1. 9 colors, 5 sizes, striped or solid, long or short sleeve
   (a) $9 * 5 * 2 * 2$
   (b) (Red, gold) + the rest of the color
   $(2 * 5 * 1 * 1) + (7 * 5 * 2 * 2)$

2.
   (a) $26 * 26 * 26 * 26$ because the letter can be reused after each letter and there's 26 different letters.
   (b) $4 * 25 * 24 * 23$, 4 because K can be in any positions, and $25 * 24 * 23$ because the letter used before cannot be used again.
   (c) $4 * 26 * 26 * 26$, 4 because K can be in any position, and $26 * 26 * 26$ because K can be reused.

3. D_5 = divisible by 5 and D_7 = divisible by 7, S = {1, … , 99999}, T = {1, … , 9999}
   T – S = {1000, …, 99999}
   $|D_5 \cup D_7| = |D_5| + |D_7| - |D_5 \cap D_7|$
   $= (19999 - 1999) + (14285 - 1428) - (2857 - 285)$
4.
   (a) 8!
   Because we can consider Ann, Beth, and Chris as one because the order must be Ann-Beth-Chris order. So (7 + 1)!
   (b) $8! * 3!$
   3! Because Ann, Beth and Chris can be in any order among 3 of them. And 8! Because we can take Ann, Beth and Chris as a whole because they have to stand next to each other. So (7 + 1)!

5.
   (a) 9^{10} for function A to B and 10^9 for function B to A
   (b) 2^{9*10}
   because each element in set A can link to any of the element in set B and theirs is 9 elements in set A and 10 elements in set B.
   (c) $\frac{10!}{(10-9)!}$ functions
   because if all the element from A that is linked must be excluded
   (d) $\frac{C(10,2)*C(9,2)*9!}{2!} + C(10,3) * 9!$ functions
   because onto functions must have all element in B linked to A.

6.
   (a) $C(8,5) * 7!$,
   $C(8,5)$ because only choose 5 out of 8 people as mom and dad is chosen already. And 7! to shuffle all 7 people in all position.
   (b) $(mum\ in) + (dad\ in)$

$C(8,6) * 7! + C(8,6) * 7!$

If mom or dad is in already, then we need to choose 6 out of 8 people because if mom is in, dad is not and vice versa.

7.

(a) K = 10, r = 5

$N \geq (5-1)10 + 1$

At least 41 tickets to get 5 same movie ticket.

(b) 5 to 50 tickets because assuming the you took the first 45 tickets and all of it is not Avengers ticket or you are lucky and first 5 tickets are Avengers ticket.

(c) Problem A requires Pigeonhole Principle

8. F

9.

(a) $C(7,3) = 35$

(b) $C(7,0) + C(7,1) + C(7,2) + C(7,3) = 1 + 7 + 21 + 35 = 64$

(c) $2^7 - C(7,0) - C(7,1) - C(7,2) = 128 - 1 - 7 - 21 = 99$

10.

(a) $2 * C(20,7)$

(b) $Total - only\ man$

$C(22,8) - C(10,8) =$

(c) $Total - only\ man - only\ woman$

$C(22,8) - C(10,8) - C(12,8) =$