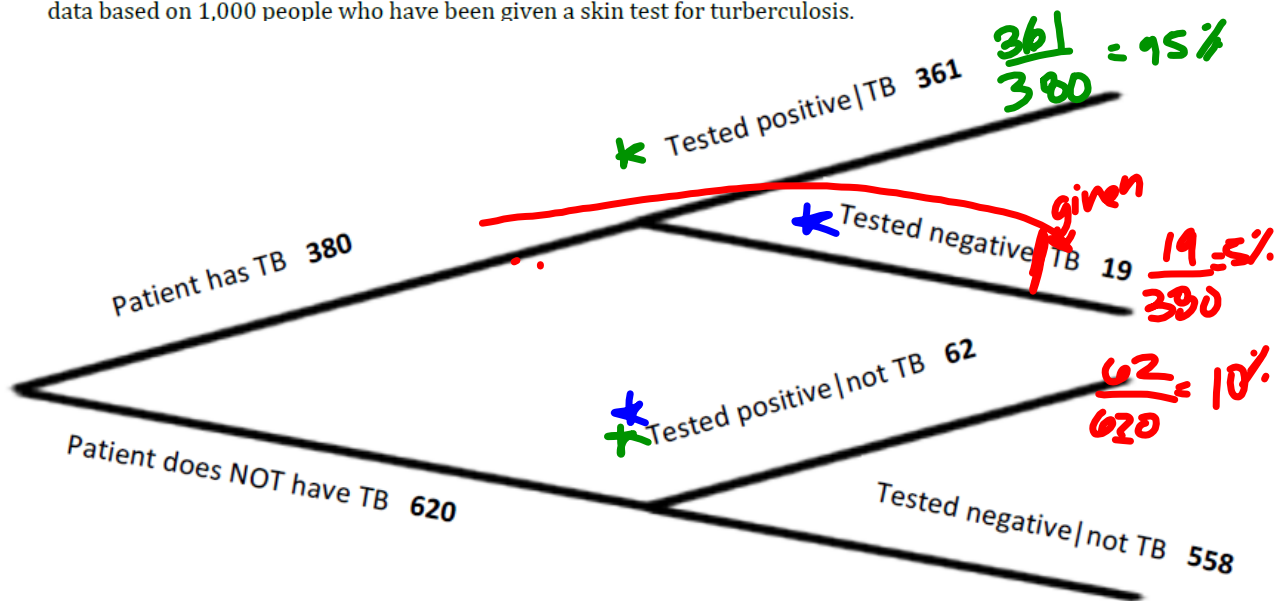


### 9.1 TB or Not TB?

#### A Develop Understanding Task



Tuberculosis (TB) can be tested in a variety of ways, including a skin test. If a person has tuberculosis antibodies, then they are considered to have TB. Below is a tree diagram representing data based on 1,000 people who have been given a skin test for tuberculosis.



1. What observations do you notice about TB tests based on the tree diagram?  
 $\frac{620}{1000}$  Do not have TB  $\frac{19}{380}$  tested neg, but actually have TB
2. You may have noticed that 380 patients have TB, yet not all 380 patients with TB tested positive. In statistics, the notation: "Tested negative | TB" means 'the number of patients who tested negative, given that they have TB'. Determine the probability that a person who has TB could receive a negative result compared to others who have TB. What does this mean?

$\frac{19}{380}$  5%

This is an example of **conditional probability**, which is the measure of an event, given that another event has occurred.

- Write several other probability and conditional probability statements based on the tree diagram.

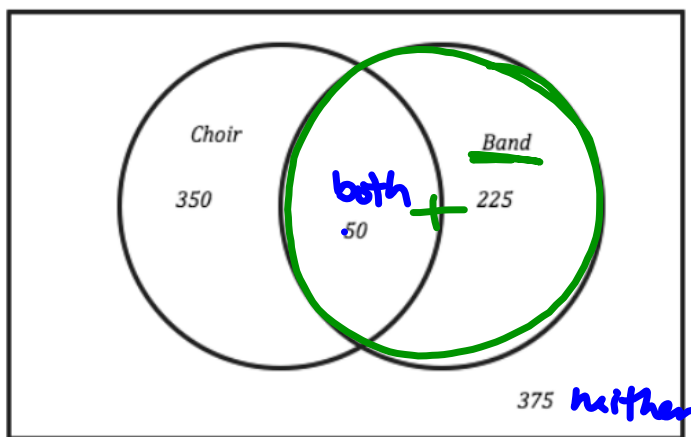
Part of understanding the world around us is being able to analyze data and explain it to others.

- Based on the probability statements from the tree diagram, what would you say to a friend regarding the validity of their results if they are testing for TB using a skin test and the result came back positive?  $\frac{62}{620}$  10%. chance that it is a false positive
- In this situation, explain the consequences of errors (having a test with incorrect results).  
quarantined. infect more people
- If a health test is not 100% certain, why might it be beneficial to have the results lean more toward a false positive? fake pos is better - it is more cautious
- Is a sample space of 200 enough to indicate whether or not this is true for an entire population?  
too small of a sample size.  
more people = more accurate

**READY**

Topic: Venn Diagrams, how to create and read.

For each Venn Diagram provided answer the questions.



1. How many students were surveyed?

add all = 1000

2. What were the students asked?

Are you in choir or band?

3. How many students are in both choir and band?

50

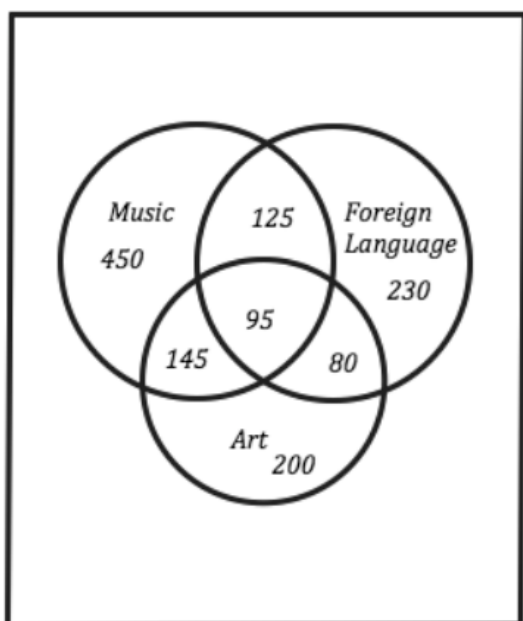
4. How many students are not in either choir or band?

375

5. What is the probability that a randomly selected student would be in band?

$$\frac{275}{1000}$$

$$\frac{275}{1000} = 27.5\%$$



This Venn Diagram represents enrollment in some of the elective courses.

6. What does the 95 in the center tell you?
7. What does the 145 tell you?
8. How many total students are represented in the diagram?
9. Which elective class has the least number of students enrolled?

**SET**

Topic: Interpreting a tree diagram to determine probability

Given the tree diagram below answer the questions and determine the probabilities. The diagram represents the number of plate appearances during the first month of a minor league baseball season.

10. How many times did a batter come to the plate during this time period?

$$1193 + 417 = 1610$$

11. Based on this data, if you are a left-handed batter what is the probability that you will face a right-handed pitcher?

$$255 / 417 = 61.5\%$$

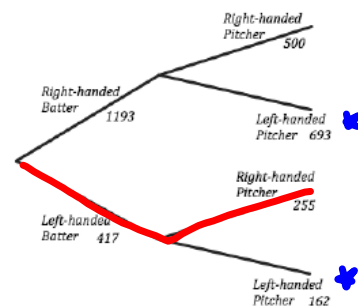
12. Based on this data, if you are a right-handed batter what is the probability that you will face a left-handed pitcher?

13. What is the probability that a left-handed pitcher will be throwing for any given plate appearance?

$$162 + 693 = 855$$

$$855 / 1610 = 53\%$$

14. What is the probability that a left-handed batter would be at the plate for any given plate appearance?



What observations do you make about the data? Is there any amount that seems to be overly abundant? What might account for this?

GO

Topic: Basic Probability

1-6

cards = 52

**Find the probability of achieving success with each of the events below.**

15. Rolling an even number on standard six-sided die.

2, 4, 6

$$\frac{3}{6} = 50\%$$

16. Drawing a black card from a standard deck of cards.

17. Flipping a coin and getting Heads three times in a row.

$$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$$

18. Rolling a die and getting a four.

19. Drawing an ace from a deck of cards.

20. Rolling a die twice in a row and getting two threes.

21. From a bag containing 3 blue, 2 red, and 5 white marbles. Pulling out a red marble.

## 9.2 Chocolate versus Vanilla

### A Solidify Understanding Task

Danielle loves chocolate ice cream much more than vanilla and was explaining to her best friend Raquel that so does most of the world. Raquel disagreed and thought vanilla is much better. To settle the argument, they created a survey asking people to choose their favorite ice cream flavor between chocolate and vanilla. After completing the survey, the following results came back:



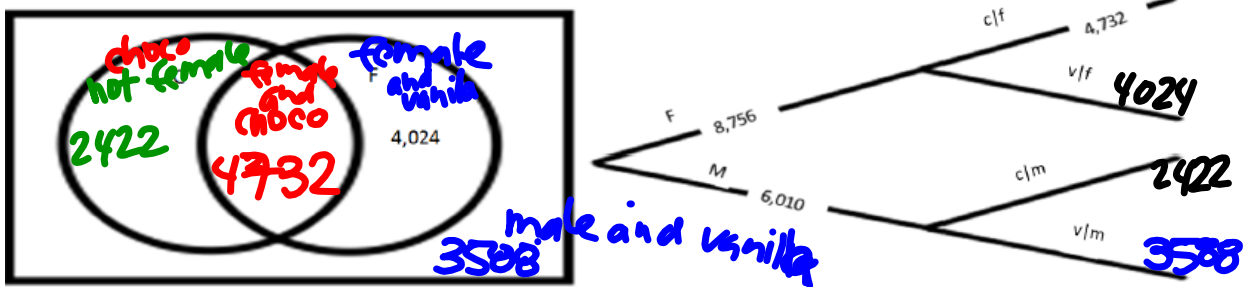
- There were 8,756 females and 6,010 males who responded.
- Out of all the males, 59.7% chose vanilla over chocolate →  $6010 \times \frac{59.7}{100} = 3588$
- 4,732 females chose chocolate.

1. Upon first observations, which flavor do you think “won”? \_\_\_\_\_ . Write a sentence describing what you see at ‘first glance’ that makes you think this.
2. Raquel started to organize the data in the following two-way table. See if you can help complete this (using counts and not percentages):

	Chocolate	Vanilla	Total
Female	<u>4732</u>	4024	8,756
Male	<u>2422</u>	<u>3588</u>	6,010
Total	7154	<u>7612</u>	14,766

Vanilla won

3. Organize the same data in a Venn diagram and a tree diagram.



4. Using your organized data representations, write probabilities that help support your claim regarding the preferred flavor of ice cream. For each probability, write a complete statement as well as the corresponding probability notation.

$\frac{7612}{14,766} = 52\%$ . 7612 people chose vanilla over chocolate out of 14,766.

5. Looking over the three representations (tree diagram, two-way table, and Venn diagram), what probabilities seem to be easier to see in each? What probabilities are hidden or hard to see?

Highlighted (easier to see)	Hidden
Tree diagram conditional statements	Tree diagram doesn't show totals
Two-way table Show totals Condition statements	Two-way table hard to separate data mutually exclusive
Venn diagram Joint & excluded info is easy to see	Venn diagram Conditional statements.

6. Getting back to ice cream. Do you think this is enough information to proclaim the statement that one ice cream is favored over another? Explain.



SECONDARY MATH II // MODULE 9  
 PROBABILITY - 9.2

9.2

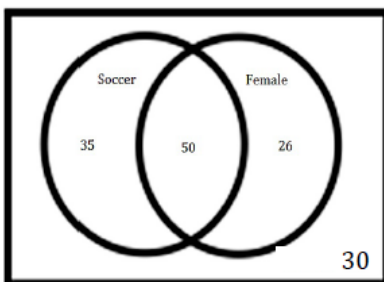
READY, SET, GO!	Name	Period	Date
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**READY**

Topic: Analyzing data given in a Venn Diagram.

Use the Venn Diagrams below to answer the following questions. (Hint: you may use the same data provided in the two-way table from question 3 on the next page to help make sense of the Venn Diagram)

The following Venn Diagram represents the relationship between favorite sport (Soccer or Baseball) and gender (Female or Male).

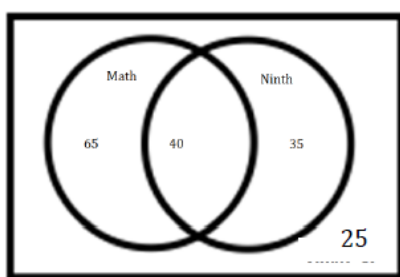


1. How many people said soccer is their favorite sport?
2. How many females are in the data?
3. How many males chose baseball?
4. What is the probability that a person would say soccer is their favorite sport?  $P(\text{soccer}) =$

Example conditional statements:

5. What is the probability that a female would say soccer is their favorite sport? ("Out of all females, % say soccer is their favorite sport")  $P(\text{soccer} | \text{female}) =$

The following Venn Diagram represents the relationship between favorite subject (Math or Science) and grade level (Ninth or Tenth). Using this data, answer the following questions.



6. How many people said math is their favorite subject?

$$65 + 40 = 105$$

7. How many tenth graders are in the data?

$$65 + 25 = 90$$

8. How many ninth graders chose science?

9. What is the probability that a person would say science is their favorite subject?  $P(s) =$

10. What is the probability that a tenth grader would say science is their favorite subject? ("If you are a tenth grader, then the probability of science being your favorite subject is \_\_\_\_ %")  $P(\text{science} | \text{tenth}) =$

$$\frac{\text{10th and science}}{\text{all 10th}} = \frac{25}{90} = 27.8\%$$

**SET**

Topic: Writing conditional statements from two-way tables *\*use examples on previous page as templates*

11. Complete the table and **write three conditional statements.**

1. Out of all the females, \_\_\_\_\_ % soccer is their favorite.

2. If you are a boy, then the probability of soccer being your favorite is \_\_\_\_\_ %.

3.

	Soccer	Baseball	Total
Male		30	
Female	50		76
Total	85		

12. Complete the table about preferred genre of reading and write three conditional statements.

	Fiction	Non-Fiction	Total
Male		10	
Female	50		60
Total	85		

13. Complete the table about favorite color of M&M's and write three conditional statements.

	Blue	Green	Red	Other	Total
Male	15	20	15		60
Female	30	20		10	
Total	45				130

14. Use the information provided to make a tree diagram, a two-way table and a Venn Diagram.

- Data was collected at the movie theater last fall. Not about movies but clothes.
- 6,525 people were observed.
- 3,123 had on shorts and the rest had on pants
- 45% of those wearing shorts were denim.
- Of those wearing pants 88% were denim.

GO

Topic: Basic Probability

Find the desired values.

15. What is half of one-third?

$$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$$

17. What is one-fourth of four-sevenths?

$$\frac{1}{4} \times \frac{4}{7} = \frac{4}{28} = \frac{1}{7}$$

16. What is one-third of two-fifths?

18. What percent is  $\frac{5}{8}$ ?

19. What is 35% of 50?

$$.35 \times 50 = 17.5$$

$$\frac{35}{100} = \frac{x}{50}$$

20. Seventy is 60% of what number?

$$\frac{70}{.60} = \frac{.60 \times ?}{.60} = 117$$

$$\text{or } \frac{70}{x} = \frac{60}{100}$$

21. Write  $\frac{7}{12}$  as a percent.

22. Write  $\frac{6}{6}$  as a percent.

23. What is 52% of 1,200?

24. What percent is 32 of 160?

25. Sixty is what percent of 250?

26. What percent of 350 is 50?