Read the problems carefully and show your work.

Two raindrops randomly fall on a large square region. The square is divided into 4 congruent subsquares as shown.

1. What is the probability that the first raindrop lands in the shaded subsquare?

   **Hint:** View a raindrop as a single point in the square region. What is the sample space? What is the event? How are events to be measured?

   **Solution:** The sample space consists of the four subsquares in which the drop can land. The event is the shaded subsquare. The subsquares have equal area, so they are all equally likely, and we measure by counting subsquares. Only one of the four subsquares is shaded, so the probability is \( \frac{1}{4} = 0.25 \).

2. What is the probability that both raindrops land in the same subsquare?

   **Solution:** There are 4 possible outcomes (subsquares) for the first drop. For each of those outcomes, there are 4 possible outcomes for the second drop. This gives a sample space of size 16. Once again the outcomes are equally likely, so counting is our measure. The event (two drops in the same square) can happen in 4 ways, so the probability is \( \frac{4}{16} = \frac{1}{4} = 0.25 \).

3. What is the probability that the two drops land in different subsquares?

   **Solution #1:** This is complement of event in question #2 above, so the probability is \( 1 - 0.25 = 0.75 \).

   **Solution #2:** You can also compute this probability directly. There are 4 possible outcomes for the first drop. For each of those outcomes, there are 3 empty squares left for the second drop, giving an event size of 12. Therefore, the probability is \( \frac{12}{16} = \frac{3}{4} = 0.75 \).

   **Solution #3:** An even simpler argument: The first drop falls in one of the squares, leaving 3 leftover for the second drop; that is, 3 out of 4 cases are permitted. Therefore, the probability is \( \frac{3}{4} = 0.75 \).

   But this last solution is a little too glib. It relies heavily on the unmentioned fact that the four subsquares are equally likely. This style of argument would give the wrong answer if we asked the same question about the four subrectangles in this figure:

Can you solve the problem for this case?