# **Beautiful Mind**

Abacus 2017 - Solutions

1. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMSUJsY3BjX1VmdzA)
2. The answer is 127th Catalan number. [Code](https://drive.google.com/file/d/0Bwtyi5pJCHMMcmVXSmt3MEFYU00/view?usp=sharing)
3. The answer is 7 times the probability of one color being present in chosen 15 gems which is (1 - probability of the color not being present). [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMaXhuS1BCQ0J3YjA)
4. [Code](https://drive.google.com/file/d/0Bwtyi5pJCHMMMlNtcE9CX1JQRHc/view?usp=sharing)
5. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMMUI2elVmQ2FZLU0)
6. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMV0FPalBaeDNIX0U)
7. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMcGt0VFRLdU9oMmc)
8. In a graph, sum of degree of each node equals twice the number of edges. Therefore number of nodes = 145 \* 2 / 5 = 58
9. Let pn denote the average number of picks required to clear out a bag with n coupons initially. After a pick, the leftover coupons may range between 0 and n-1. Each possibility is equally likely. Therefore,  
    pn = 1 + 1/n \* 0 <= k < n pkTrivially, p0 = 0. p1 = 1.  
    pn+1 = 1 + 1/(n+1) \* ∑0 <= k < n+1 pk  
    pn+1 = 1 + pn /(n+1) + 1/(n+1) \* ∑0 <= k < n pk  
    pn+1 = 1 + pn /(n+1) + n/(n+1) \* 1/n \* ∑0 <= k < n pk  
    pn+1 = 1 + pn /(n+1) + n/(n+1) \* (pn -1)  
    pn+1 = pn + 1/(n+1)  
   Therefore, pn = 1 + ½ + ⅓ +¼ + … + 1/n. Compute for 10 ^ 5. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMeVpPR0ZWaXZoRmM)
10. [Reference](https://en.wikipedia.org/wiki/Fibonacci_number#Relation_to_the_golden_ratio). [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMMEI1SmFheWFZVGs)
11. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMVGM3NjFCejJYdTg)
12. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMOEZLUjNIalc4MzQ)
13. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMQ0JsMHlmQjd0T3M)
14. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMRUZZOUR4YzJ0MG8)
15. Simple Logic
16. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMQjlXSUI2cHhGUlE)
17. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMS0E1dG8wYnFCODg)
18. Self-explanatory
19. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMSVYzd3JoT2ZCNHM)
20. [Code](https://drive.google.com/open?id=0Bwtyi5pJCHMMS1VPeVRoSmZCOWc)