

UW Math Circle

Homework

1. Thorin has declared that Dwalin, Balin, Bifur, Bofur, Oin, and Gloin each are to be sent to a dominion to watch over the treasure hordes there. The dominions that need a guard are Belegos, Glittering Caves, Iron Hills, Nogrod, Gundabad and Dunland. Each dwarf has rated the dominions in descending order of preference and the current residents of each dominion have also rated the dwarves in descending order of preference. For example, Dwalin most prefers Dunland and least prefers Gundabad. You may assume that the happiness associated to each rating is the same for each dwarf and dominion. Where should each dwarf go to maximize everyone's happiness? How did you decide this?

Dwalin	Balin	Bifur	Bofur	Oin	Gloin
Dunland	Glittering Caves	Dunland	Gundabad	Glittering Caves	Iron Hills
Iron Hills	Gundabad	Nogrod	Iron Hills	Iron Hills	Belegos
Nogrod	Nogrod	Belegos	Glittering Caves	Gundabad	Nogrod
Belegos	Iron Hills	Iron Hills	Belegos	Dunland	Gundabad
Glittering Caves	Belegos	Glittering Caves	Nogrod	Belegos	Dunland
Gundabad	Dunland	Gundabad	Dunland	Nogrod	Glittering Caves
Belegos	Glittering Caves	Iron Hills	Nogrod	Gundabad	Dunland
Bifur	Dwalin	Gloin	Oin	Bifur	Bofur
Oin	Bofur	Bofur	Bifur	Bofur	Gloin
Dwalin	Balin	Oin	Bofur	Oin	Dwalin
Balin	Bifur	Balin	Dwalin	Gloin	Balin
Gloin	Gloin	Bifur	Gloin	Balin	Oin
Bofur	Oin	Dwalin	Balin	Dwalin	Bifur