MATHCOUNTS 2021–2022 Handbook Poster Solution

There are four possible colors—gold, purple, red, blue. Therefore, there are $_4C_2 = 4!/(2! \times [4-2]!) = 4!/(2! \times 2!) = (4 \times 3)/2 = 12/2 =$ 6 outcomes for a two-color phoenix. If each outcome was equally likely, the probability of each occurring would be 1/6. However, since red-gold is twice as likely as every other outcome, we can think of this as 7 equally likely outcomes, 2 of which are red-gold. They are blue-red, blue-purple, red-purple, blue-gold, purple-gold, red-gold, red-gold. Thus, the probability of a red-gold phoenix is 2/7, while the probability of every other two-color phoenix, including purple-gold, is **1/7**.