one-to-one and onto is done in Theorem 0.7. If $a, b \in G$, then $(\alpha\beta)(ab) = \alpha(\beta(ab)) = \alpha(\beta(a)\beta(b)) = \alpha(\beta(a))\alpha(\beta(b)) = (\alpha\beta)(a)(\alpha\beta)(b)$.

20. Observe that $\langle 2\rangle, \langle 3\rangle, \ldots$ are distinct and each is isomorphic to Z.