Module 5B Questions:

Does Hyperglycemia Risk Differ Between Male and Female Mice? Twelve mice (three strains) participated in a 12-week dietary intervention study where they were fed one of two types of Diet, regular mouse chow and a High-Fat Diet (HFD). Various measurements were taken, and at the end, each mouse was assessed for hyperglycemia ("Yes" or "No").

ID	Strain	Diet	Sex	Weight0	Weight12	Glucose12	Activity	Pparg	I16	Hyperglycemia
M1	B6	Chow	M	20	22	118	3.0	6	4	No
M2	B6	Chow	F	19	21	116	3.5	6	4	No
M3	B6	HFD	M	20	27	162	6.0	8	7	Yes
M4	B6	HFD	F	19	26	160	6.5	8	7	Yes
M5	BALB	Chow	M	19	21	114	4.0	6	4	No
M6	BALB	Chow	F	18	20	112	4.5	6	3	No
M7	BALB	HFD	M	19	25	158	7.0	7	7	Yes
M8	BALB	HFD	F	18	24	156	7.5	7	6	Yes
M9	CAST	Chow	M	18	20	110	5.0	6	3	No
M10	CAST	Chow	F	17	19	108	5.5	6	3	No
M11	CAST	HFD	M	18	24	154	8.0	7	6	No
M12	CAST	HFD	F	17	23	152	8.5	7	6	No

1. **Build the 2×2 table**
   Compare:
   - **Exposure:** Sex (Male vs Female)
   - **Outcome:** Hyperglycemia (Yes vs No)

Compute the number of males and females who *do* and *do not* have hyperglycemia.

2. Calculate the risk in each group

$$\text{Risk}_{\text{Male}} = \frac{\text{Male with hyperglycemia}}{\text{Total males}}$$
$$\text{Risk}_{\text{Female}} = \frac{\text{Female with hyperglycemia}}{\text{Total females}}$$

3. Compute the relative risk (RR)

$$RR = \frac{\text{Risk}_{\text{Male}}}{\text{Risk}_{\text{Female}}}$$

Indicate whether RR > 1, RR < 1, or RR ≈ 1.

4. Compute the 95% confidence interval for the RR

Use the standard log-method formula:

$$\ln(RR) \pm 1.96\sqrt{\frac{1}{a} - \frac{1}{a+b} + \frac{1}{c} - \frac{1}{c+d}}$$

where:

Sex	Hyperglycemia Yes	Hyperglycemia No
Male	a	b
Female	c	d

Then exponentiate the lower and upper bounds to get the CI on the RR scale.

5. Interpret the RR and CI

Discuss the following two questions based on your results:

- Do males appear to have higher, lower, or similar *risk* of hyperglycemia compared to females?
- Is your conclusion precise, or does the CI suggest uncertainty due to small sample size?