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and consider the action of conjugation  
by  $G$  on  $H_i$ .

$$|G| = |\text{Stab } H_i| \times |\text{Orb } H_i|$$

But all the Sylow 13 subgroups  
are conjugate. There are 53 such subgroups

$$\therefore |\text{Stab } H_i| = \frac{|G|}{|\text{Orb } H_i|} = \frac{689}{53} = 13 \checkmark$$

?  $|\text{Stab } H_i| \leq |H_i|$  since  $H_i$  is a subgroup  
of  $G$ , but  $|H_i| = 13 \therefore \text{Stab } H_i = H_i$  for  
each Sylow 13-subgroup

You need to show that  $H_i \subseteq \text{Stab } H_i$

and then you have that  $\text{Stab } H_i = H_i$ .

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