For each problem, Show work and explain your answer.

Exercises — More Probability Problems and some Expected Value Problems

1. A pair of dice is rolled. What is the expected value of *P*, the product of the numbers on the two dice? Show work and explain your answer.

2. A casino game is played as follows:
   a. First the player pays $7 to play the game
   b. Then the casino puts $1 on the *Winnings Circle* and hands the player a coin
   c. The player flips the coin 5 times, and each time heads comes up, the casino doubles the money on the *Winning Circle*

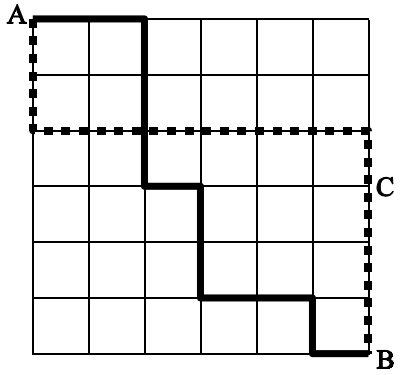
   For example, if the player flips THHTH, then he wins $8, and since he had to pay $5 to play the game, his net winnings is $3. Who wins this game on average, the casino or the player? Show work and explain your answer.

3. **A Variation on last week's problem:** A certain carnival game consists of a spinner with 30 sectors with various payoffs. Two of the sectors win $12, five of them with $3, ten of them win $2, nine of them win $1 and the rest are losers. How much should the carnival charge to play this game? Show work and explain your answer.

4. An urn contains 3 red and 5 yellow balls. On each of ten successive trials, a ball is randomly selected from the urn, the color is noted, and then the ball is replaced. What is the probability that a red ball is never drawn? Give your answer to 6 decimal places.

5. Three dice are thrown. What is the probability that all 3 numbers are different? Show work and explain your answer.

6. A person takes a random walk from A to B without backtracking on the figure to the right as follows: If he has two options (east and south) he flips a fair coin to decide which route to take. Otherwise he just takes the required path. For example, at point A he would flip a coin, but at point C, he would just proceed south to B without flipping a coin. Which of the two paths shown is more likely to happen under this model; the dotted or the solid? Show work and explain your answer.



7. What is the probability of each of the following events:
   a. A randomly selected 3-card "poker hand" does not contain a pair
   b. A randomly selected 3-card "poker hand" does contain a pair
   c. A person selecting 3 distinct numbers randomly from 1 to 25 does not select a prime number

8. **Extra Credit Problem with an Infinite Sum:** An experiment consists of rolling a single die until a "1" appears. Let *R* denote the number of rolls required. Show that the expected value of *R* is 6?