ABSTRACT - In Fisher (1971), a lady was able to distinguish (by tasting) from whether the tea or the milk was first added to the cup. This is probably the first popular order of addition experiment. In general, there are m required components and we hope to determine the optimal sequence for adding these m components one after another. Knowing the optimal order of addition of components related in production is crucial. It is often unaffordable to test all the m! treatments, and the design problem arises (when m=10, for example, m! is about 3.5 million). We consider the model in which the response of a treatment depends on the pairwise orders of the components. The optimal design theory under this model is established, and the optimal values of the D-, A-, E-, and M:S:-criteria are derived. We identify a special constraint on the correlation structure of such designs. The closed-form construction of a class of optimal designs is obtained, with examples for illustration. One case study for job scheduling will be discussed.

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