Name: _____

Foundations 12: Probability Quiz #2

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cap B) = P(A) \cdot P(B|A)$

Full credit will only be awarded for all work shown in a neat and organized manner.
For probabilities, answer with percentages to 2 decimal places, if needed (e.g. 14.56%)

In a deck of cards there are...

- 52 cards total
- 26 black cards (Clubs and Spades)
- 26 red cards (Hearts and Diamonds)
- 13 cards of each suit (Clubs, Spades, Hearts Diamonds)
- 4 Cards of each type (A, 2-10, J, Q, K)

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1. Two cards are drawn from a standard deck **without** replacement. Determine:
   a. P(The first is a red Jack, and the second is a 10) = $\frac{2}{52} \cdot \frac{4}{51} = 0.30\%$ (J♥ 10)

   b. P(One card is red and one card is black) = (Red then Black) or (Black then red) $\frac{26}{52} \cdot \frac{26}{51} + \frac{26}{52} \cdot \frac{26}{51} = 50.98\%$

   c. P(No Aces) = $\frac{48}{52} \cdot \frac{47}{51} = 85.07\%$ (4 aces ⇒ 48 other)

   d. P(Both cards are a different number/letter) = $\frac{52}{52} \cdot \frac{48}{51} = 94.12\%$ (any thing; not same number/letter) (A not A, 2 not 2, 3 not 3)

2. A carnival game uses a bag that contains 3 red marbles, 5 blue marbles and 6 green marbles. It costs $1.50 to pick a marble. A red marble is worth $5, a blue marble is worth $1, and a green marble is worth $0.50. Would you play this game? Justify your answer mathematically.

14 total marbles

$EV = \underset{\text{red}}{\$5 \cdot \frac{3}{14}} + \underset{\text{Blue}}{\$1 \cdot \frac{5}{14}} + \underset{\text{Green}}{\$0.5 \cdot \frac{6}{14}}$

$= \$1.64 > \$1.50$ yes! because EV is higher than cost to play

3. When you get fouled in basketball, you get to take 2 shots ("Free-Throws"). On his first shot, Mr. G makes 72% of his free-throws. If he misses his first shot, the probability of making it goes down by 10%. If he makes his first shot, the probability of making the second shot goes up 5%.

a. Draw a tree diagram to represent this situation

b. P(Makes both shots) = $72\% \cdot 77\% = 55.44\%$

c. P(Makes exactly 1 shot) = $72\% \cdot 23\% + 28\% \cdot 62\% = 33.92\%$

d. P(Makes his second shot | missed his first shot) = 62%

If I know that

4. In a class of 30 students, 22 students have dark hair and 16 of the dark hair students are right-handed. The rest of the students have blonde hair and 3 of the blonde students are left-handed.

(Leave answers b. to e. as fractions. You don't need to reduce them)

a. Complete the table below

	Right-Handed (RH)	Left-Handed (LH)	Total
Dark Hair (D)	16	6	22
Blonde Hair (B)	5	3	8
Total	21	9	30

b. $P(D \cap LH) = \frac{6}{30}$

c. $P(LH \cup B) = \frac{5+3+6}{30} = \frac{14}{30}$

$P(LH) + P(B) - P(LH \cap B)$

d. $P(D \mid RH) = \frac{16}{21}$ ← RH

If we know that

e. $P(RH \cap B') = \frac{16}{30}$ ← D

B ① ← not

If we know that

f. In this class, are being right-handed and having dark hair independent? Explain.

$P(D \mid RH) \stackrel{?}{=} P(D)$

$\frac{16}{21} \stackrel{?}{=} \frac{22}{30} \Rightarrow$

$0.7619 \stackrel{?}{=} 0.7 \Rightarrow$ not the same ∴ dependent!