Recall from last Friday:

Definition: A **homomorphism** from a group (G, *) to a group (\bar{G}, \odot) is a function $\phi : G \to \bar{G}$ that preserves the group operation. That is,

$$\phi(a*b) = \phi(a) \odot \phi(b).$$

Definition: An **isomorphism** from a group (G, *) to a group (\bar{G}, \odot) is a one-to-one and onto function $\phi : G \to \bar{G}$ that preserves the group action. That is,

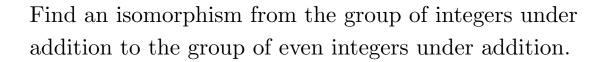
$$\phi$$
 is 1-1, ϕ is onto, and $\phi(a*b) = \phi(a) \odot \phi(b)$.

If an isomorphism from G to \bar{G} (any isomorphism) exists, then we say that G and \bar{G} are **isomorphic** and denote this by $G \approx \bar{G}$.

As an example of an isomorphism, we constructed the canonical isomorphism from a cyclic group $\langle a \rangle$ of order 5 and \mathbb{Z}_5 :

$$\phi : \langle a \rangle \to \mathbb{Z}_5 \text{ by } \phi(a^k) = k.$$

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Show that U(8) is not isomorphic to U(10), but is isomorphic to U(12).

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