(1) A museum sponsors three paleontological expeditions: one to Mongolia, one to Canada, and one to Argentina. The museum estimates that the Mongolian expedition has a 50% probability of discovering a new kind of dinosaur, the Canadian expedition 30%, and the Argentinian expedition 80%.

(a) What is the probability that all three of the expeditions discover a new kind of dinosaur?
(b) What is the probability that at least one of the expeditions discovers a new kind of dinosaur?

(2) Well-designed opinion polls usually report a margin of error along with their estimates (e.g., “49% approve of the job President Obama is doing, with ±3% margin of error”).

(a) Why is a margin of error necessary? That is, why do the polls not simply report that 49% approve of the job President Obama is doing? What causes the uncertainty that makes such a margin of error necessary? Be specific.
(b) Less than one week before the 2000 presidential election between Bush and Gore, pollsters were estimating that as many as 25% of potential voters were undecided. This uncertainty makes it harder to predict the outcome of the election. Is this uncertainty accounted for in the ±3% margin of error?

(3) A university that is better known for its basketball program than for its academic strength claims that 80% of its basketball players get degrees, the same graduation rate as the rest of the student body. An investigation examines the outcomes of 40 randomly selected players who entered the program over a period of years. Of these 40 players, 65% graduated with a degree.

(a) If the university’s claim is true, the proportion of players graduating in a sample of 40 will have a sampling distribution that is approximately Normal. What is the expected value (mean) of this sampling distribution? What is the SD?
(b) If the university’s claim is true, what is the probability that, in a randomly selected sample of 40 players, 65% or less will graduate?
(c) Given your answer to part (b), do you think the university’s claim is plausible? Explain briefly.

(4) A national opinion research firm conducts polls to estimate the proportion of people who would vote for presidential candidates. Just before an election, the firm increases the size of its sample from the usual 1200 people to 2500 people.

(a) Does the larger sample lessen the bias of the poll result? Explain briefly.
(b) Does the larger sample improve the precision (i.e., decrease the variability) of the result? Explain briefly.

(5) Approximately 6% of passengers who purchase airline tickets do not show up for their flight. As a result, airlines typically overbook flights, selling more tickets than there are seats. Suppose an airline sells 275 tickets for a flight that has 265 seats.

(a) In repeated random samples of 275 passengers, what is the shape of the sampling distribution of the proportion of no-shows? What is the expected value of this sampling distribution? What is the SD of this sampling distribution? Show your work.
(b) Fill in the blanks: In 95% of random samples of 275 passengers, we would expect the proportion of no-shows to lie between ____% and ____%. Show your work.
(c) What is the probability that the flight will be overbooked — i.e., that there will not be enough seats for the passengers who show up for the flight?