Answer the questions in the spaces provided on the question sheets. If you run out of room for an answer, continue on a separate sheet of paper.

Random variables and expectation

1. Consider a game in which a fair die is rolled. If the die comes up 1, the player wins \$2. If the die comes up 2, the player wins \$1. For all other outcomes, the player loses \$1. Let X denote the amount of money won by the player for a single role of the die.

   (a) What is the range of X?

   (b) What is the distribution over the random variable X?

   (c) What is the expected amount that the player wins or loses, i.e., what is $E[X]$? Round to the nearest cent.

2. In a network of 40 computers, 5 hold a copy of a particular file. Suppose that 7 computers at random fail. Let F denote the number of computers that fail and have a copy of the file.

   (a) What is the range of F?

   (b) What is $p(F = 2)$?

   (c) What is the distribution over the random variable F?

   (d) What is the expected number of computers that will fail and have a copy of the file, i.e., what is $E[F]$? Round to the nearest computer.