Q1: Suppose we roll a red die and a green die

(i) What is the sample space for this experiment?

{1,1} {1,2} {1,3} {1,4} {1,5} {1,6}
{2,1} {2,2} {2,3} {2,4} {2,5} {2,6}
{3,1} {3,2} {3,3} {3,4} {3,5} {3,6}
{4,1} {4,2} {4,3} {4,4} {4,5} {4,6}
{5,1} {5,2} {5,3} {5,4} {5,5} {5,6}
{6,1} {6,2} {6,3} {6,4} {6,5} {6,6}

(ii) What is the probability that the number on the green die is larger than the number on the red die?

5/12

(iii)Define what it means for two events E and F to be independent.

Two events E and F are independent if the order in which they occur doesn't matter. Alternatively, if observing one doesn't affect the other.

$P(E \cap F) = P(E)P(F)$

(iv) Let event E be that the sum of the dice equals 2 or 3 and event F be that the sum equals 3. Are E and F independent? Explain with reference to the definition given above

No, E and F are not independent. Observing E affects the outcome of F. Using the mathematical definition $P(E \cap F) = P(E)P(F)$:

$P(E \cap F) = 1/36$, $P(E)P(F) = 1/12 * 1/18 = 1/216$

Thus, E and F are dependent as $P(E \cap F) \mathrel{!}= P(E)P(F)$