Buck & Doe Ratio

Title: Buck to Doe Ratio

Standard(s) Met:

- ★ **Common Core State Standards: Math**
- ★ **Ratios and Proportional Relationships**
- ❑ **Understanding ratio concepts and use ratio reasoning to solve problems.**
  - ❑ CCSS.Math.Content.6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*
  - ❑ CCSS.Math.Content.6.RP.A.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
  - ❑ CCSS.Math.Content.6.RP.A.3.C Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

Overview: Students will engage in a sampling activity to determine the ratio of bucks to does.

Learning Outcomes:

- Students will be able to examine the blacktail deer population data to determine the ratio of bucks to doe's.
- Students will be able to analyze their findings after completing the sampling activity and explain how their findings varied based on the sample size.

Logistics: This activity will take place in the classroom. Students will be put into pairs. Teachers will need to prep the bags with 56 beans.

Materials Needed/Preparation/Equipment:

- ➢ Brown paper bags (enough for each pair)
- ➢ 56 Beans for each group (16 males and 40 females) Use different colors to represent does and bucks.
- ➢ Digital copy to show sample sizes taken by each pair
- ➢ Note cards for exit tickets
- ➢ Interview with Lindsay Belonga, Wildlife Biologist

- ➢ Blacktail deer data (Table 5)
- ➢ Activity sheet

Time Frame: This activity will take one class period. The lesson can be extended if needed.

Background for teachers: In order for students to be able to complete this lesson, they will need to have prior knowledge about ratios. If they have not done ratios before they will need some explanation beforehand.

The data used for this lesson was pulled from a real study that is being conducted by the Confederated Tribes of Grand Ronde.

Key vocabulary:

1. **Ratio-** The quantitative relation between two amounts showing the number of times one value contains or is contained within the other.
2. **Buck-** Male deer
3. **Doe-** Female deer

Considerations for teachers:

Assessments: Use the students sampling activity sheet to check for understanding.

Practices: Students will make sense of problems and persevere in solving them, use mathematical models, reason abstractly and quantitatively, construct viable arguments and critique the reasoning of others.

Learning Targets:

I can *determine a ratio with two given numbers.*
I can *analyse data, ask questions and discuss statistical information.*

Activities:

1. Have students watch the video of Grand Ronde wildlife biologist Lindsay Belonga.
2. Have students get into pairs.
3. Pass out the background information for students. Have each pair read the background information and write down three things each, that they got as a take away from the sheet.
4. Have students find a new partner and share with their new partner what they learned from the background sheet.
5. Show students the data sheet labeled Blacktail Deer table 5. Tell students that this is the information the biologists were able to collect from the deer pellets. Explain to students

that by collecting the pellets the biologists were able to extract DNA from them and identify each deer as a buck or doe.

6. Inform students that they will only be focusing on the male and female deer for this activity.
7. The goal of this activity is for students to use sampling techniques to determine the ratio of bucks to does. In the sample with 89 data points, 56 were individual deer. Of those 56 individual deer, 16 were male (bucks) and 40 were female (does). This means for every 2 bucks (28%) there are 5 females (72%).
8. Students will do a simulation using paper bags to represent a node and slips of paper or beans will represent the deer. All of the bags should be set up the same. For example, 56 beans or slips of paper, with 16 marked as male and 40 marked as female. See notes for ideas for this part.
9. Working in pairs, have students take sample sizes of 7, 21, 35 and record how many males/females they draw. “Deer” should be left out as the sample size increases.
10. Have students determine total bucks and total does in each simulation for each sample size and calculate the percentage of male and female.
11. Have students record their data on a class chart so they can see the data from all groups. See digital table in slide show and to the right of his text.
12. Before analyzing the whole class data, ask the students to use their own sampling to make a prediction of the percentages of bucks and does in the population. On what did they base their prediction?
13. Show the class data for sample sizes of 7 to the class. As a class, analyze the data. What do you notice about the data? Why do you think that is true? How accurate do you feel your prediction would be? If these questions don’t come out, ask the following questions. What do you notice about the variance in the percentages when the sample size was seven?
14. Now show the class data for the sample size of 21. What do you notice about the data? How is the variance different from the sample size of 7? How accurate do you feel your prediction would be if you based it on this sample size?
15. Repeat the analysis with the sample size of 35. Which sample size showed the most variability? Which sample size showed the least variability? On which sample size would you rather base your prediction? Explain your thinking.
16. Use the class data to make a prediction on the percentages of bucks and does in the sample. On what did you base your prediction and what influenced your thinking? What is your prediction now that you have looked at many samples?

Options/Extensions/Anticipatory set/Differentiation: When having students do the sampling activity it can be helpful to mark the bags ahead of time and let students assume that each bag has a different amount of beans in the bag. It is also helpful to collect the bags from students before the end of the lesson so that they cannot count the beans before making their predictions.

Reflection/Closure: Quickwrite/exit ticket: Explain how sampling part of a population can give you information on the whole population..

Attachments:

- Blacktail deer data (Table 5)
- Digital copy to show sample sizes taken by each pair
- Interview Lindsay Belonga, Wildlife Biologist
- Activity sheet

Blacktail Deer Data Background (for teacher)

The Confederated Tribes of Grand Ronde has been working towards regaining and retaining hunting and fishing rights for tribal members since 1983, when the tribe was restored with federal recognition. Today, the tribe has a Natural Resources Department (NRD) that “serves the Grand Ronde tribal membership through responsible stewardship of all natural resources important to the cultural identity, self-sufficiency, and **sovereignty** (inherent authority of indigenous tribes to govern themselves within the borders of the United States) of current and future generations.” Hunting and fishing rights are important to the tribe because it helps promote land management, land conservation and also allows the tribe to continue to practice cultural ceremonies and activities.

The purpose of this study is to obtain reliable blacktail deer population estimates to help the tribe determine how many additional hunting tags should be distributed to tribal members. Currently the tribe nor the Oregon Department of Fish and Wildlife have an estimate on the deer population in Oregon. The Trask hunting unit is on reservation land and is open to the public. Over distributing hunting tags in the Trask unit could potentially have a negative effect on the habitat on the reservation.

A panel of seven microsatelites and two sexing markers were used to screen all 269 samples. Of the 269 samples, 89 (33%) produced data at five or more loci in Panel 1. Forty samples (15%) failed at all loci, and the remaining 140 samples (52%) amplified at 1-5 loci. The 89 samples that amplified at ≥5 loci were identified as 56 unique deer, of which 40 were female and 16 were male (1 male : 2.5 females). In addition to the 19 deer that were recaptured within the 2017 data set, several deer sampled in 2017 were previously sampled in 2015 and/or 2016. For the sake of this lesson, we will be using table 2, which gives information on 89 samples that were collected.

A team from NRD was assembled to go out on the reservation to collected fresh deer pellets. The surveyed area consisted of habitats that were freshly logged or the trees were only 0-5 years old. The team covered 403 acres of land. The attached excel sheet labeled 2017 Node Locations. The map shows where each node plot is and how many pellets were collected from that node.

In addition to microsatellite loci, each panel contained 2 markers for sex identification. The markers are repeated twice because you get two genes on the allele, one from each parent.

The sample ID's (example BTD17.001) represent the fecal samples that were collected. BTD stands for blacktail deer, while the number 17 stands for the year the data was collected, i.e. 2017. The last three digits indicate the sample number. You will notice that there are some missing samples. That is because not all of the samples that were collected were blacktail deer or the quality of the sample wasn't complete enough to determine it's species. The data on table 2 represents the all complete locus, which was only 33% of that data.

The data in the body of the excel sheet show the specific alleles the microsatellite primers target. Meaning if that allele shows up, we know it's a blacktail deer and that the number is unique to that individual. For example BTD17.001 matches BTD17.005 which shows us that it's the same deer because their alleles are the same. The alleles also show us which deer are male and which ones are females. Which helps us identify the ratio of female to male deer on the reservation.

Grand Ronde Blacktail Deer Population Study

The Confederated Tribes of Grand Ronde has been working towards taking back and keeping it's hunting and fishing rights for tribal members since 1983, when the tribe was restored with federal recognition. This is an example of how the tribe uses sovereignty. Today, the tribe's Natural Resources Department helps support that goal, as well as being responsible for the stewardship of natural resources on the reservation. Hunting and fishing rights are important to the tribe because it helps promote land management, land conservation and also allows the tribe to continue to practice cultural ceremonies and activities.

In the spring of 2017 the tribe's Natural Resources Department did a study where they collected fecal samples from 269 blacktail deer. A team of four Grand Ronde wildlife biologists were assembled to collect fresh deer pellets on the reservation.The purpose of this study was to help identify the blacktail deer population on the reservation. This information would help the tribe make a decision to supply tribal members with additional hunting tags during deer hunting season. The wildlife biologists are able to pull DNA from the deer pellets so they know if they've already collected pellets from a deer more than once.

The area that the wildlife biologists collected deer pellets were habitats that were freshly logged or the trees were only 0-5 years old. The team covered 403 acres of land. Fresh deer pellets were collected into containers that held 95% ethanol and then stored at room temperature, until ready to be analyzed for DNA.

Currently, the tribe doesn't have an estimate on the deer population on the reservation. The reservation falls in the Trask unit and is open to the public to hunt. This is a general season tag. Over distributing hunting tags in the Trask unit could have a negative effect on the habitat on the reservation. Overpopulation of deer can also cause a loss in agriculture and vegetation, causing a rippling effect on the habitat.

Names:_____

_____

How Many Bucks & How Many Does

1. Begin by deciding who will do what. One partner will be the recorder the other partner will be the one pulling the beans from the bag.

2. First pull out 7 beans.

How many Bucks did you pull out? _____ How many Does did you pull out? ____

3. Keep the 7 beans you already pulled out and take out 14 more beans.

How many Bucks did you pull out? _____ How many Does did you pull out? ____

4. Keep the 21 beans you have and now pull out 14 more beans.

How many Bucks did you pull out? _____ How many Does did you pull out? ____

★ Now, use your data and fill in the table below

Sample Size	Bucks	Does	Ratio of Bucks to Does	Percent of Bucks	Percent of Does
Example: 5	1	4	1 to 4 Or 1:4	$1 \div 5 = 20\%$	$4 \div 5 = 80\%$
7					
21					
35					

★ Based on your samples, how many bucks and how many does do you think there are? Bucks:_____ Does:_____

★ Fill in the blank: The ratio of bucks to does on the reservation is ___ : ___, because for every _____ bucks there are _____ does.

★ What happened as your sample sizes got bigger?_____

_____

Bucks and Does

Ratios and Graphing

Title: Blacktail Deer Data

Standard(s) Met:

- ★ **Common Core State Standards: Math**
- ★ **Ratios and Proportional Relationships**
- ❑ CCSS.Math.Content.6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- ❑ CCSS.Math.Content.6.RP.A.3.A Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

Overview: Students will use real data using ratios of bucks to does on the Grand Ronde reservation to find missing values in a ratio table and be able to plot those values on a graph.

Learning Outcomes:

- Students will be able to find the missing value in a ratio table.
- Students will be able to plot the ratios on a graph.
- Students will be able to analyze a ratio graph for information.

Logistics: This lesson will take place in the classroom. Parts of the lesson will include partner work, whole group discussion and individual work.

Materials Needed/Preparation/Equipment:

- Activity sheet
- Part 2 of interview with Lindsay Belonga

Time Frame: This lesson will take one class period. It can be extended if needed.

Background for teachers:

Key vocabulary:

1. **Ratio table-**
2. **Ratio-**

Considerations for teachers:

Assessments: Use the activity sheet to assess understanding.

Practices: Students will make sense of problems and persevere in solving them, use mathematical models.

Learning Targets:

I can *solve real world problems using statistical models and reasoning of ratios.*

I can *find missing values on a table using mathematical equations.*

Activities:

1. Have students do a share one, get one activity to review from the previous day. Have students get with a partner and share one thing they learned, remembered or found interested from the previous lesson. Then have students switch partners and do this one more time.
2. Explain to students that ratios are in the world around us and sometimes we have to solve a ratio in order to figure out information.
3. Have students watch part 2 of the interview with Lindsay Belonga. This will give them more information on how biologists take deer pellets and use them to distinguish between bucks and does.
4. Once the video is over, pass out the activity sheet to each student.
5. Teachers may walk students through the first one to show students how to complete the process.
6. Allow enough time for students to fill in the ratio table.

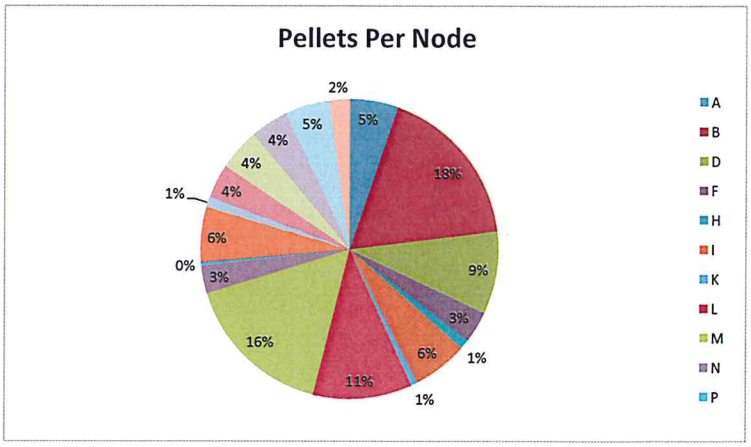
Options/Extensions/Anticipatory set/Differentiation:

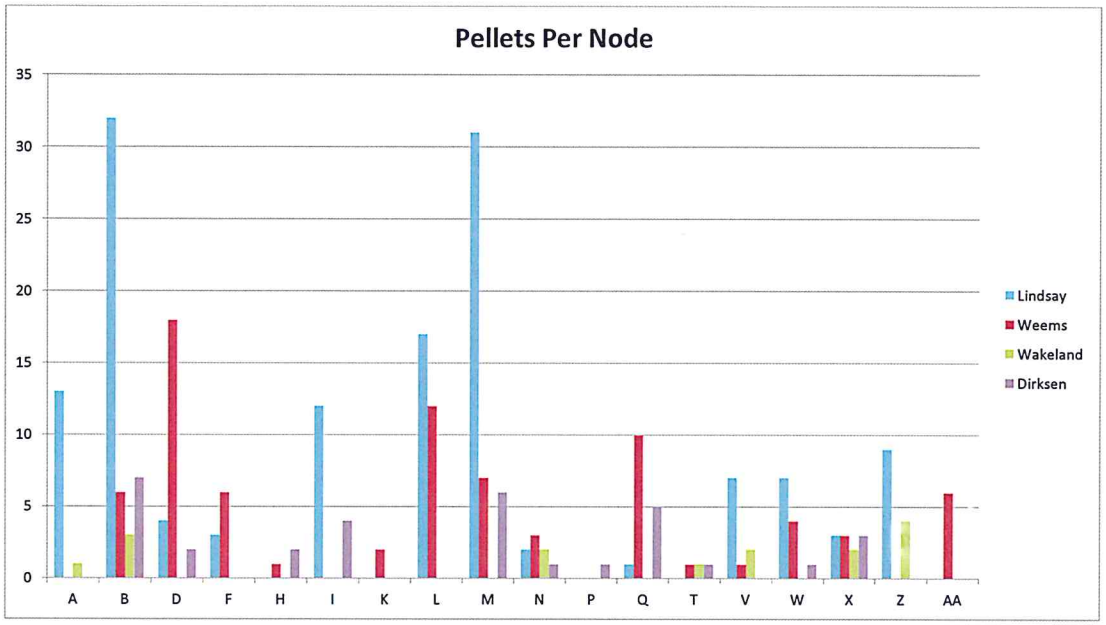
Reflection/Closure: To close the lesson have students plot the information they have recorded onto a graph. This information will eventually show them that the larger the population size, the more accurate their ratios will be.

Attachments:

- ➢ Activity sheet
- ➢ Part 2 of interview with Lindsay Belonga

Nodes	Pellets	Lindsay	Weems	Wakeland	Dirksen
A	14	13	0	1	0
B	48	32	6	3	7
D	24	4	18	0	2
F	9	3	6	0	0
H	3	0	1	0	2
I	16	12	0	0	4
K	2	0	2	0	0
L	29	17	12	0	0
M	44	31	7	0	6
N	8	2	3	2	1
P	1	0	0	0	1
Q	16	1	10	0	5
T	3	0	1	1	1
V	10	7	1	2	0
W	12	7	4	0	1
X	11	3	3	2	3
Z	13	9	0	4	0
AA	6	0	6	0	0
SUM	269	141	80	15	33





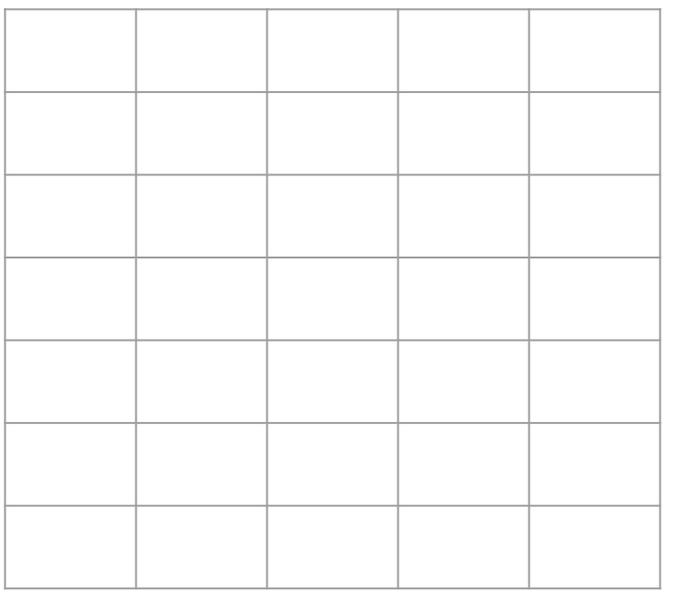
Name:_____

Bucks and Does Ratio Table & Graphing

The Grand Ronde Tribe is studying the Blacktail Deer population to determine how many hunting tags to give to tribal members. In order to do this the wildlife biologists have collected deer pellets and then pulled DNA from those deer pellets to identify which deer are bucks and which ones are does. This helps them make an estimate of how big the population size is. The more samples they collect they more accurate their estimate is.

1. Fill in the missing data on the ratio table.
2. Label the graph next to the ratio table.
3. Plot the pairs of values on the coordinate plane.

X(buck)	Y(doe)	(x,y)
2	6	(2,6)
	10	
6		
8	18	
12	26	
	30	



1. There is 1 buck for every 5 does. Create a ratio table that shows how many bucks increase to does, as the sample sizes increase.
2. Plot the values on the coordinate plate.

X	Y	(x,y)