Problem session 1. Friday January 16

Find the group with the circled number. Start working together on the circled question. Continue with the next question (1 is the next question after 8). Do as many as you have time for.

1. A new no-frills airline runs a commuter shuttle service using a refurbished World War II bomber. The two-propeller plane will fly if either or both of its engines function. Suppose that $P(\text{port engine fails})=0.10$, $P(\text{starboard engine fails})=0.15$, and $P(\text{both engines fail})=0.015$. What is the probability that the plane will complete its next flight safely?

2. Winthrop, a pre-med student, has been summarily rejected by all 126 US medical schools. Desperate, he sends his transcripts and MCATs to the two least selective foreign schools he can think of, the two branch campuses (N and E) of Swampwater Tech. Based on the success his friends have had there, he estimates that his probability of being accepted at E is 0.7, and at N, 0.4. He also suspects there is a 75% chance that at least one of his applications will be rejected. What is the probability that at least one of the schools will accept him?

3. An experiment has two possible outcomes: the first occurs with probability $p$, the second, with probability $p^2$. Find $p$.

4. In the game of odd man out, each player tosses a fair coin. If all the coins come out the same, except for one, the minority coin is declared "odd man out" and is out of the game. Suppose that three people play odd man out. What is the probability that on the first toss someone will be eliminated?

5. Jean d'Alembert, an eighteenth century French mathematician, was once asked the following question: What is the probability of getting at least one head in two tosses of a fair coin. d'Alembert answered $2/3$, his argument being that there are 3 possible outcomes, H, TH, and TT, two of which (H and TH) satisfy the description "at least one head". Discuss his answer and method of solution.

6. The crew of Apollo 17 consisted of two pilots and one geologist. Suppose that NASA had actually trained nine pilots and four geologists. How many possible Apollo 17 crews could have been formed (a) if the two pilot positions have identical duties? (b) if there is a pilot and a co-pilot?

7. A public opinion poll (circa 1850) had the following three questions:
1. Are you a registered Whig?
2. Do you approve of President Fillmore's performance in office?
3. Do you favor the Electoral College system?

Out of 1000 persons polled,

- 550 answered "no" to question 3.
- 325 answered "yes" exactly twice
- 100 answered "yes" to all three questions
- 125 registered Whigs approved of Fillmore's performance

How many of those who favor the Electoral College system do not approve of Fillmore's performance, and in addition are not registered Whigs?

8. The Bertillon system if identification predates finger prints (from Lecture Notes). 11 anatomical variables, such as height, head width, ear length, which do not change much for adults, were used to identify people. Each of these variables was classified as small, medium or large, e.g., (s, m, m, s, l, s, m, m, s, s, m).

How likely would it be that in Seattle there are two individuals with the same Bertillon configuration?