

Problems from our text:

- 14.10
- 14.21
- 14.23
- 15.11
- 16.14

More problems:

1. Use (the proof of) Cayley's theorem, Theorem 15.6, to realize U_8 as a subgroup of a symmetric group.
2. Prove Proposition 16.13. Note there is a typo in part (1): g should be a .
3. Fix an integer $n > 1$, and let k be an integer with $1 < k < n$. When is the function $x \mapsto x^k$ a permutation of S_n ? Use Sage to look for patterns. (I don't know the answer.) Find the smallest n for which there exists a nonprime k giving an permutation. (By "permutation of S_n " I mean a bijection of S_n with itself.)

Here is some useful Sage code:

```
sage: def f(x,n):
.....:     return x^n
.....:
```

(The dots will be provided by Sage automatically. Note the semicolon.)

```
sage: x = [i^2 for i in SymmetricGroup(4)]
sage: len(x)
24
sage: x = set(x)
sage: len(x)          # note: x originally had repeats
12
```