(1 point; 2 minutes)

1. In the field of probability and statistics, what do we mean when we say that two events, A and B, are independent of one another?

   The probability of each event is Not affected
   by the occurance (or failure to occur) of the
   other event.

(4 points; 5 minutes)

2. If one picks two marbles at random (without replacement) from a jar that contains 5 red marbles, 4 blue marbles, and 3 black marbles, show that getting a black marble on the second pick is not independent of what happens on the first pick.

$$5$$
$$+\ 4$$
$$+\ 3$$
$$\overline{12}\ marbles$$

$$P(Black\,|\,Red) = \frac{3}{11}$$

$$P(Black\,|\,Blue) = \frac{3}{11}$$

$$P(Black\,|\,Black) = \frac{2}{11}\quad probability\ was\ changed,$$

   so N<u>ot</u> independent.

(4 points; 5 minutes)

3. A system is developed to protect against missiles fired by terrorists. The system fires defensive missiles that try to intercept an incoming offensive missile. Each defensive missile has probability 0.8 of succeeding in blowing up the incoming offensive missile. If a defensive missile fails, then another defensive missile is fired. Determine the probability that the next incoming offensive missile will be destroyed by the third missile that is fired in defense against it.

   The 3rd defensive missile will only be fired if the
   1st & the 2nd missiles fail. $P(Fail) = 1 - P(succeed) = 0.2$

   $$P(3rd\ succeeds) = P(Fail\ and\ Fail\ and\ Succeed)$$

   $$= (0.2)(0.2)(0.8) = \boxed{0.032}$$
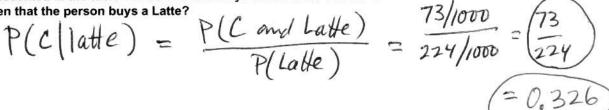
4. Based on the table on this page, answer question (a).

Coffee	Vendor				Row
Choice	A	B	C	D	Totals
Plain	130	123	138	128	519
Latte	40	53	73	58	224
Mocha	80	74	39	64	257
Column Totals	250	250	250	250	1000

(3 points; 3 minutes)

(a) What is the probability that a randomly selected person from those represented in the table will be one who buys coffee from Vendor C given that the person buys a Latte?

$$P(C \mid latte) = \frac{P(C \ and \ Latte)}{P(Latte)} = \frac{73/1000}{224/1000} = \frac{73}{224}$$

$$= 0.326$$

(3 points; 3 minutes)

5. A summer camp has 36 children that are staying for two weeks. On the first day, 9 of the kids will be selected to form a baseball team. How many different teams of nine players are possible to form out of the 36 children?

order does not matter in my opinion.

$$36C_9 = 94143280 \ \text{different teams are possible.}$$

(3 points; 3 minutes)

6. Reuben is one of the 36 children at the summer camp in problem #5. If the 9 kids for the baseball team are selected at random, what is the probability that Reuben gets picked to be on the team?

Solution A: $1 - P(\text{not picked}) = 1 - \frac{35}{36} \cdot \frac{34}{35} \cdot \frac{33}{34} \cdot \frac{32}{33} \cdot \frac{31}{32} \cdot \frac{30}{31} \cdot \frac{29}{30} \cdot \frac{28}{29} \cdot \frac{27}{28} = \frac{9}{36}$

Solution B: Reuben has 9 chances in 36 $= \frac{9}{36} = 0.25$

Solution C: $\frac{35C_8 \ \text{teams will include Reuben}}{36C_9 \ \text{all possible teams}} = \frac{23535820}{94143280} = \frac{9}{36} = 0.25$

(3 points; 3 minutes)

7. A shoe store stocks 18 different styles of shoes. The manager of merchandizing must select 5 of the 18 styles to display from left to right in the store's main wondow. How many ways can the merchandizing manager pick 5 styles and display them? *order matters*

$$_{18}P_5 = 1028160 \text{ different arrangements}$$
of 5 of the 18 styles are possible.

(4 points; 4 minutes)

8. In a very large population (treat sampling as though it was "with replacement"), what is the probability that a random sample of 6 values will include at least one that is below the 12th percentile?

$$P(\text{Below } 12^{th} \text{ percentile}) = 0.12$$
$$P(\text{Above } 12^{th} \text{ percentile}) = 0.88$$

$$P(\text{at least one below } 12^{th} \text{ percentile}) =$$

$$1 - P(\text{all above } 12^{th} \text{ percentile})$$

$$= 1 - (0.88)(0.88)(0.88)(0.88)(0.88)(0.88)$$

$$= 1 - (0.88)^6 = \boxed{0.5356}$$