Name: _____ Section (Circle One): 8:00 - 8:50 10:00 - 10:50

Math 110 Supplemental Instruction Worksheet 6

1. Hot Topic is running a special: for \$5, you choose a paper bag from a bin which contains a mystery t-shirt. Suppose the bin contains 20 t-shirts, each with a different design. You only like 12 of their 20 t-shirt designs, but you buy five of them anyway.

   (a) What is the probability that you like all five shirts that you bought?

   $P(\text{like all five}) = \frac{\#\text{buy five I like}}{\#\text{buy five}} = \frac{792}{15504} = \frac{33}{646}$

   #ways to buy five I like:
   $C(12,5) = \frac{12!}{7!5!} = 792$

   #ways to buy five:
   $C(20,5) = \frac{20!}{15!5!} = 15504$

   (b) What is the probability that you like at least two of the shirts that you bought?

   options: like 2, dislike 3
   like 3, dislike 2
   like 4, dislike 1
   like 5, dislike 0

   $P(\text{like at least two}) = \frac{\#\text{ways to like at least 2 of 5.}}{\#\text{ways to buy 5}}$

   #ways to like at least 2:
   $C(12,2)\cdot C(8,3) = 66\cdot 56$
   $+ C(12,3)\cdot C(8,2) + 220\cdot 28$
   $+ C(12,4)\cdot C(8,1) + 495\cdot 8$
   $+ C(12,5) + 792$
   $= 14608.$

   $= \frac{14608}{15504} = \frac{913}{969}$

   OR $P(\text{like at least two}) = 1 - P(\text{like 0 or 1})$

2. You pick four stones out of a bag consisting of 4 diamonds and 16 diamond shaped pieces of glass.

   (a) What is the probability that you did not get any diamonds?

   $P(\text{no diamonds}) = \frac{\#\text{ways to get 4 glass}}{\#\text{ways to get 4.}} = \frac{1820}{4845} = \frac{364}{969}$

   4glass:
   $C(16,4) = 1820$

   Any 4:
   $C(20,4) = 4845$

(b) What is the probability that you got at least one diamond?

P(at least one diamond) = 1 − P(no diamond)

$= 1 - \frac{364}{969} = \frac{605}{969}$.

3. A baseball team has 12 pitchers, 7 infielders and 6 outfielders. Suppose three players are picked at random to be team captains. Find the probability:

(a) All three captains are pitchers.

$P(\text{3 pitchers}) = \frac{\#\text{ways to select 3 pitchers}}{\#\text{ways to select 3 players}} = \frac{C(12,3)}{C(25,3)}$

$= \frac{220}{2300} = \frac{11}{115}$

(b) There is one pitcher, one infielder and one outfielder.

$P(\text{one each}) = \frac{\#\text{ways to pick one each}}{\#\text{ways to pick 3 players}} = \frac{C(12,1)\cdot C(7,1)\ C(6,1)}{C(25,3)}$

$= \frac{504}{2300} = \frac{126}{575}$

(c) There is no outfielder picked as a captain.

$P(\text{no outfielder}) = \frac{\#\text{ways to pick pitcher \& inf only}}{\#\text{ways to pick any 3}}$

$= \frac{C(19,3)}{C(25,3)} = \frac{969}{2300}$