

Solution to Exercise 3.3 (Version 1, 22/09/14)

from **Statistical Methods in Biology: Design & Analysis of Experiments and Regression (2014)** S.J. Welham, S.A. Gezan, S.J. Clark & A. Mead. Chapman & Hall/CRC Press, Boca Raton, Florida. ISBN: 978-1-4398-0878-8

© S J Welham, S A Gezan, S J Clark & A Mead, 2014.

Exercise 3.3

Four replicates of each of four treatments, labelled A–D, are to be applied at random to batches of aphids in 16 Petri dishes laid out in a 2 × 8 array (Figure 3.10). The environment is thought to be homogeneous. Use a pack of playing cards to determine an appropriate randomization for this experiment.

Solution 3.3

We have 16 experimental units (Petri dishes labelled 1-16) to which we wish to allocate four replicates of each of four treatments. As the environment is homogeneous we can use a completely randomized design. The principle of the randomization is to pick four different types of card and allocate these types to the four treatments. We then need four replicates of each type, giving us 16 cards in total, and we shuffle them and draw cards one by one. The type of the first card picked tells us which treatment is assigned to the first experimental unit, and so on.

We have illustrated the process in Table S3.3.1. We have selected four types of card to represent the treatments A–D (Jack, Queen, King and Ace, respectively) and used the four suits (Hearts, Diamonds, Clubs and Spades) to give four replicates of each treatment. Once the 16 cards are chosen they are shuffled (to achieve the randomization) and then selected one at a time from the top of the pile, discarding once used, to fill in the plan in order. This procedure gave us the sequence in Table S3.3.1 which is then transferred to the experimental plan as in Figure S3.3.1.

Table S3.3.1 Randomization of experiment using jack to ace of four suits (J = Jack, Q = Queen, K = King, A = Ace). Before the draw, each card type has been allocated to one treatment.

Draw	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Card	Q♥	Q♠	J♣	A♦	K♠	A♣	J♥	K♦	J♠	J♦	A♥	Q♦	A♠	K♣	K♥	Q♣
Treatment	B	B	A	D	C	D	A	C	A	A	D	B	D	C	C	B

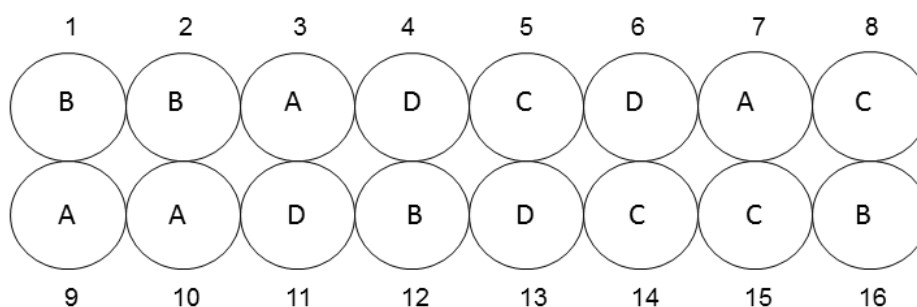


Figure S3.3.1. Randomization of treatments A–D to Petri dishes.