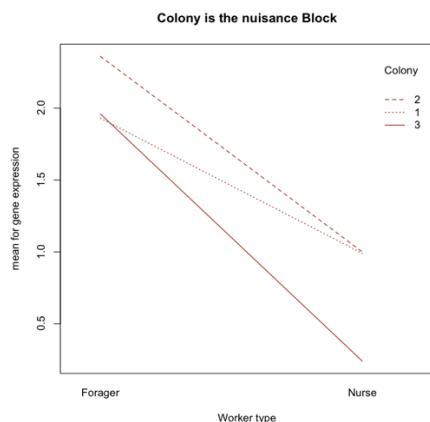


### **Module 4F Questions:**

1. The foraging gene, *for*, has been found to underlie variation in foraging behavior in several insect species. Researchers examined if the gene might influence behavioral differences in the honeybee. Worker bees perform tasks in the hive such as brood care when they are young and switch to foraging for nectar and pollen as they age. The authors compared *for* gene expression in **nurse** and **foraging workers** bees in **three** bee colonies.

Source of variation	Sum of Squares	df	Mean Square	F	P
<b>Colony</b>	0.342	2	0.171		
<b>Worker Type</b>	2.69340	1	2.6930	35.53	0.0271
<b>Residual</b>	<u>0.152</u>	<u>2</u>	<u>0.076</u>		
<b>Total</b>		5			



<b>Worker type</b>	<b>Colony</b>	<b>for gene expression</b>
<b>Nurse</b>	<b>1</b>	<b>0.99</b>
<b>Forager</b>	<b>1</b>	<b>1.93</b>
<b>Nurse</b>	<b>2</b>	<b>1.00</b>
<b>Forager</b>	<b>2</b>	<b>2.36</b>
<b>Nurse</b>	<b>3</b>	<b>0.24</b>
<b>Forager</b>	<b>3</b>	<b>1.96</b>

- a. Write out the full null hypothesis and the alternate hypothesis
  - b. Interpret the given table with hypothesis testing.
  - c. Is worker type a random effect or a fixed effect?
  - d. What is the purpose of a blocking variable in experimental design?
2. Identify the blocking variable in the following example: We have 3 different pastry recipes, and we are trying to determine which one is most delicious. Pastry is temperamental and can respond to many environmental features (temperature, moisture in the air etc.).

Day 1	Day 2	Day 3	Day 4	Day 5
1	3	1	2	1
3	1	2	3	2
2	2	3	1	3

a. The particular recipe (#)

b. The particular day

3. When I run this in RStudio, we get the following output. Pick the appropriate answer and justify it:

#### Analysis of Variance Table

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
block	4	6.9465	1.7366	3.6692	0.0555884
recipe	2	29.1472	14.5736	30.7918	0.0001747
Residuals	8	3.7864	0.4733		

- a. Reject the null hypothesis and include block in further analysis
- b. Reject the null hypothesis and DON'T include block in further analysis
- c. Fail to reject the null hypothesis and include block
- d. Fail to reject the null hypothesis and DON'T include block