STAT/MA 41600
In-Class Problem Set #2: August 25, 2017
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Problem Set 2 Answers

1a. There are 20 equally-likely outcomes, and Jack is immediately on Diane's left in exactly 4 of these outcomes, so the probability that Jack is immediately on Diane's left is $4/20 = 1/5$.
1b. Jack is either on Diane's left or right (they cannot share a seat), and these probabilities are equal. So the probability that Jack is on Diane's left is $1/2$. (Alternatively, Jack is on Diane's left in 10 of the 20 equally-likely outcomes, so the desired probability is $10/20 = 1/2$.)
1c. The seats 2, 3, 4 are empty in exactly 2 out of the 20 equally-likely outcomes, so the probability that seats 2, 3, 4 are empty is $2/20 = 1/10$.
1d. Jack and Diane have exactly one empty seat between them in 6 of the 20 equally-likely outcomes, so the probability that Jack and Diane have exactly one seat between them is $6/20 = 3/10$.

2a. There are 6 equally-likely outcomes. She picks no red books in just 1 of these outcomes, so the probability she picks no red books is $1/6$.
2b. She picks exactly one red book in 4 of the outcomes, so the probability she picks exactly one red book is $4/6$.
2c. She picks two red books in just 1 of the outcomes, so the probability she picks two red books is $1/6$.

Alternative approach to 2abc. If we only consider 4 outcomes, namely: two red books; one red and one blue; one red and one green; one blue and one green, then the probabilities associated with these outcomes are, respectively, : $1/6$, $1/3$, $1/3$, $1/6$.

The probability she picks no red books equals the probability she picks one blue and one green, which is $1/6$. The probability she picks exactly one red book equals $1/3 + 1/3 = 2/3$. The probability she picks two red books equals $1/6$.

3a. The dice have an even sum in 18 of the 36 equally likely outcomes, so the probability that the dice have an even sum is $18/36 = 1/2$.
3b. The dice have a sum of 8 or larger in 15 of the 36 equally likely outcomes, so the probability that the dice have a sum of 8 or larger is $15/36 = 5/12$.
3c. The dice have a sum between 6 and 8 (inclusive) in 16 of the 36 equally likely outcomes, so the probability that the dice have a sum between 6 and 8 (inclusive) is $16/36 = 4/9$.

4a. The value on the black die is greater than or equal to the value on the white die in 18 of the 24 equally likely outcomes, so the probability that the value on the black die is greater than or equal to the value on the white die is $18/24 = 3/4$.

4b. The value on the black die is strictly greater than the value on the white die in 14 of the 24 equally likely outcomes, so the probability that the value on the black die is strictly greater than the value on the white die is $14/24 = 7/12$.

4c. The dice have a sum between 6 and 8 (inclusive) in 11 of the 24 equally likely outcomes, so the probability that the dice have a sum between 6 and 8 (inclusive) is $11/24$.