

## MATHCOUNTS 2021–2022 Handbook Poster Solution



**MATHCOUNTS®**

Two-color phoenixes can be any combination of *gold*, *purple*, *red* or *blue*.

If *red-gold* is twice as likely as every other combination, what is the probability of a *purple-gold* phoenix?

[www.mathcounts.org](http://www.mathcounts.org)

GET THE SOLUTION AT [WWW.MATHCOUNTS.ORG/POSTER](http://WWW.MATHCOUNTS.ORG/POSTER)

Title Sponsors: Raytheon Technologies, U.S. Department of Defense STEM  
Lead Sponsor: Northrop Grumman Foundation  
National Sponsors: National Society of Professional Engineers, 3Mgives, Texas Instruments Incorporated, Art of Problem Solving  
Founding Sponsors: National Society of Professional Engineers, National Council of Teachers of Mathematics, CNA Insurance

There are four possible colors—gold, purple, red, blue. Therefore, there are  ${}_4C_2 = \frac{4!}{(2! \times [4-2]!)} = \frac{4!}{(2! \times 2!)} = \frac{(4 \times 3)}{2} = 12/2 = 6$  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  $1/7$ .