

39.1 Laboratory Data Analysis



Summarize main points from each video.

Video Title / topic _____

Video Title / topic _____

Video Title / topic _____

Topic Introduction



Summarize your understanding of each paragraph.

Quantitative data is in numerical form. Examples are measurements of mass, distance, velocity, and height. Qualitative data is not usually in numerical form. Examples are city of residence, type of car students drive, or species of an animal.

In a laboratory, most people think of quantitative data first. Making measurements with various instruments allows scientists to record data in a numerical form. Sometimes though, data is written down that is not numerical. Qualitative data is very useful also.

Students need to distinguish qualitative data from quantitative data. Sometimes the evaluation of these two different types of information produce different conclusions. That can happen in a laboratory too. Scientists use both types of information.

Improved scientific conclusions can be made by analyzing both qualitative and quantitative data. Sometimes, combining and comparing qualitative and quantitative data helps scientists make a new hypothesis. Students should be familiar with both.

Background Information



Scientists in Minnesota collected frog specimens living near a lake. There are several species of frogs found throughout the region. The scientists gathered male and female specimens representing three different species. The frogs are commonly called green frogs, bullfrogs and mink frogs.

Lithobates clamitans -- *Lithobates catesbeianus* -- *Lithobates septentrionalis*

The scientists collected six frogs of each species for a total of 18 frogs.

	female	male	count
Green frogs	3	3	6
Bullfrogs	3	3	6
Mink frogs	3	3	6

18 total specimens

The green frog is the second largest frog in Minnesota, second only to the bullfrog. Some green frogs are actually brown, bronze, or bluish instead of green. This species has two ridges down its back. Males have large tympanums (the round structures directly behind the eye).

The bullfrog is the largest frog in North America. It does not have ridges down its back. They are from 9 to 15 cm long from snout to vent. They are green with yellow throat in males and white throat in females.

The mink frog is very similar to the green frog. Males sometimes have a bright yellow throat – and often this species has distinctive bright green lips. They range in size from 4.8 to 7.6 cm long.

Basic Frog Data (Quantitative)

Each frog was tagged with a specimen ID. This helps the scientists keep track of information related to each individual frog.

Table 1: Basic Data

Specimen ID	sex	length (cm)	mass (grams)	
F-65:14	f	6.8	160	<< 160 g/6.8 cm
F-65:15	f	8.6	200	<< 200 g/8.6 cm
F-65:21	f	11.0	360	
F-65:24	f	7.6	150	
F-65:25	m	5.0	70	
F-65:61	f	9.5	230	
L-12:13	f	7.9	165	
L-12:18	m	12.0	330	
L-12:63	m	7.5	165	
L-12:68	m	8.3	170	
T-97:10	m	6.0	125	
T-97:12	m	9.0	210	
T-97:17	m	8.0	200	
T-97:19	m	15.0	480	
T-97:22	f	14.0	430	
T-97:25	m	6.7	125	
T-97:27	f	7.0	100	
T-97:28	f	6.5	130	

Calculate. Divide mass by length of each specimen. This will provide you a ratio in grams per centimeter of each frog specimen.

Note. This ratio will be helpful to identify the species of each frog. Usually, this ratio is in the range of 20-26 grams per centimeter for green frogs. The ratio is usually in the range of 24-33 g/cm for bullfrogs. And the ratio is usually 15-23 for the mink frog.

Identify the Species. Based on your calculated values, make an initial educated-guess. What is the most likely species of each frog listed?

Qualitative Frog Data



Each frog has been described using color and other observable features. Notice some of the data is missing.

Table 2: Qualitative Data

Specimen ID	color	underside	throat	lips	ridges	tympanums	texture
F-65:14	Green	--	--	--	yes	--	smooth
F-65:15	Brown-Green	white	--	--	--	small	--
F-65:21	Green	white	white	--	no	--	--
F-65:24	Brown	pale	--	--	yes	--	--
F-65:25	Blotchy-green	--	--	bright green	yes	large	--
F-65:61	Green	white	white	--	no	--	bumpy
L-12:13	Bronze	white	--	--	yes	--	--
L-12:18	Green	--	--	--	no	--	--
L-12:63	Green	--	bright yellow	--	--	--	smooth
L-12:68	Brown	--	--	--	--	large	--
T-97:10	Brown	--	yellow	--	yes	large	--
T-97:12	Brown-Green	white	--	--	yes	large	--
T-97:17	Green	white	yellow	--	no	--	bumpy
T-97:19	Green	--	--	--	--	--	--
T-97:22	Green	white	--	--	--	--	--
T-97:25	Brown	pale	--	--	yes	--	--
T-97:27	Blotchy-green	pale	yellow	--	yes	--	--
T-97:28	Brown	--	--	bright green	yes	--	--

Review. Re-read the background information about the three types of frogs.

Identify the Species. Based on the qualitative information provided in this table, make an educated guess as to the species of each frog listed.

Combining the Data

Circle your assessment of quantitative and qualitative for each specimen. Then use your best judgment to write a final conclusion.

Specimen ID	Quantitative			Qualitative			FINAL
F-65:14	green	bull	mink	green	bull	mink	
F-65:15	green	bull	mink	green	bull	mink	
F-65:21	green	bull	mink	green	bull	mink	
F-65:24	green	bull	mink	green	bull	mink	
F-65:25	green	bull	mink	green	bull	mink	
F-65:61	green	bull	mink	green	bull	mink	
L-12:13	green	bull	mink	green	bull	mink	
L-12:18	green	bull	mink	green	bull	mink	
L-12:63	green	bull	mink	green	bull	mink	
L-12:68	green	bull	mink	green	bull	mink	
T-97:10	green	bull	mink	green	bull	mink	
T-97:12	green	bull	mink	green	bull	mink	
T-97:17	green	bull	mink	green	bull	mink	
T-97:19	green	bull	mink	green	bull	mink	
T-97:22	green	bull	mink	green	bull	mink	
T-97:25	green	bull	mink	green	bull	mink	
T-97:27	green	bull	mink	green	bull	mink	
T-97:28	green	bull	mink	green	bull	mink	

Using your data assessment from the quantitative and qualitative information, circle green frog, bullfrog or mink frog for each specimen. Some of these may suggest two different species for a given frog. Give your final answer based on analyzing all of the data provided.

Compare your Conclusions



After completing the previous pages, compare your conclusions with this list.

Some of your conclusions may vary from this list. That's okay. The intention of this exercise is to experience how quantitative and qualitative data can be combined.

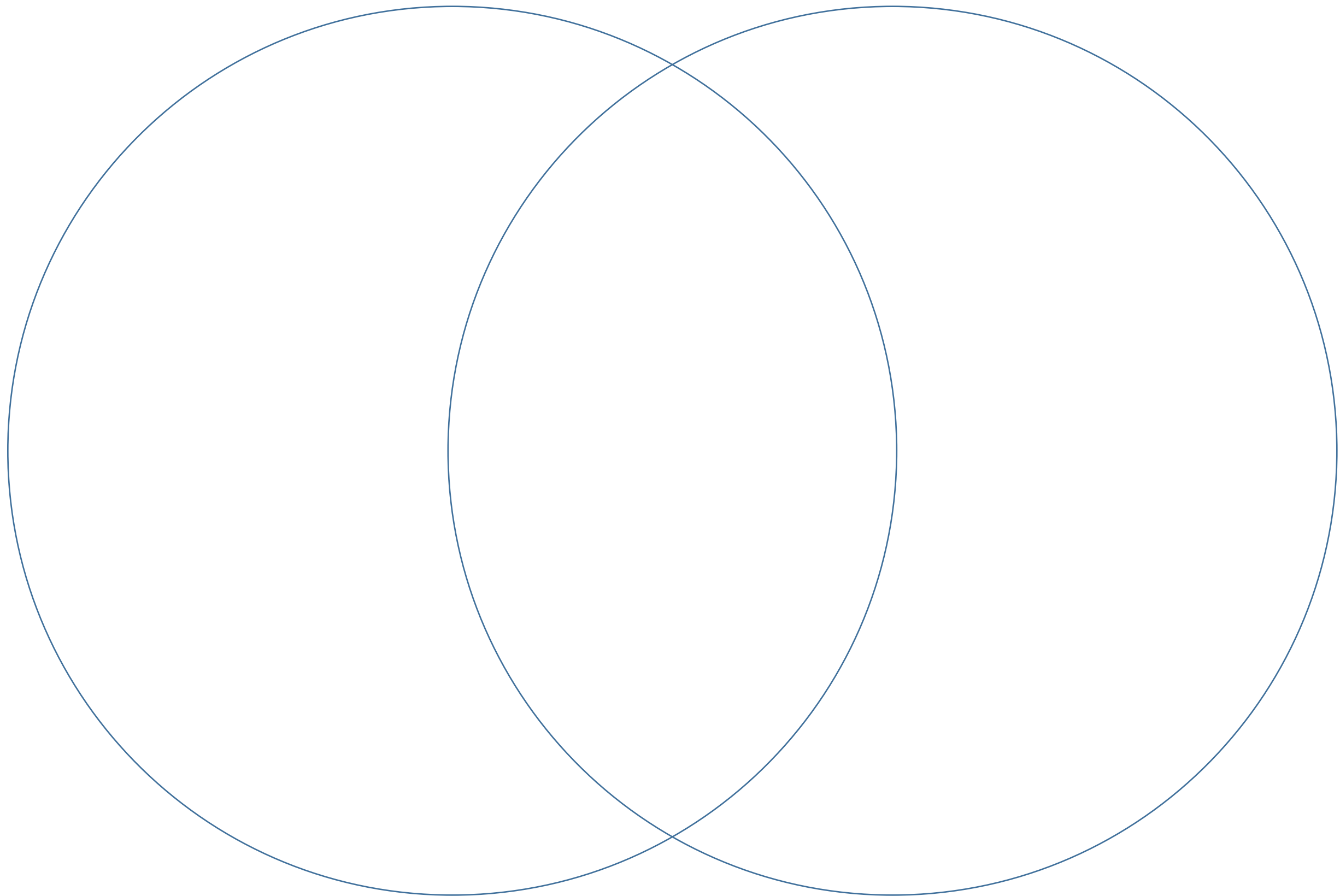
T-97:28	Mink frog
T-97:27	Mink frog
T-97:25	Mink frog
T-97:22	Bull frog
T-97:19	Bull frog
T-97:17	Bull frog
T-97:12	Green frog
T-97:10	Green frog
L-12:68	Mink frog
L-12:63	Green frog
L-12:18	Bull frog
L-12:13	Green frog
F-65:61	Bull frog
F-65:25	Mink frog
F-65:24	Mink frog
F-65:21	Bull frog
F-65:15	Green frog
F-65:14	Green frog

Show your Smarts!

Complete a Venn Diagram: Compare and contrast quantitative and qualitative data used for scientific investigation.

Quantitative

Qualitative



Write a Brief Essay: Write 35-45 words about what you have learned in this module.
