Remember: Ask yourself first whether any part of the problem is guaranteed to happen (100% probability), then determine the probability of each of the other things that might happen and multiply those probabilities by the relevant utilities.

Show the utility equation, as well as the answer, for each problem.

1. What is the expected utility of a promotion at your local grocery store that gives a coupon worth $10 to every fifth customer who comes into the store, assuming that you go to the store twice while the promotion is running.

   \[ EU = 2 \times (10 \times 0.20) = 4 \]

2. What is the expected utility of betting $2 that you can draw a "club" out of a regular deck of 52 cards, assuming that you will win $16 if you succeed?

   \[ EU = -2 + (16 \times 0.25) + (0 \times 0.75) = -2 + 4 + 0 = 2 \]

3. Suppose a friend offers to pay you $128 if you can flip a coin five times and get exactly the following sequence: Heads-Tails-Heads-Tails-Heads. If any other sequence occurs, however, you must you must pay your friend $5. Calculate the expected utility of this situation. Should you take the bet?

   \[ EU = (128 \times 1/32) + (-5 \times 31/32) = 4 - 4.84 = -0.84 \]

   You should not take this bet (since it has a negative expected utility).

4. Suppose you invest $10,000 in a business that promises to pay you a 20% return on your investment (i.e., $12,000) if the business succeeds. If the business fails, however, you will receive nothing. You estimate that there is a 75% chance that the business will succeed. Calculate the expected utility. Should you invest?

   \[ EU = -10,000 + (12,000 \times 0.75) + (0 \times 0.25) = -10,000 + 9,000 + 0 = -1000 \]

   You should not invest in this business (since doing so would have a negative EU).

5. What is the expected utility of agreeing to flip a coin three times under the following circumstances? If it is Heads on the first try, you win $5; but you lose $2 if it is Tails. If it is Heads on the second try, you win $2; but you lose $10 if it is Tails. If it is Heads on the third try, you win $2; but you lose $2 if it is Tails. Finally, if it is Heads three times in a row, you win an extra $20.

   \[ EU = [5 \times 0.5] + [(-2 \times 0.5)] + [2 \times 0.5] + [(-10 \times 0.5)] + [2 \times 0.5] + [(-2 \times 0.5)] + [20 \times 0.125] = 2.5 - 1 - 5 + 1 - 1 + 2.5 = 0 \]