Notes:

Some homework and exam problems will involve sums, products, or other arithmetical computation; please do the arithmetic, and don’t leave the answer incomplete. Numerical answers should be given as exact fractions (in lowest terms) or as decimal numbers with enough digits to let the grader know whether the answer is correct or not—usually that means 3 or 4 correct decimals, not 1 or 2, and 6 or 8 is overkill. I’ll try to indicate when a problem needs more precision than usual to let the grader know if you’re on the right track (e.g., the first exercise below).

Exercise (1)
Ten people in a room discover that they all have different birthdays.
a) If five more people enter the room, what is the conditional probability that there are still no duplicate birthdays among the 15 persons present? Give the answer correct to five decimal places (or as an exact fraction, if you prefer).
b) Give the assumptions you made to justify your calculation.
c) Why is your estimate from a) probably too high? i.e., which of your assumptions is probably a bit wrong and how does this affect the answer?

Exercise (2)
This computational exercise has been postponed to a later HW set, due to cancellation of the Sept 16 class.

Exercise (3)
One woman has twin daughters, one has twin sons, and a third has twins, one boy and one girl, all six children the same age. By a phenomenal coincidence, all six children are in the same class at school. Are siblings’ gender independent in this group? More precisely: if we choose a child at random from among these six, and discover we’ve chosen a girl, what is the probability that the girl’s twin will be a sister? Why?

Exercise (4)
Ross, Chapter 3, problem 8 (p. 104). You may assume that girls and boys are equally likely for first and second child. How would answer change if we used $P[G] = 0.48$, $P[B] = 0.52$?

Exercise (5)
Ross, Chapter 3, problem 12 (p. 105).

Exercise (6)
Ross, Chapter 3, problem 45 (p. 109).

Exercise (7)
Ross, Chapter 3, problem 53 (p. 111).
Exercise (8)
Ross, Chapter 3, problem 56 (p. 112).

Exercise (9)
A new treatment has an adverse reaction for a small fraction $p$ of the population, for some number $0 < p < 1$. How many patients must be given the treatment for there to be at least probability 0.50 of at least one adverse reaction among the group? You may assume independence.

Exercise (10)
Draw a whole number $X$ from 1 to $N$, each of the $N$ choices equally likely. Let $A_j$ be the event, “The number $X$ is evenly divisible by $j$” (for example, $A_2$ is the event that the number is even). Are the events $A_2$ and $A_3$ independent? Explain your answer.