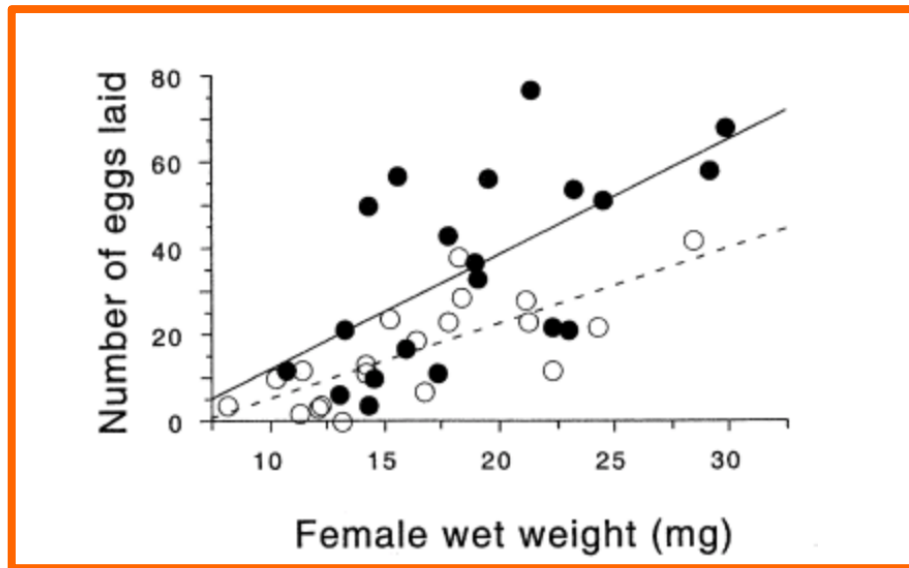


#### Module 4E Questions:

1. Females were mated once (white circles) or three times (black filled circles). Since larger females are known to produce more offspring, before mating, the female fireflies were weighed. The slopes between the once mated and thrice mated were not significantly different but the Y-intercepts are significantly different. Is there a difference in the number of eggs laid between once and thrice mated females?



- a. No
- b. Yes
- c. Can't tell
2. We want to assess whether Diet affects gene expression, controlling for the influence of body weight.

Source of variation	Sum of Squares	df	Mean Square	F	P
Body Weight	50.2	1	50.2	12.8	0.001
Diet	20.6	2	10.3	2.63	0.091
<u>Residual</u>	<u>78.0</u>	<u>19</u>	<u>4.11</u>		

<i>Total</i>	148.8	22			
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- What is the covariate in this case?
  - The first round of fitting has already occurred. Can you write out the F equations for this second round and interpret the results of this table on gene expression?
3. Researchers want to know whether **diet (Chow vs. HFD)** affects **Glucose12** after adjusting for **final weight (Weight12)**. They fit the model:

$$\text{Glucose12} = \beta_0 + \beta_1(\text{Weight12}) + \beta_2(\text{Diet} = \text{HFD}) + \varepsilon$$

Below is a complete summary table of descriptive statistics so that you do **not** need to compute any sums of squares or means by hand.

Source	SS	df	MS	F	p-value
<b>Weight12</b>	<b>1117.3</b>	1	<b>1117.3</b>	255.7	< 0.0001
<b>Diet</b>	<b>13 357.5</b>	1	<b>13 357.5</b>	3055.3	< 0.0001
<b>Residual</b>	<b>39.3</b>	9	<b>4.37</b>	—	—
<b>Total</b>	<b>14 514.1</b>	11	—	—	—

Explain these results – Can you do two rounds of fitting?

4. Researchers want to know whether the relationship between **Weight12** and **Glucose12** differs across the three strains of mice (B6, BALB, CAST). They fit the following ANCOVA model:

$$\text{Glucose12} = \beta_0 + \beta_1(\text{Weight12}) + \beta_2(\text{Strain}) + \beta_3(\text{Weight12} \times \text{Strain}) + \varepsilon$$

- Using the ANCOVA table below, decide whether the **Weight12 × Strain**
- interaction** should be kept or dropped.
- Explain your conclusion.

Source	SS	df	MS	F	p-value
<b>Strain</b>	291.4	2	145.7	33.41	0.0006
<b>Weight12</b>	<b>617.5</b>	1	617.5	141.6	<0.0001
<b>Strain × Weight12</b>	<b>72.4</b>	2	36.2	<b>0.81</b>	<b>0.321</b>
<b>Residual (Error)</b>	<b>26.2</b>	6	4.36	—	—
<b>Total</b>	1007.5	11	—	—	—