MATH 345 - Spring '15

Problem Sets

1. Due February 16: Pages 20—25 numbers - 2, 4(a), 16, 17, 32, 38
   For $n = 4, 5$ calculate the number of ways of returning n hats to n people so that each person is wearing the wrong hat. In each case calculate the ratio of this number and $n!$.

   Also do: 4(b), 8, 15, 18, 34, 40.

2. Due February 25: Pages 60—68 numbers 2, 7, 19, 29, 39

   Also do 21, 28, 38, 45, 51, 53

3. Due March 6: Pages 82—85 numbers 4, 18, 20, 27
   Problem: Show that the theorem of Erdős and Szekeres is "sharp" for $n = 4$. That is, show that you can arrange, say, the first 16 positive integers in such a way so that there is neither an increasing subsequence of length 5 nor a decreasing subsequence of length 5. Can you generalize your arrangement for all n?

   Also do 5, 15, 22, 25, 28

4. Exam on March 12

5. Due March 20(?): Pages 153—160 numbers 15, 25, 28, 44

   Also do 13, 16, 22, 35, 40, 47 Note that in this section there are numerous typos, including in problems 26, 44 and 45. I haven't assigned these, but you can find the typos in the errata sheet handed out earlier or you can try finding them yourself!

6. Due **Tuesday** April 7: Pages 200-205 - 7, 10, 11, 16, 24(a), 31

   Also do - 2, 3, 9, 12, 15, 17, 21, 22, 23 (for last identity, can you give a combinatorial proof as well?), 26, 29

7. Due April 15: Pages 257–264 1(a), 1(d), 8, 33, 45

   Also do 2, 11, 43

8. EXAM on April 16, 7:30–9:30pm (in our usual location)

9. Due April 24: Pages 257–264 14 (a)-(c), 38(e) (the Tower of Hanoi recurrence relation)

   Also do 9, 16, 28, 48(b), 48 (c)

10. (**Now**) Due May 4: Pages 388 – 394 numbers 20, 28, 32, 42, 52.
    Prove that Fisher's inequality holds in the case that $\lambda = 1$ without using linear algebra. (Hint: consider a point x and a block B not containing x and recall the established arithmetic conditions that we have.)

    Also do 21, 33, 44, 48, 55, 60

11. FINAL EXAM on Friday, May 15, 9am–12noon, WNS 506