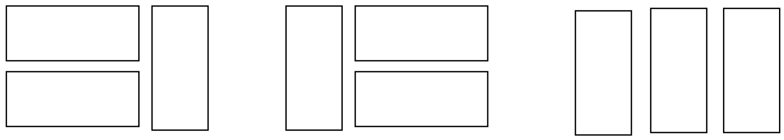
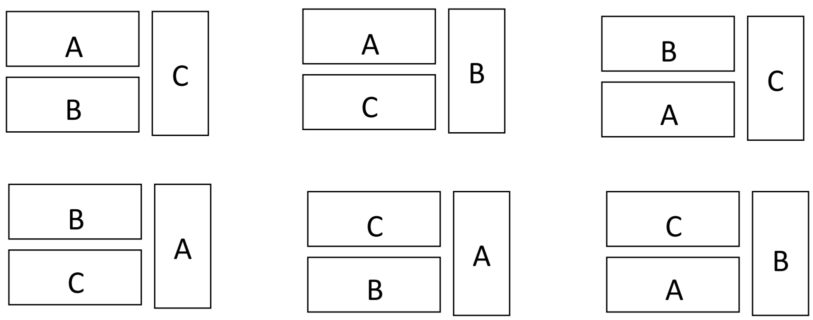
# Table For Six Answer

If they sit down randomly, there are 6! = 720 possible arrangements.

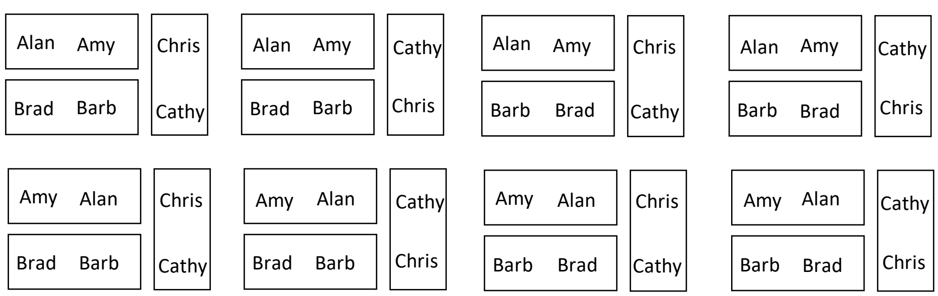
There are three basic groupings of the couples if they are “next” to each other. They are:



Each of these has six permutations of the couples as a group. If we call the three couples A (Alan and Amy), B (Brad and Barb) and C (Chris and Cathy), the first grouping can be:




Further, for each one of these six configurations, any of the three couples can exchange seats with each other. For example, Alan and Amy can switch seats. This produces eight $(2 \times 2 \times 2)$ possibilities for each of the six possible couple groupings. These eight possible arrangements are shown below for one of the three groupings of the three couples.

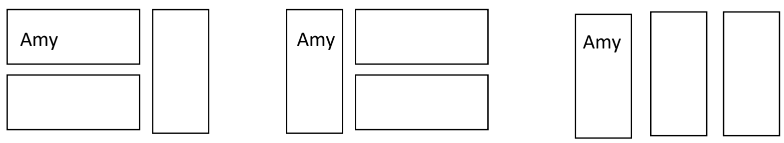



So, each of the three basic groupings have 48 possible seating arrangements; six arrangements of the couples and then eight configurations for the couples for each of the six arrangements. This is a total of 48 x 3 = 144. The answer is **144/720 = 1/5**.

**ANOTHER WAY**

Another way to get the answer is to seat the couples one at a time and calculate the probability of each of the three possible configurations.

To get any of the three configurations, the first person can sit in any one of the six seats. His/Her partner must sit in the only space in the same box for each configuration. For example, if Amy sat in the position shown in the diagram below, Adam would only have one choice for any particular configuration. The probability that Adam is "next" to Amy is 1/5 for any particular configuration because there are five seats remaining and only is next to Amy.




The third person to sit can choose any of the four empty chairs. His/Her partner only has one spot in each of the configurations and the probability of getting this spot is 1/3. Finally, if the first two couples are seated in any of the three configurations, the third couple must be seated next to each other. The probability that all three couples are next to each other in a particular configuration is:

$$P = \frac{6}{6} \times \frac{1}{5} \times \frac{4}{4} \times \frac{1}{3} \times \frac{2}{2} \times \frac{1}{1} = \frac{1}{15}$$

Since it is 1/15 for each of the three configurations, the total probability is 3/15, which is **1/5**.