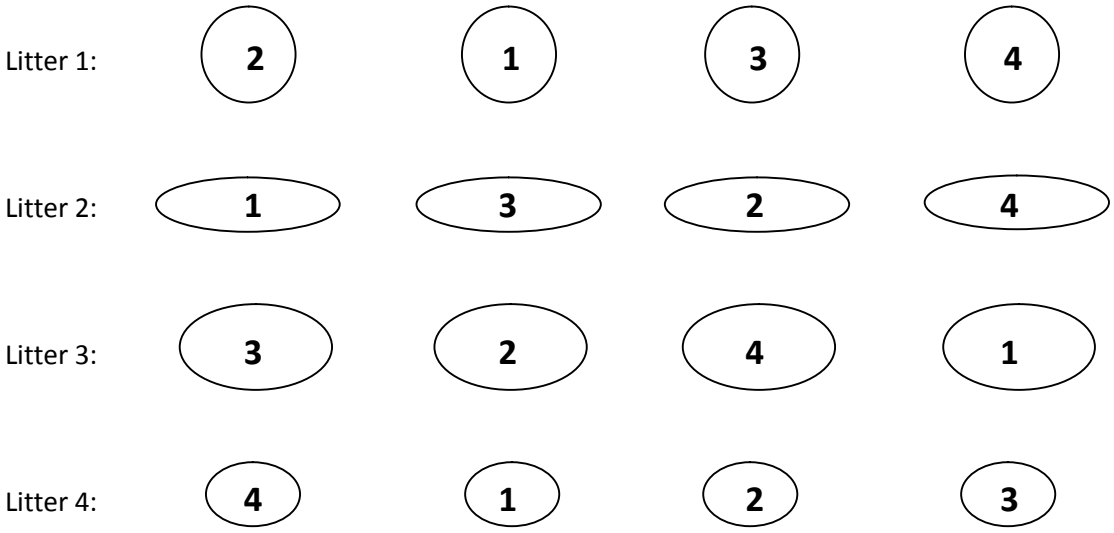
Answers

a. Here is one possible randomization. The restriction is that each treatment (1 to 4) appears exactly once in each litter.



b. There are 16 observations, so the total degrees of freedom is 15. There are 4 diets, so diet df = 3. There are 4 litters, so litter df = 3. The error df is 15 - 3 - 3 = 9. Note that we could also get the error df by realizing that the error mean square is the diet by litter mean square, so the error df = 3x3 = 9.

c. Here is the analysis of variance table. It shows a significant diet effect (p=0.0068) and a significant litter effect (p=0.0016). The significant litter effect simply indicates that blocking is effective at explaining excess variation in these data.

Dependent Variable: ADG

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.02960000	0.00493333	10.09	0.0014
Error	9	0.00440000	0.00048889		
Corrected Total	15	0.03400000			

R-Square	Coeff Var	Root MSE	ADG Mean
0.870588	2.816666	0.022111	0.785000

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Litter	3	0.01800000	0.00600000	12.27	0.0016
Diet	3	0.01160000	0.00386667	7.91	0.0068

Here are the marginal means for diet. We see that diet 4 has significantly bigger mean than the other three diets, but diets 1, 2 and 3 do not differ from each other.

The GLM Procedure
Least Squares Means

Diet	ADG LSMEAN	Standard Error	Pr > |t|	LSMEAN Number
1	0.78000000	0.01105542	<.0001	1
2	0.76000000	0.01105542	<.0001	2
3	0.77000000	0.01105542	<.0001	3
4	0.83000000	0.01105542	<.0001	4

Least Squares Means for effect Diet
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: ADG

i/j	1	2	3	4
1		0.2328	0.5384	0.0109
2	0.2328		0.5384	0.0015
3	0.5384	0.5384		0.0040
4	0.0109	0.0015	0.0040	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

Here are the marginal means for litter. Generally, a comparison of means among blocks is not of interest.

Litter	ADG LSMEAN	Standard Error	Pr > |t|	LSMEAN Number
1	0.78000000	0.01105542	<.0001	1
2	0.75000000	0.01105542	<.0001	2
3	0.77000000	0.01105542	<.0001	3
4	0.84000000	0.01105542	<.0001	4

Least Squares Means for effect Litter
Pr > |t| for H0: LSMean(i)=LSMean(j)

Dependent Variable: ADG

i/j	1	2	3	4
1		0.0872	0.5384	0.0040
2	0.0872		0.2328	0.0003
3	0.5384	0.2328		0.0015
4	0.0040	0.0003	0.0015	

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.