MATH ANALYSIS II HONORS

PROBABILITY 16.1 – 16.3

For questions # 1 – 6, use the following list of events.

A card is chosen from a standard deck of 52 cards.

Event A – "a king is chosen" 1/13
Event B – "a red card is chosen" 1/2
Event C – "a diamond is chosen" 1/4
Event D – "a queen is chosen" 1/13
Event E – "a spade is chosen" 1/4

$P(K|R) = P(K) = \frac{1}{13}$

1. Choose two events that are independent. Explain why they are.
   A & B, one being chosen does not affect the prob of the other.
2. Choose two events that are not independent. Explain why they are not.
   B & C, one event affects the prob of the other.
3. Choose two events that are mutually exclusive. Explain why they are.
   A & D, C & E. can't happen at the same time
4. Is P(C | B) = P(C)? Explain what this means.
   $P(\text{Diamond}|\text{Red}) = \frac{1}{2}$, $P(\text{Diamond}) = \frac{1}{4}$, they are not independent
5. Is P(choosing either a king or a red card) = P(A) + P(B)? Explain why or why not? no, the red king would be counted twice.

6. What is P(C)? What is P(E)? Explain why these cannot be the only two possible outcomes, based on probability. (i.e. without assuming any knowledge about a deck of cards.) $P(C) = \frac{1}{4}$, $P(E) = \frac{1}{4}$, these do not add to 1.

7. A 6-sided die is rolled and a coin is tossed. What is the probability of rolling a number "above 2" and getting "tails"? $\frac{4}{6} \cdot \frac{1}{2} = \frac{4}{12} = \boxed{\frac{1}{3}}$

8. Two 10-sided dice are rolled (Each numbered 1 – 10). What is the probability of getting a sum that is **greater than** 15? (10,7), (10,6), (9,7), (7,10), (6,10) (7,9), (8,8) (9,8) (8,9) (8,10) (10,8) (9,10) (10,9) (10,10) (9,9) $\frac{15}{100} = \boxed{\frac{3}{20}}$

9. Four cards are chosen from a standard deck (without replacement.) What the probability of getting 4 aces? $\frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} \cdot \frac{1}{49} = \boxed{3.7 \times 10^{-6}}$

10. Four cards are chosen from a standard deck (without replacement.) What the probability of getting at least 1 ace?

1 – P(NO Aces)

$1 - \left[\frac{48}{52} \cdot \frac{47}{51} \cdot \frac{46}{50} \cdot \frac{45}{49}\right] = \boxed{.28}$

11. A coin is flipped 6 times. What is the probability of getting "tails" exactly 2 times?

$${}_6C_2(.5)^2(.5)^4 = \frac{15}{64} \approx \boxed{.234}$$

12. The percentage of women in a large population is 55%. If three people are picked at random, what is the probability that exactly 2 women will be chosen?

$${}_3C_2(.55)^2(.45)^1 = \boxed{.408}$$

13. The following data shows the number of students who play sports and are on the honor roll.

	$\bar{A}$ Not on Honor Roll	A Honor Roll	
B Sports	125	50	175
$\bar{B}$ Not on Sports	175	75	250
	300	125	425 total

A = "student is on the honor roll"

B = "student plays sports"

Find:

P(A) = $\frac{125}{425} = \boxed{\frac{5}{17}}$

P(B) = $\frac{175}{425} = \boxed{\frac{7}{17}}$

P(A | B) $\longrightarrow$ $\frac{50}{175} = \boxed{\frac{2}{7}}$

P(B | A) $\frac{50}{125} = \boxed{\frac{2}{5}}$