Define the symmetric group on 4 letters as AgGroup.

```
gap> G := SymmetricGroup( AgWords, 4 );
Group( g1, g2, g3, g4 )

gap> IsAgGroup(G);
true

gap> IsFpGroup(G);
false

gap> F := FpGroup(G);
Group( g1, g2, g3, g4 )
```

Generators and Relators:

```
gap> F.generators;
[ g1, g2, g3, g4 ]

gap> G.generators;
[ g1, g2, g3, g4 ]

gap> F.generators = G.generators;
false

gap> F.relators;
[ g1^2, g2^3, g3^2, g4^2,
  g2^-1*g1^-1*g2*g1*g2^-1,
  g3^-1*g1^-1*g3*g1*g4^-1,
  g4^-1*g1^-1*g4*g1,
  g3^-1*g2^-1*g3*g2*g4^-1,
  g4^-1*g2^-1*g4*g2*g4^-1*g3^-1,
  g4^-1*g3^-1*g4*g3 ]

gap> G.relators;
Error, Record: element 'relators' must have an assigned value
```

Multiplication in F and in G:

```
gap> f := F.generators;;

gap> a := f[1]*f[2]*f[3]*f[4];
g1*g2*g3*g4

gap> b := f[4]*f[1];
g4*g1

gap> a*b;
g1*g2*g3*g4^2*g1


gap> g := G.generators;;

gap> a := g[1]*g[2]*g[3]*g[4];
g1*g2*g3*g4

gap> b := g[4]*g[1];
g1*g4

gap> a * b;
g2^2*g3*g4
```

Igs and Cgs:

```
gap> U := Subgroup( G, [a,b] );
Subgroup( Group( g1, g2, g3, g4 ), [ g1*g2*g3*g4, g1*g4 ] )

gap> Igs(U);
[ g1*g4, g2^2*g3*g4 ]

gap> Size(U);
6

gap> Cgs(U);
[ g1*g4, g2*g4 ]
```

All subgroups at once:

```
gap> cls := ConjugacyClassesSubgroups( G );;

gap> List(cls, Representative);
[ Subgroup( Group( g1, g2, g3, g4 ), [  ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g4 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g1 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g2 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g4, g3 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g4, g1 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g4, g1*g3 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g2, g1 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g4, g3, g1 ] ),
  Subgroup( Group( g1, g2, g3, g4 ), [ g4, g3, g2 ] ),
  Group( g1, g2, g3, g4 ) ]

gap> List(last, Cgs);
[ [  ], [ g4 ], [ g1 ], [ g2 ], [ g3, g4 ], [ g1, g4 ],
  [ g1*g3, g4 ], [ g1, g2 ], [ g1, g3, g4 ],
  [ g2, g3, g4 ], [ g1, g2, g3, g4 ] ]
```

A larger example : B(2,6)

```
gap> Read("/home/eick/gap/groups/b26.g");
A group of order 2274423042394376 11008 will be defined.
A group of order 2274423042394376 11008 has been defined.
It is called b26

gap> S := SpecialAgGroup(b26);
Group( g1, g2, g3, g4, g5, g6, g7, g8, g9, g10, g11, g12,
g13, g14, g15, g16, g17, g18, g19, g20, g21, g22, g23,
g24, g25, g26, g27, g28, g29, g30, g31, g32, g33, g34,
g35, g36, g37, g38, g39, g40, g41, g42, g43, g44, g45,
g46, g47, g48, g49, g50, g51, g52, g53 )

gap> S.name := "S";;

gap> Size(S);
227442304239437611008

gap> S.first;
[ 1, 3, 5, 6, 32, 44, 53, 54 ]
```

The Frattini subgroup and the centre:

```
gap> F := FrattiniSubgroup(S);
Subgroup( S, [ g35, g36, g37, g38, g39, g40, g41, g42, g43,
               g44, g45, g46, g47, g48, g49, g50, g51, g52,
               g53 ] )

gap> IsAbelian(F);
true

gap> IsElementaryAbelian(F);
true

gap> Collected(Factors(Size(F)));
[ [ 3, 19 ] ]

gap> Centre(S);
Subgroup( S, [ g53 ] )
```

A Sylow System:

```
gap> SylowSystem(S);
rec(
  primes := [ 2, 3 ],
  sylowSubgroups :=
   [ Subgroup( S,
        [ g1, g2, g6, g7, g8, g9, g10, g11, g12, g13, g14,
          g15, g16, g17, g18, g19, g20, g21, g22, g23,
          g24, g25, g26, g27, g28, g29, g30, g31 ] ),
     Subgroup( S,
        [ g3, g4, g5, g32, g33, g34, g35, g36, g37, g38,
          g39, g40, g41, g42, g43, g44, g45, g46, g47, g48,
          g49, g50, g51, g52, g53 ] )
     ],
  sylowComplements :=
   [ Subgroup( S,
        [ g3, g4, g5, g32, g33, g34, g35, g36, g37, g38,
          g39, g40, g41, g42, g43, g44, g45, g46, g47,
          g48, g49, g50, g51, g52, g53 ] ),
      Subgroup( S,
        [ g1, g2, g6, g7, g8, g9, g10, g11, g12, g13,
          g14, g15, g16, g17, g18, g19, g20, g21, g22,
          g23, g24, g25, g26, g27, g28, g29, g30, g31 ] ) ] )

gap> Syl := last.sylowSubgroups;;

gap> List(Syl, IsAbelian);
[ true, false ]
```

The maximal subgroups:

```
gap> max := ConjugacyClassesMaximalSubgroups(S);;

gap> Length(max);
35

gap> max := List(max, Representative);;

gap> List(max, x -> IsNormal(S,x));
[ true, true, true, true, true, true, true, false,
  false, false, false, false, false, false, false,
  false, false, false, false, false, false, false,
  false, false, false, false, false, false, false,
  false, false, false, false, false, false ]

gap> List(max, x -> Index(S,x));
[ 2, 2, 2, 3, 3, 3, 3, 4, 64, 4, 64, 64, 64, 64, 64,
  64, 64, 64, 64, 64, 64, 64, 64, 64, 64, 64, 64, 64,
  64, 4, 64, 4, 3, 3, 3 ]
```