

A, B, C, D are seated at random around a square table. What is the probability that A and C are opposite?

Solution 1: By symmetry, the number of arrangements in which A is opposite C is equal to the number where A is opposite B, and the number where A is opposite D. Hence the probability is $\boxed{\frac{1}{3}}$

Solution 2: Seat A First. There are three choices for the person opposite her, and only one is C, so the probability is $\boxed{\frac{1}{3}}$

Solution 3: Seat A First. There are $3!$ total arrangements (need to choose seats for 3 other people). If C is opposite A then there are $2!$ ways to fill the remaining seats, hence the probability that A and C are opposite is $\frac{2!}{3!} = \frac{2}{6} = \boxed{\frac{1}{3}}$