1. [**PJC 18 MYE**]
   A contestant on a quiz show is presented with two questions, Question 1 and 2, which he is to attempt to answer in some order chosen by him. If he decides to try Question 1 first, then he will be allowed to go on to Question 2 only if his answer to Question 1 is correct. Similarly, if he decides to try Question 2 first, then he will be allowed to go to Question 1 only if his answer to Question 2 is correct. The probabilities of answering Question 1 and 2 correctly are 0.6 and 0.5 respectively. The events of the contestant answering Question 1 and Question 2 correctly are independent of each other. The contestant will get \$150 and \$200 if he is able to answer Question 1 and 2 respectively, regardless of the order in which he answers them. Let X be the amount of money won by the contestant if he answers Question 1 first.

   (a) Find the probability distribution of X.   [2]

   (b) Show that $E(X) = 150$ and find $Var(X)$.   [2]

   (c) By considering the expected winnings when the contestant answers Question 2 first, determine if the contestant should answer Question 1 or Question 2 first in order to maximise his winnings.   [3]

2. [**TJC 18 MYE (modified)**]
   Robin participates in a game show with 2 rounds.

   In the first round, Robin needs to answer 2 questions, each having 5 possible answers. Robin chooses an answer randomly for each question. For each question she answers correctly, she will score 50 points. However, she will lose any points she has scored if she answers the second question wrongly.

   (a) Show that Robin's expected score in the first round is 12.   [4]

   In the second round, Robin needs to answer 3 questions, each also having 5 possible answers. Robin chooses an answer randomly for each question. For each question she answers correctly, she will score 12 points. For each question she answers wrongly, she will lose k points. Robin wins the grand prize if her final score is positive.

   (b) Find the largest possible integer value of k if Robin is expected to win the grand prize.   [4]

   (c) Find the probability that Robin answers at least 2 questions correctly throughout the **entire** game show.   [3]

Answers

1. (a) $P(X = 0) = 0.4, P(X = 150) = 0.3, P(X = 350) = 0.3$.

   (b) $Var(X) = 21000$.

   (c) Since the expected winnings of answering Question 1 first is \$150 whereas the expected winnings of answering Question 2 first is \$145, Contestant should answer Question 1 first in order to maximize winnings

2. (b) Largest $k = 2$.

   (c) 0.26272.