

Name: _____

KEY

Period: _____

Algebra 2

Chapter 11: Probability and Statistics

Targets	Learning Targets	Got it	Ok	No way
T11-1	I can identify types of data collection and improve flaws in the design.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T 11-2	I can describe a distribution of data and select appropriate measures of center and spread.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T 11-3	I can construct a relative frequency table and find an expected value.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T 11-4	I can use Tree and Venn diagrams to find probabilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Date	Lesson/Activity	Homework Assignment o = only do odd problems	Turned In?
4/11 4/14	T11-1 11.1 Design a Study	11.1 Pg.727 #10-21, 23, 26, 28-29	
	T11-1 Survey Question		
4/15 4/16	T 11-2 11.2 Distribution of Data	11.2 Pg.739 #5-10, 13, 21-23	
4/21 4/22	T11-3 11. 3 Probability Distribution 11-4	Probability Distribution and Expected Value Worksheet	
4/23 4/24	T 11-4 Tree Diagrams 11-3	Tree Diagram Worksheet	
4/25 4/28	T 11-4 Venn Diagrams	Venn Diagram Worksheet	
4/29 4/30	Review	Ch. 11 ART	
5/1 5/2	Ch. 11 Test	<i>You must have all stamps in order to be eligible for retakes.</i>	

Retake/Revision Problems for Stats

T Stat- 1	I can find the mean, median, mode, and 5-number summary of a set of data.	Stat 1 Retake Worksheet Measures of Center
T Stat- 2	I can create and interpret a box plot given a set of data.	Stat 2 Retake Worksheet 5# Summary and Box and Whisker Plots
T Stat- 3	I can find and interpret the standard deviation of a set of data.	Stat 3 Retake Worksheet Standard Distribution

You may revise and turn in your project for additional credit. However I need to see you have done the STAT homework (WS's above) first.

11.3 Probability Distribution and Expected Value

Identify the random variable in each distribution, and classify it as *discrete* or *continuous*. Explain your reasoning.

1. The number of bytes in the memory of a computer. *discrete*

5. The number of strikes thrown by a pitcher. *discrete*

2. The world population. *# of people discrete*

6. The mass of a cell. *continuous*

3. The mass of a banana. *weight → continuous*

7. The number of chapters in a book. *discrete*

4. The speed of a car. *mph continuous*

8. The number of chips in a package. *discrete*

9. CARDS Chuck is drawing a card from a special deck that includes the following cards.

Card Value	1	2	3	4	5	6	7
Frequency	6	10	9	4	8	7	6

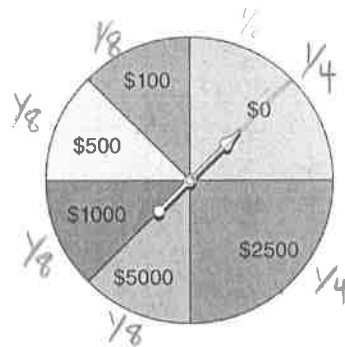
= 50

rel freq $\frac{6}{50} \frac{10}{50} \frac{9}{50} \frac{4}{50} \frac{8}{50} \frac{7}{50} \frac{6}{50} = \frac{193}{50} = 3.86$

What is the expected value of the drawn card?

$E(x) = 3.86$

10. GAMES A contestant won two spins of the wheel.



a. Construct a relative-frequency table.

Sum (\$)	0	100	500	1000	5000	2500	200	600	1100	5100
Relative Frequency	1/16	2/32	2/32	5/64	1/8	2/32	1/64	2/64	2/64	2/64
Sum (\$)	2600	1500	5500	3000	2000	6000	3500	10000	7500	
Relative Frequency	2/32	2/64	2/64	2/32	1/64	2/64	2/32	1/64	2/32	

b. What is the expected value of two spins?

$$\frac{0}{16} + \frac{200}{32} + \frac{1000}{32} + \frac{5000}{64} + \frac{5000}{8} + \frac{5000}{32} + \frac{200}{64} + \frac{1200}{64} + \frac{2200}{64} + \frac{10200}{64} + \frac{5200}{32} + \frac{3000}{64} + \frac{11000}{64} + \frac{6000}{32} + \frac{2000}{64} + \frac{12000}{64} + \frac{7000}{32} + \frac{10000}{64} + \frac{15000}{32}$$

$E(x) = \$2743.75$

$\frac{10975}{4} = 2743.75$

11. DRAWINGS Sarah can buy a \$10 ticket for each of the following drawings.

Drawing 1					
Prize Value	\$0	\$10	\$50	\$100	\$500
Frequency	0.80	0.14	0.03	0.02	0.01

Drawing 2					
Prize Value	\$0	\$10	\$100	\$500	\$1000
Frequency	0.90	0.075	0.015	0.005	0.005

0 1.40 1.5 2 5

0 .75 1.5 2.5 5

a. What is the expected value of two drawings?

Draw 1: $E(x) = \$9.9$ Draw 2: $E(x) = \$9.75$

b. Which drawing would you recommend for Sarah? Explain your reasoning.

Drawing 1, since she would loose less \$ (10 cents) in the long run.

For the following problems create a relative frequency table and find the expected value. Would you play the game? Explain your reasoning.

12. You play a game in which you flip a fair coin three times. You pay \$5 to play this game. If you get 3 heads, you win \$15 (for a net profit of \$10). If you get 2 heads you win \$5 (for a net profit of \$0). Otherwise you win nothing (for a net loss of \$5). What is the expected value of your net profit? **-1.25 NOWAY!**

Outcomes	Rel Freq	E(x)
10	1/8	10/8
0	3/8	0/8
-5	4/8	-20/8

$E(x) = -1.25$



13. A game consists of rolling a colored die with three red sides, two green sides, and one blue side. A roll of a red loses. A roll of green pays \$2.00. A roll of blue pays \$5.00. The charge to play the game is \$2.00. Would you play the game? Why or why not?

Outcome	Rel F	E(x)
RED	3/6	-6/6
Green	2/6	0/6
BLUE	1/6	3/6

$6/6 \checkmark - 3/6 = -1/2 = E(x)$

6 SIDES
 $P(R) = 3/6$
 $P(G) = 2/6$
 $P(B) = 1/6$

nope I'm expected to loose

14. A game consists of drawing a single card from a standard 52-card deck. A player receives 40¢ for a heart and 50¢ for an ace (90¢ for the ace of hearts). If the cost of a draw is 15¢, should a person play the game? Explain.

Outcome	Rel Freq	E(x)
Heart	12/52	3/52
Ace	3/52	1105/52
ace ♥	1/52	75/52
Other	36/52	-54/52

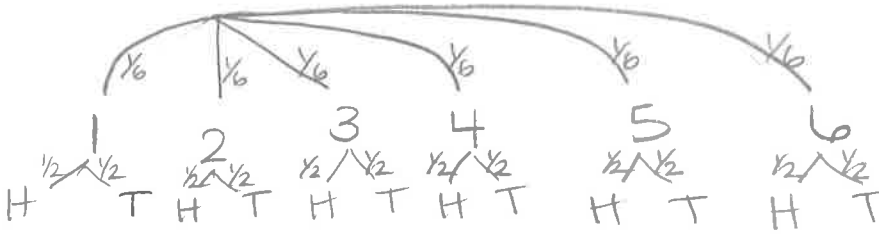
$E(x) = -0.6/52 = -0.12$ cents

$P(\heartsuit) = 13/52$
 $-A\heartsuit = 12/52$
 $P(A\heartsuit) = 1/52$
 $P(\heartsuit) = 3/52$

No - I'm expected to LOSE in the long run.

Tree Diagram Worksheet

1. A student **rolls a die** then **flips a coin** one time.
 a. Create a tree diagram and a list to show all possible outcomes.



- LIST
- 1H
 - 1T
 - 2H
 - 2T
 - 3H
 - 3T
 - 4H
 - 4T
 - 5H
 - 5T
 - 6H
 - 6T

- b. What is the probability of first rolling a 1 then flipping heads **in that order**?

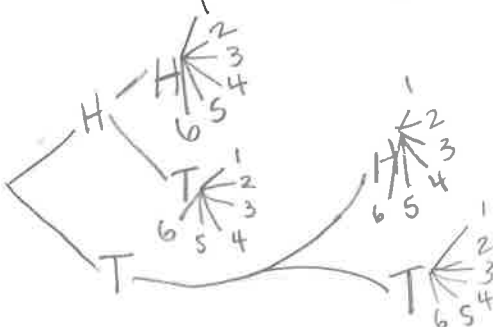
$$P(1H) = \frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$$

- c. What is the probability of rolling exactly one even number?

$$P(\text{even}) = \frac{3}{6} = \frac{1}{2}$$

- d. $P(E \text{ and } H) = \frac{3}{12} = \frac{1}{4}$

2. A student flips a coin twice and then rolls a die one time.
 a. Create a tree diagram and a list to show all the possible outcomes.



- | | | | |
|-----|-----|-----|-----|
| HH1 | HT1 | TH1 | TT1 |
| HH2 | HT2 | TH2 | TT2 |
| HH3 | HT3 | TH3 | TT3 |
| HH4 | HT4 | TH4 | TT4 |
| HH5 | HT5 | TH5 | TT5 |
| HH6 | HT6 | TH6 | TT6 |

6 · 4 = 24
total outcomes

- b. What is the probability of flipping a head, then tails, and rolling a six in that order?

$$P(HT6) = \frac{1}{24}$$

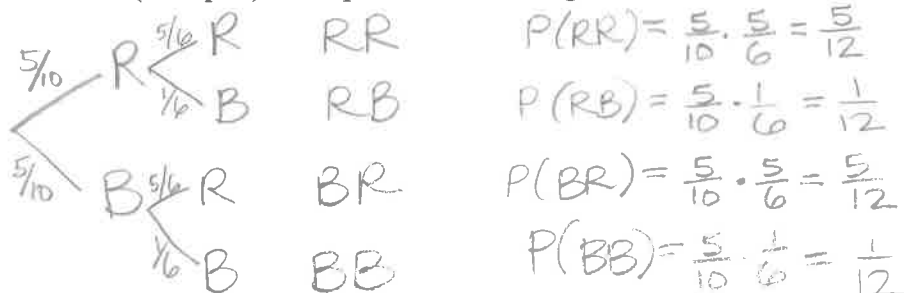
- c. What is the probability of flipping exactly one heads and rolling a three in any order?

$$P(\text{one H and 3}) = \frac{2}{24}$$

- d. $P(H \text{ and } T \text{ and Even \#}) = \frac{3}{24} = \frac{1}{8}$ (in that order)

$$P(H \& T \& \text{Even \#}) = \frac{4}{24} = \frac{1}{6}$$
 (in any order)

3. One spinner has 5 black sections and 5 red sections (all equal). Another spinner has 1 black section and 5 red sections (all equal). Complete this tree diagram and then answer the following:



a. What is the probability of getting red twice?

$$P(RR) = 5/12$$

b. What is the probability of getting black at least once?

$$P(RE \text{ or } BR \text{ or } BB) = \frac{1}{12} + \frac{5}{12} + \frac{1}{12} = \frac{7}{12}$$

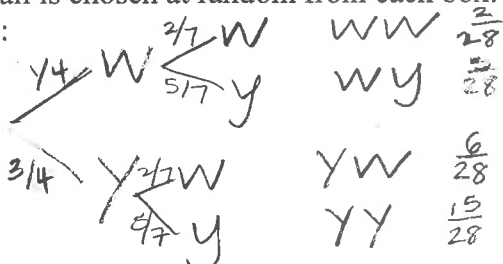
c. What is the probability of getting the same color twice?

$$P(RR \text{ or } BB) = \frac{5}{12} + \frac{1}{12} = \frac{6}{12} = \frac{1}{2}$$

d. What is the probability of getting different colors?

$$P(RB \text{ or } BR) = \frac{1}{12} + \frac{5}{12} = \frac{6}{12} = \frac{1}{2}$$

4. 1 One box contains 2 white balls and 6 yellow balls. A second box contains 2 white balls and 5 yellow balls. A ball is chosen at random from each box. Complete this tree diagram and hence answer the following:



$$P(W_1) = \frac{2}{8} = .25 = \frac{1}{4}$$

$$P(Y_1) = \frac{6}{8} = .75 = \frac{3}{4}$$

$$P(W_2) = \frac{2}{7} = .286$$

$$P(Y_2) = \frac{5}{7} = .714$$

a. What is the probability of getting two yellow balls?

$$P(YY) = \frac{6}{8} \cdot \frac{5}{7} = \frac{15}{28}$$

b. What is the probability of getting white at least once?

$$P(WW \text{ or } WY \text{ or } YW) = \frac{2}{28} + \frac{10}{28} + \frac{6}{28} = \frac{18}{28}$$

c. What is the probability of getting two balls of different colors?

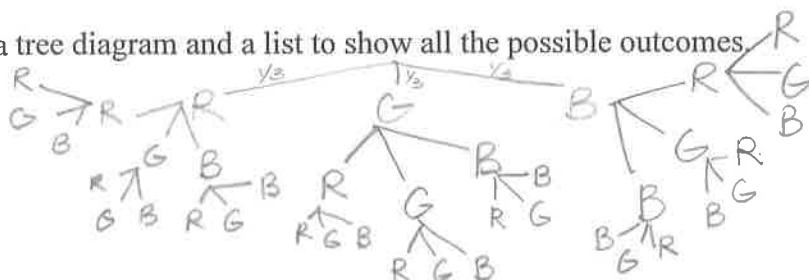
$$P(WY \text{ or } YW) = \frac{10}{28} + \frac{6}{28} = \frac{16}{28}$$

d. What is the probability of getting two balls of the same color?

$$P(WW \text{ or } YY) = \frac{2}{28} + \frac{15}{28} = \frac{17}{28}$$

5. A student spins a spinner with 3 equal parts of red, blue and green three times.

a. Create a tree diagram and a list to show all the possible outcomes



- RRR RBR GGR
- RRG RBG GGG
- RRB RBB GGB
- RGR GRR GBR
- RGG GRG GGB
- RGB GRB GBB

27 total outcomes.

b. What is the probability of spinning a Red, Blue and Blue in that order?

$$P(RBB) = \frac{1}{27}$$

- BRR BGR BBB
- BRG BGG BBG
- BRB BGB BBR

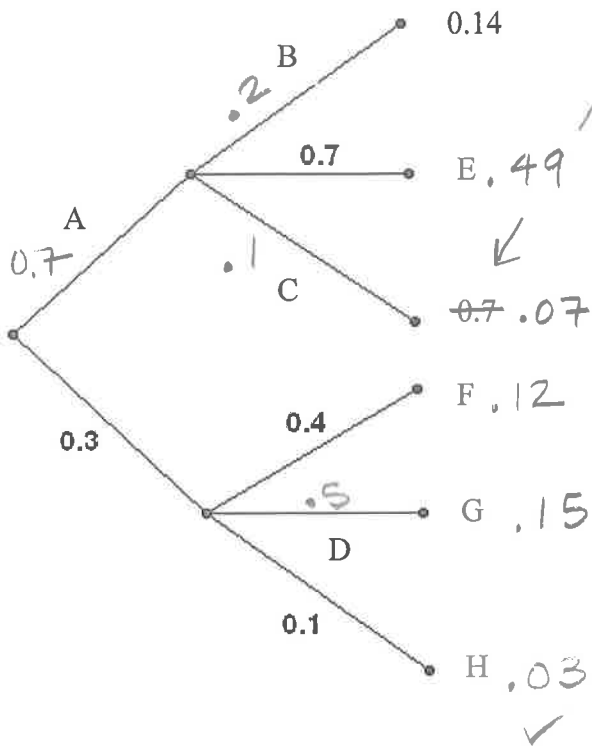
c. What is the probability of spinning exactly one blue and one green in any order?

$$P(\text{one B \& one G}) = \frac{6}{27} = \frac{2}{9}$$

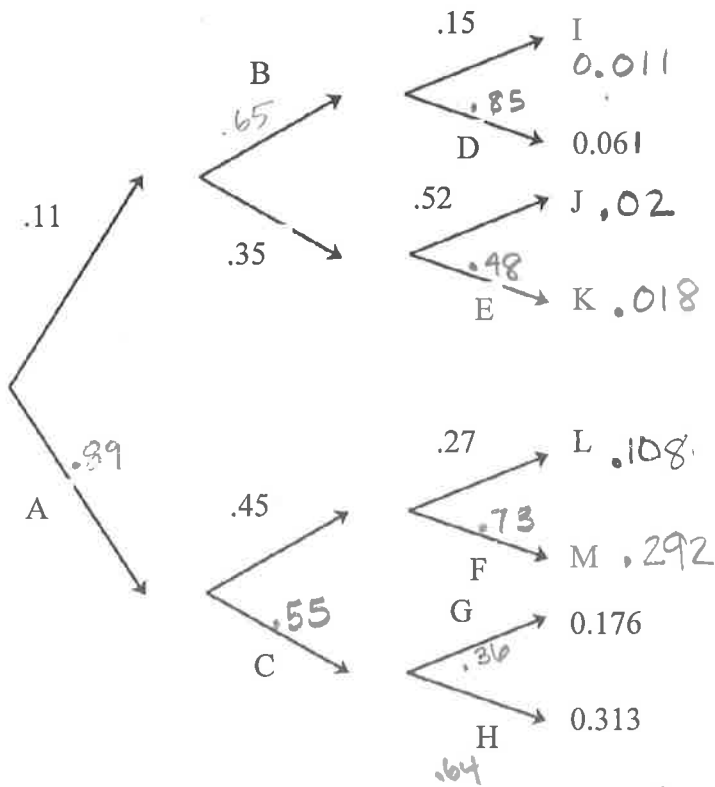
d. $P(GGG) = 1/27$

Complete the following tree diagrams.

Error 0.7 should be 0.07



- A = 0.7
- B = .2
- C = .1
- D = .5
- E = .49
- F = .12
- G = .15
- H = .03

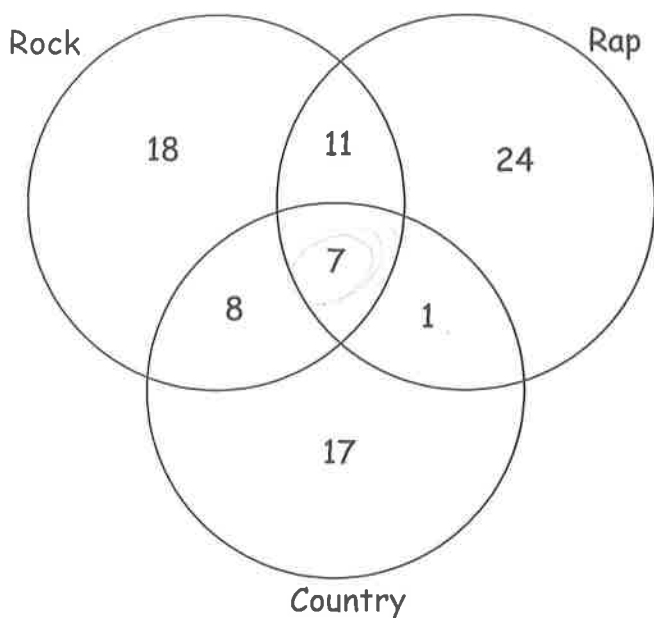


- A = .89
- B = .65
- C = .55
- D = .85
- E = .48
- F = .73
- G = .36
- H = .64
- I = 0.011
- J = .02
- K = .018
- L = .108
- M = .292

≈ .999

Venn Diagram Worksheet

Use the Venn Diagram below to answer question #1 - 5.



1. How many total people are represented in the diagram? 86

2. $P(\text{Country}) = \frac{33}{86}$

3. $P(\text{rap}) = \frac{43}{86}$

4. If one person is chosen at random, what are the odds against picking a person who likes all three types of music?

$P(\text{all 3}) = \frac{7}{86}$

Odds against all three

$P(\text{NOT all 3}) = \frac{79}{86}$

5. $P(\text{Rap or Rock}) = \frac{69}{86}$
one or other (add)

6. $P(\text{Rock} | \text{Country}) = \frac{15}{33}$

chance of ROCK when picking from country listeners! 33 country listeners

1. $P(E) = .61$

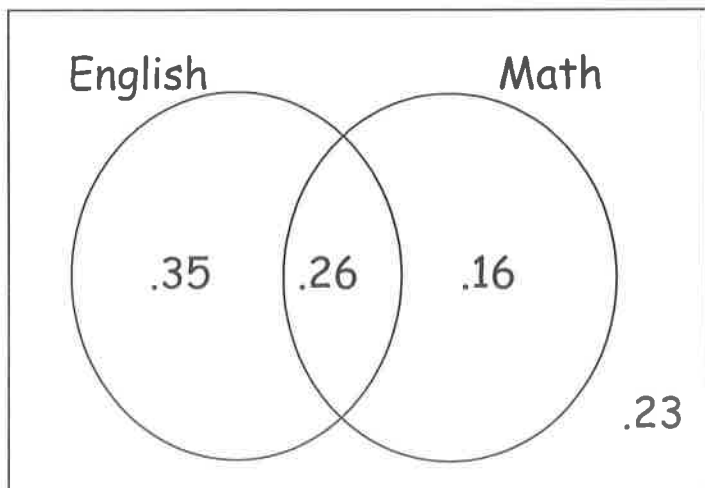
2. $P(E \text{ and } M) = .26$

3. $P(M \text{ or } E) = .77$

4. $P(M \text{ and Not } E) = .16$

5. $P(\text{Not } M \text{ and Not } E) = .23$

6. $P(E | M) = \frac{.26}{.42} = .619$



Use the following information to fill in the Venn Diagram below.

25 people were asked if they liked Math, Science, or Social Studies. ~~Everyone answered that they liked at least one.~~

$56 - 24 = 32$

56 like Math - Take out the 24 already in the circle.

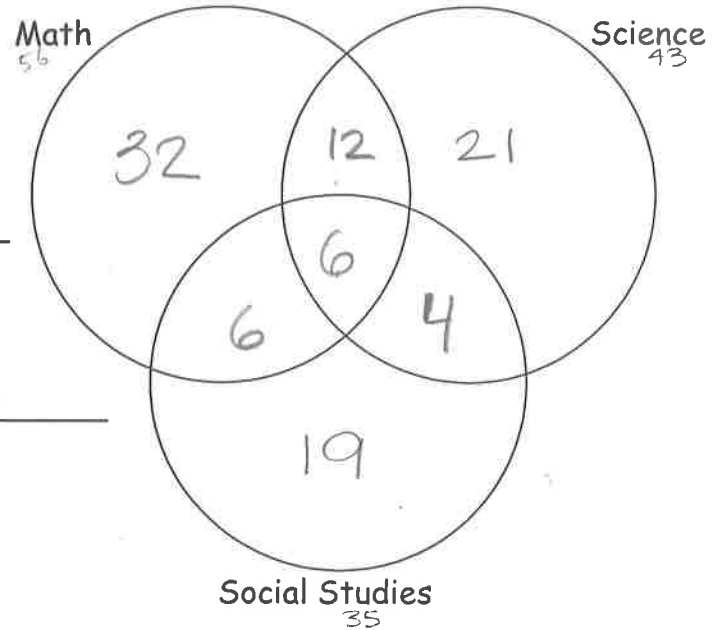
43 like Science

35 like Social Studies

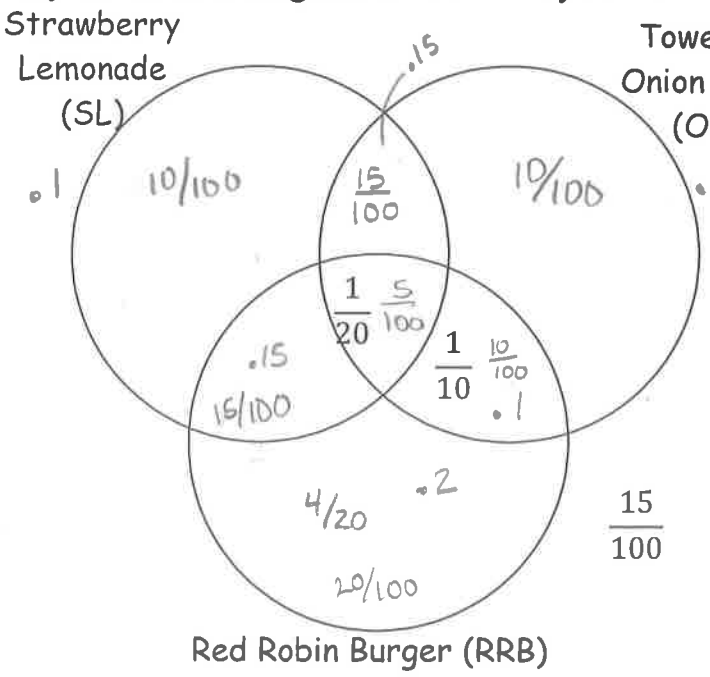
6 like all three subjects ← Start here and work your way out

18 like Math and Science - includes the 6 so $18 - 6 = 12$
 10 like Science and Social Studies → includes the other 6! so $10 - 6 = 4$
 12 like Math and Social Studies - $12 - 6 = 6$

1. How many people like Math only? 32
2. How many people like Science only? 21
3. How many people like Social Studies only? 19
4. $P(\text{Math or Science}) = \underline{18/25}$
5. $P(\text{Math or Science or Social Studies}) = \underline{\hspace{2cm}}$
6. $P(\text{Social Studies and Math}) = \underline{\hspace{2cm}}$
7. $P(\text{Science} | \text{Math}) = \underline{18/56}$



100 people seated at different tables at Red Robin, costumers were asked if their party had ordered any of the following items: Strawberry Lemonade, Tower of Onion Rings, or Red Robin Burger.



Use the following information to fill in the Venn Diagram:

- ✓ $P(\text{RRB}) = 50/100$.5
- ✓ $P(\text{SL and OR}) = 20/100$.2
- ★ $P(\text{at least two items}) = 45/100$.45
- ✓ $P(\text{OR or RRB}) = 75/100$.75