Name: **KEY**

Day 2 Notes

Date: _____

Union, Intersection, and Venn Diagrams

Many problem situations require extensive logic to sort through. A **Venn diagram** is a visual aid used to assist us in sorting through the logic of certain types of questions. Venn diagrams show the relationships between different sets.

Exercise #1: Professor Carlson was trying to determine who was in her Advanced Asian History course. The Venn diagram below shows how she classified all of her students into different subsets. Based on this diagram, answer the following questions.

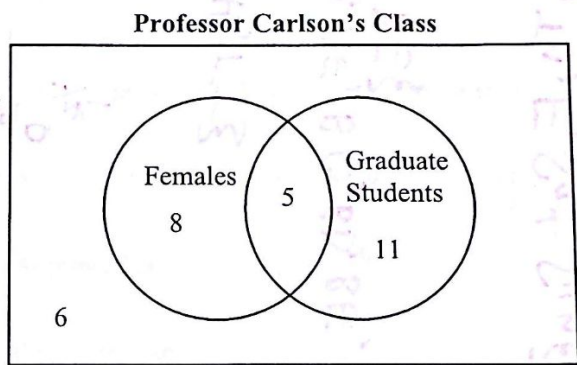(a) How many of the students were female graduate students?

5

(b) How many total students are in the class?

30

(c) How many of Dr. Carlson's students are male?

17

Professor Carlson's Class

Females 8 | 5 | Graduate Students 11

6

Exercise #2: A soft-drink company wanted to see which of two new drinks its consumers would prefer. To find out, the company surveyed 400 people who had tried both new drinks. 254 of the people surveyed liked drink *A*, 136 liked both drinks *A* and *B*, and 42 people liked neither. Which of the two drinks was preferred by the larger number of people?
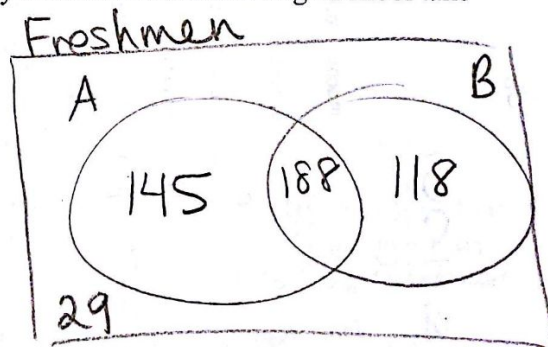
$A = 254$
$B = 240$

Drink A

A | 118 | 136 | 104 | B
42
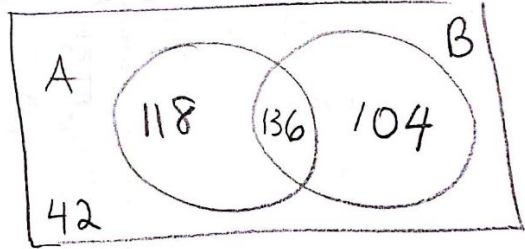
Exercise #3: Central High School has 480 freshmen. Of those freshmen, 333 take Algebra, 306 take Biology, and 188 take both Algebra and Biology. How many freshmen at Central High School take neither Algebra nor ~~Geometry~~? **Biology**

$480 -$
$(145 + 188 + 118)$
$= $ **29**

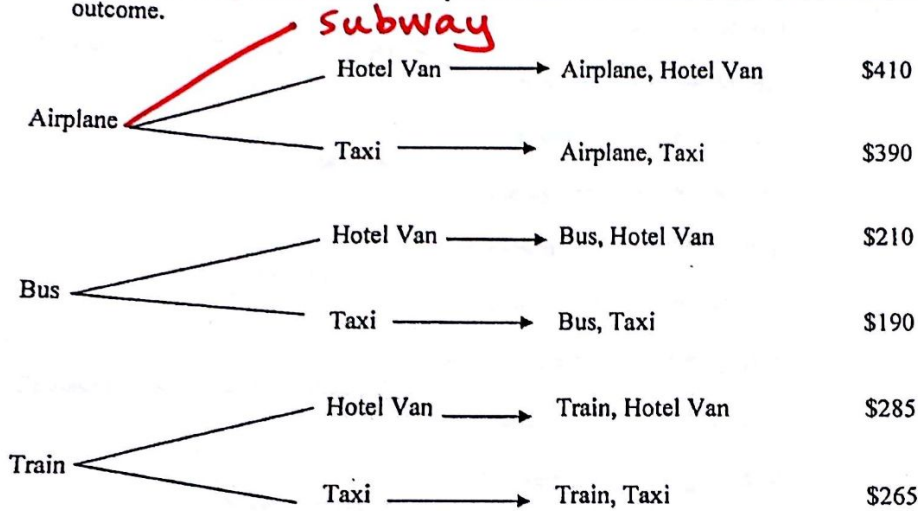Freshmen
A | 145 | 188 | 118 | B
29

Day 2 CW

2) 3·2 = 6
3) 2·4 = 8
4) 2·2·2 = 8
5) 3·3 = 9
6) 3·2·2 = 12

Travel Time Answer Key

A travel agent plans trips for tourists from Chicago to Miami. He gives them three ways to get from town to town: airplane, bus, train. Once the tourists arrive, there are two ways to get to the hotel: hotel van or taxi. The cost of each type of transportation is given in the table below.

Transportation Type	Cost
Airplane	$350
Bus	$150
Train	$225
Hotel Van	$60
Taxi	$40

1. Draw a tree diagram to illustrate the possible choices for the tourists. Determine the cost for each outcome.

subway

Airplane
- Hotel Van → Airplane, Hotel Van — $410
- Taxi → Airplane, Taxi — $390

Bus
- Hotel Van → Bus, Hotel Van — $210
- Taxi → Bus, Taxi — $190

Train
- Hotel Van → Train, Hotel Van — $285
- Taxi → Train, Taxi — $265

2. If these six outcomes are chosen equally by tourists, what is the probability that a randomly selected tourist travel in a bus? $\frac{2}{6}$ or $\frac{1}{3}$

3. What is the probability that a person's trip cost less than $300? $\frac{4}{6}$ or $\frac{2}{3}$

4. What is the probability that a person's trip costs more than $350? $\frac{2}{6}$ or $\frac{1}{3}$

5. If the tourists were flying to New York, the subway would be a third way to get to the hotel. How would this change the number of outcomes? Use the Fundamental Counting Principle to explain your answer. *Using the Fundamental Counting Principle, I would multiply 3 x 3 to get 9 outcomes.*

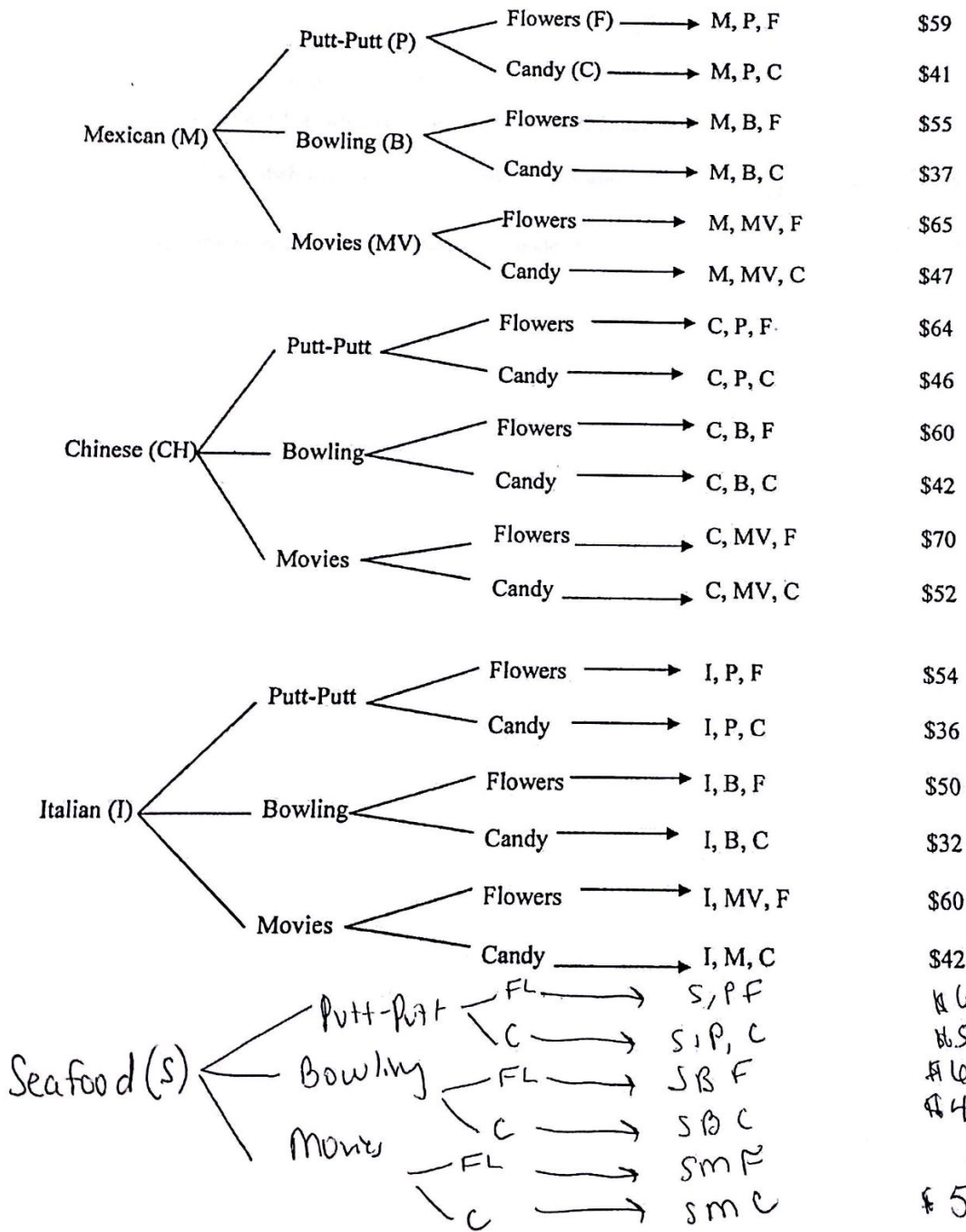It would add one more branch to each town to town ophea. You would get 9 outcomes.

7

"Happy Birthday to You" Answer Key

Andy has asked his girlfriend to make all the decisions for their date on her birthday. She will pick a restaurant and an activity for the date. Andy will choose a gift for her. The local restaurants include Mexican, Chinese, Seafood, and Italian. The activities she can choose from are Putt-Putt, bowling, and movies. Andy will buy her either candy or flowers.

1. How many outcomes are there for these three decisions?
2. Draw a tree diagram to illustrate the choices.

Happy Birthday

−24 outcomes

Path	Outcome	Cost
Mexican (M) → Putt-Putt (P) → Flowers (F)	M, P, F	$59
Mexican (M) → Putt-Putt (P) → Candy (C)	M, P, C	$41
Mexican (M) → Bowling (B) → Flowers	M, B, F	$55
Mexican (M) → Bowling (B) → Candy	M, B, C	$37
Mexican (M) → Movies (MV) → Flowers	M, MV, F	$65
Mexican (M) → Movies (MV) → Candy	M, MV, C	$47
Chinese (CH) → Putt-Putt → Flowers	C, P, F	$64
Chinese (CH) → Putt-Putt → Candy	C, P, C	$46
Chinese (CH) → Bowling → Flowers	C, B, F	$60
Chinese (CH) → Bowling → Candy	C, B, C	$42
Chinese (CH) → Movies → Flowers	C, MV, F	$70
Chinese (CH) → Movies → Candy	C, MV, C	$52
Italian (I) → Putt-Putt → Flowers	I, P, F	$54
Italian (I) → Putt-Putt → Candy	I, P, C	$36
Italian (I) → Bowling → Flowers	I, B, F	$50
Italian (I) → Bowling → Candy	I, B, C	$32
Italian (I) → Movies → Flowers	I, MV, F	$60
Italian (I) → Movies → Candy	I, M, C	$42
Seafood (S) → Putt-Putt → FL	S, P F	$49
Seafood (S) → Putt-Putt → C	S, P, C	$51
Seafood (S) → Bowling → FL	S B F	$65
Seafood (S) → Bowling → C	S B C	$47
Seafood (S) → Movie → FL	S m F	$75
Seafood (S) → Movie → C	s m C	$57

"Happy Birthday to You" Answer Key (continued)

Dinner for Two	Activity Cost for Two	Gift Cost
Mexican - $20	Putt-Putt - $14	Flowers - $23
Chinese - $25	Bowling - $10	Candy - $7
Italian - $12	Movies - $20	

Seafood 30

3. If all the possible outcomes are equally likely, what is the probability that the date will cost at least $50?

$$\frac{15}{24} = \frac{5}{8} = .625 = 62.5\%$$

4. What is the maximum cost for the date $75

5. What is the minimum cost for the date? $32

6. To the nearest dollar what is the average cost for this date? $53

7. What is the probability that the date costs exactly $60?

$$\frac{2}{24} = \frac{1}{12} = .083 = 8.3\%$$

8. What is the probability that the date costs under $40?

$$\frac{3}{24} = \frac{1}{8} = .125 = 12.5\%$$

Key

Probability – Worksheet

A. Coin Flip

1) What is the theoretical probability that the coin will land on tails? $\frac{1}{2} = .5$

2) What is the theoretical probability that the coin will land on heads? $\frac{1}{2} = .5$

3) If the coin is flipped 140 times, how many times would you predict that the coin lands on heads? **70**

4) Johnny flipped a coin 450 times. His results are below:

Heads	Tails
240	210

What is the **experimental** probability that the coin lands on heads? $\frac{240}{450} = .53$

B. Roll of the Die (6-sided)

5) $P(4) = \frac{1}{6}$

6) $P(3 \text{ or } 5) = \frac{2}{6} = \frac{1}{3}$

7) $P(\text{not a } 2) = \frac{5}{6}$

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

9) If the die is rolled 300 times, how many times would you predict a roll of a 1 or a 6? $\frac{1}{3}(300) = 100$

10) Johnny rolled the die 1,500 times. His results are below:

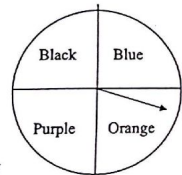| # on die	1	2	3	4	5	6
Times rolled	230	245	300	280	215	230

What is the **experimental** probability that the die will land on a 4?

$\frac{280}{1500} = .19$

Probability – Worksheet

C. Spinners

11) $P(\text{black}) = \frac{1}{4}$

12) $P(\text{not orange}) = \frac{3}{4}$

13) $P(\text{blue or black}) = \frac{2}{4} = \frac{1}{2}$

14) If the spinner is spun 40 times, how many times would you predict a spin of something that is not purple? $\frac{3}{4}(40) = 30$

Black	Blue
Purple	Orange

15) Johnny spins the spinner 60 times. His results are below:

Color	Black	Blue	Orange	Purple
Times Spun	17	15	21	7

a) What is the **experimental** probability of a spin of orange? $\frac{21}{60} = .35$

b) Which color had an experimental probability that matched its theoretical probability? **Blue**

D. Multiple Choice.

16) Neil tossed a 6-sided die 90 times. The results of his tosses are recorded in the table below:

Number	Times tossed
1	13
2	15 →
3	14
4	12
5	18
6	18

What number had an experimental probability that matched its theoretical probability?

Ⓐ 2
B 3
C 4
D 5

$\frac{15}{90} = \frac{1}{6}$