

On the GAP Graph Package

GAP (Groups, Algorithms and Programming) is a system for computational discrete algebra (with particular emphasis on computational group theory). We shall give a brief introduction to programming in GAP. Then, we shall present several examples, demonstrating the abilities of the graph package to perform graph computations. (Click here for more on GAP.)

The following simple code computes the diameter of the commuting graph of S_n . (It returns -1 if the graph is not connected.) Recall that the *commuting graph* of a group G is the graph on the vertex set $G - \{1\}$, where $\{x, y\}$ is an edge if $xy = yx$.

```
RequirePackage("grape");

commuting:=function(x,y)
  return x<>y and x*y=y*x;
end;

commutinggraph:=function(n)
  local g, v, gamma;
  g:=SymmetricGroup(n);
  v:=AsSet(g);
  v:=Difference(v, [(1)]);
  gamma:=Graph(g, v, OnPoints, commuting);
  return gamma;
end;

Solution1:=function(n)
  return Diameter(commutinggraph(n));
end;
```