1[2] Read the story about the two Duke University students. The two students will pass the exam if they give the same answer to the 95-point question.

What is the probability that they will pass? Explain your answer fully and clearly.

2[2] To allow for the 10% (on average) of people who make reservations but do not show up for their flights, an airline company "over-books" i.e., it takes reservations for up to 145 seats when it only has space on the plane for 140 passengers.

• If the airline takes 145 reservations, what is the probability that it will not have a seat for every passenger who shows up? *Actual calculations are not required, but explain the steps in sufficient detail that your research assistant could complete them*.

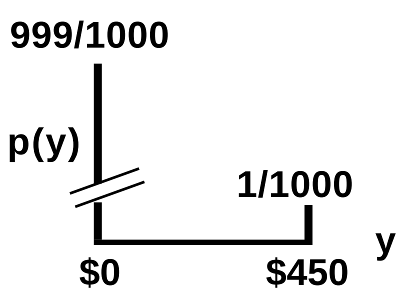
• Suppose that some of the 145 individuals are related. Does this affect the appropriateness of the probability model you base your calculations on? Why/why not?

3[4] Suppose that couples stop having children after they have had a boy, or have had 2 children, whichever happens first. Suppose that Probability(boy) = 1/2 (rather than "0.5-something").

• Under this scenario, what is the probability distribution of the number of children a couple has? *It may help to build a probability tree that starts with (e.g.) 100 couples.*

• Does this "wanting to have a boy" family planning strategy distort the sex ratio in the (overall) aggregate of children. i.e., in the aggregate, what is the probability distribution of the sexes (i.e. proportions of boys and girls)?

4[3] For the random variable shown below, show <u>how</u> you would calculate (i) the expected value (ii) the variance and (iii) the standard deviation. *DO NOT COMPLETE THE CALCULATIONS*.



5[4] Which probability distribution is most appropriate for each of the following:
[in addition to specifying the distribution, also list the parameter(s), and indicate (or make up) value(s) for them]:

(i) how many ice-storms (or major floods, or earthquakes, ...) in Québec in a decade?

(ii) how many† of 116 persons, who wore graduated elastic compression stockings on long-haul airline flights, develop blood clots -- under the null hypothesis that these stockings do not protect against blood clots?. *The Lancet 2001; 357: 1485–89* † In the study, the observed number was zero.

	Randomly allocated to experimental group: they wore below-knee graduated elastic compression stockings	Randomly allocated to comparison group: they did not wear below-knee graduated elastic compression stockings	Total
Developed Blood Clots	?		12
Did Not			219
Total	116	115	231

6[5] Two coins, one "regular" and one with "two tails" (see below) are placed in a hat. One coin is selected at random and tossed. You are not allowed to see it until it lands. It lands "tails".

• In light of this outcome, what is the probability that the side facing down is also "tails"? Explain your calculations fully/clearly. *Hint: be careful of intuition -- and draw a tree!*