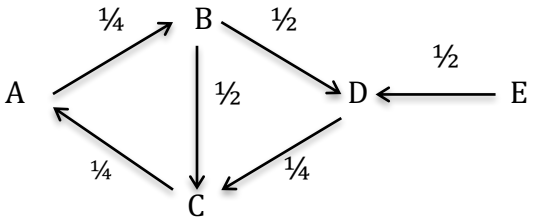
This assignment covers textbook Chapter 5, 7 and Chapter1~4.

1. **Probability with Graph** (20 points)
   Consider the directed graph below. Each edge has a number that represents the probability that a message can reliably travel between the associated nodes in the given direction.
   (a) (5 points) If all links are working reliably, then which nodes can a message sent from A reach?

   (b) (15 points) If the probability of reliable travel is as given, then what is the probability that a message sent from A can travel to C and then a responding message can travel from C to A?



For question 2 and 3: please specify clearly (1) what the indicator random variable is and (2) what it represents, and (3) how do you use the linearity of expectation and lemma 5.1 to calculate the result.

2. **Indicator Random Variables** (25 points)
   Exercise 5.2.4 (P122)

3. **Indicator Random Variables** (25 points)
   Exercise 5.2.5 (P122)
   About **uniform random permutation** of <1, 2, …, n>. The definition is in page 125. A uniform random permutation is one in which each of the n! possible permutations are equally likely.

4. **QuickSort Algorithm** (30 points)
   Problem 7.2 a, b, c (P186)