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Foundations Presentation

A $\{1,2,3\}$ B $\{4,5,6\}$

$f: A \to B = \{(1,4),(2,5),(3,6)\}$

$g: A \to B = \{(1,5),(2,6),(3,4)\}$

$h: A \to B = \{(1,6),(2,4),(3,5)\}$

$i: A \to B = \{(1,4),(2,6),(3,5)\}$

$j: A \to B = \{(1,5),(2,4),(3,6)\}$

$k: A \to B = \{(1,6),(2,5),(3,4)\}$

$S = \{f, g, h, i, j, k, l\}$

#4 Proof: First, we need $\sim$ to be reflexive, in other words, we need $f \sim f$ for any $f \in S$. For $f \sim f$, f would have to reverse the same number of orientations as f, which it does so $f \sim f$ and $\sim$ is reflexive. Next, let $f \sim g$ for any $f, g \in S$. Then f reverses the same number of orientations as g, so clearly $g \sim f$ and $\sim$ is symmetric. Finally, let $f \sim g$ and $g \sim h$ with $f, g, h \in S$. Since $f \sim g$, f and g reverse the same number of orientations. Also, g and h reverse the same number of orientations. Since f and g reverse the same number of orientations and g and h reverse the same number of orientations, f and h reverse the

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same number of orientations. Thus $f \sim h$ and $\sim$ is transitive. Now, we have $\sim$ reflexive, symmetric, and transitive, so $\sim$ is an equivalence relation. $\square$

Equivalence Classes:

0 reversals $\to$ $\{(1,4), (2,5), (3,6)\}$

1 reversal $\to$ $\{(1,4), (2,6), (3,5)\}$
$\{(1,5), (2,4), (3,6)\}$

2 reversals $\to$ $\{(1,5), (2,6), (3,4)\}$
$\{(1,6), (2,4), (3,5)\}$

3 reversals $\to$ $\{(1,6), (2,5), (3,4)\}$