

Lab 1. Using symmetry to uncover a group

■ Evaluate initialization cells, if not done upon opening

■ Notes regarding this lab

This lab is intended to supplement an abstract algebra course. It is part of a series of labs and packages under the name *Exploring Abstract Algebra with Mathematica*, a joint project by Al Hibbard (Central College) and Ken Levasseur (UMass-Lowell).

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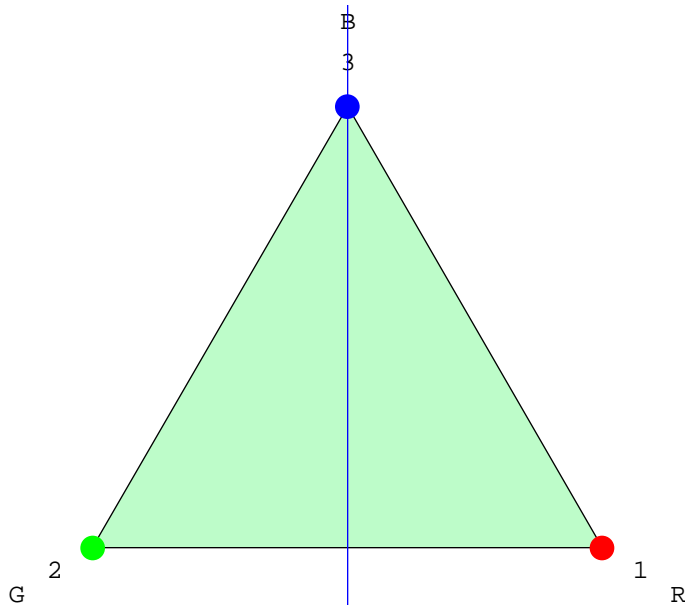
August 7, 1996

■ Goals for this lab

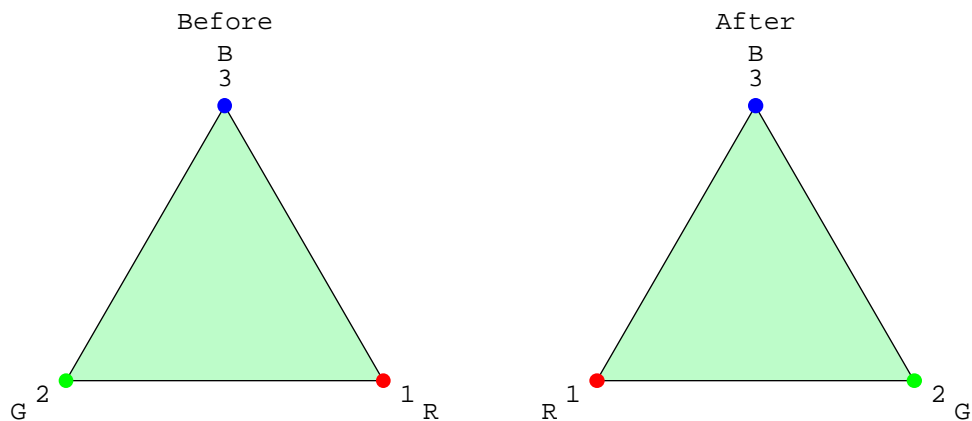
In this lab, we will try to discover the properties of a group by considering a regular n -gon.

■ A symmetry of an equilateral triangle

```
Show[ShowFigure[3,{1,2,3},"D"],
      Epilog->{Blue,
              Line[{{0,-1.5},{0,2.0}}]}];
```



```
ShowPermutation[{{1->2},{2->1},
                 {3->3}}]
```



The figure on the left represents the original figure and the one on the right reflects the effect of the transformation determined by the permutation.

- Are there other symmetries?

- Multiplying our transformations

```
MultiplyPermutations[{2, 3, 1},  
  {{1->2}, {2->1}, {3->3}}]  
{3, 2, 1}
```

- Are there any commutators?

- Is it always bad to be closed-minded?

- We should try to find our identity

- Is it perverse to not have an inverse?

- Should we associate together?

- What else?

- Let's group it all together