Tree Diagrams

How many outcomes are possible from the following situations?

1. Flip a dime and then flip a quarter
2. A choice of chicken, fish or beef for the main dish and a choice of cake or pudding for dessert
3. A choice of either a green or blue shirt and a choice of blue, black or khaki pants
4. A choice of pizza or spaghetti; a choice of milk or juice to drink; a choice of pudding or an apple for dessert
5. Shirts come on three sizes: small, medium or large; shirts have buttons or snaps; colors are blue or beige
6. The choices for school mascot are lion, bear and porpoise; colors are red, blue and gold

As students present their work create a table like the one below:

Decisions per event	Possible Outcomes

Is there a relationship between the number of decisions to be made and the possible outcomes? *The possible outcomes is the product of the decisions – this is the* **Fundamental Counting Principle**

The **Fundamental Counting Principle** tells us that if we have two decisions to make, and there are *M* ways to make the first decision, and *N* ways to make the second decision, the product of *M* and *N* tells us how many different outcomes there are for the overall decision process. In general, when a series of decision are to be made, the product of all the way to make the individual decisions determines the number of outcomes there are.

Travel Time

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.

2. If these six outcomes are chosen equally by tourists, what is the probability that a randomly selected tourist travel in a bus?

3. What is the probability that a person's trip cost less than $300?

4. What is the probability that a person's trip costs more than $350?

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?

"Happy Birthday to You"

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

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

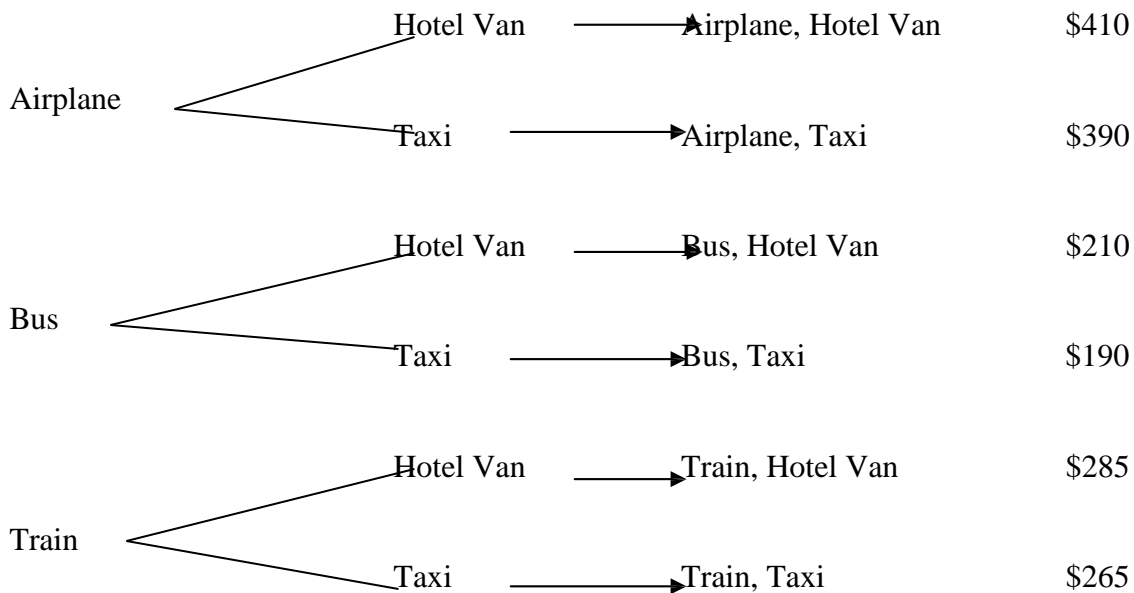| Dinner for Two	Activity Cost for Two	Gift Cost
Mexican - $20	Putt-Putt - $14	Flowers - $25
Chinese - $25	Bowling - $10	Candy - $7
Italian - $15	Movies - $20	

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

4. What is the maximum cost for the date?

5. What is the minimum cost for the date?

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

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

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

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.

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
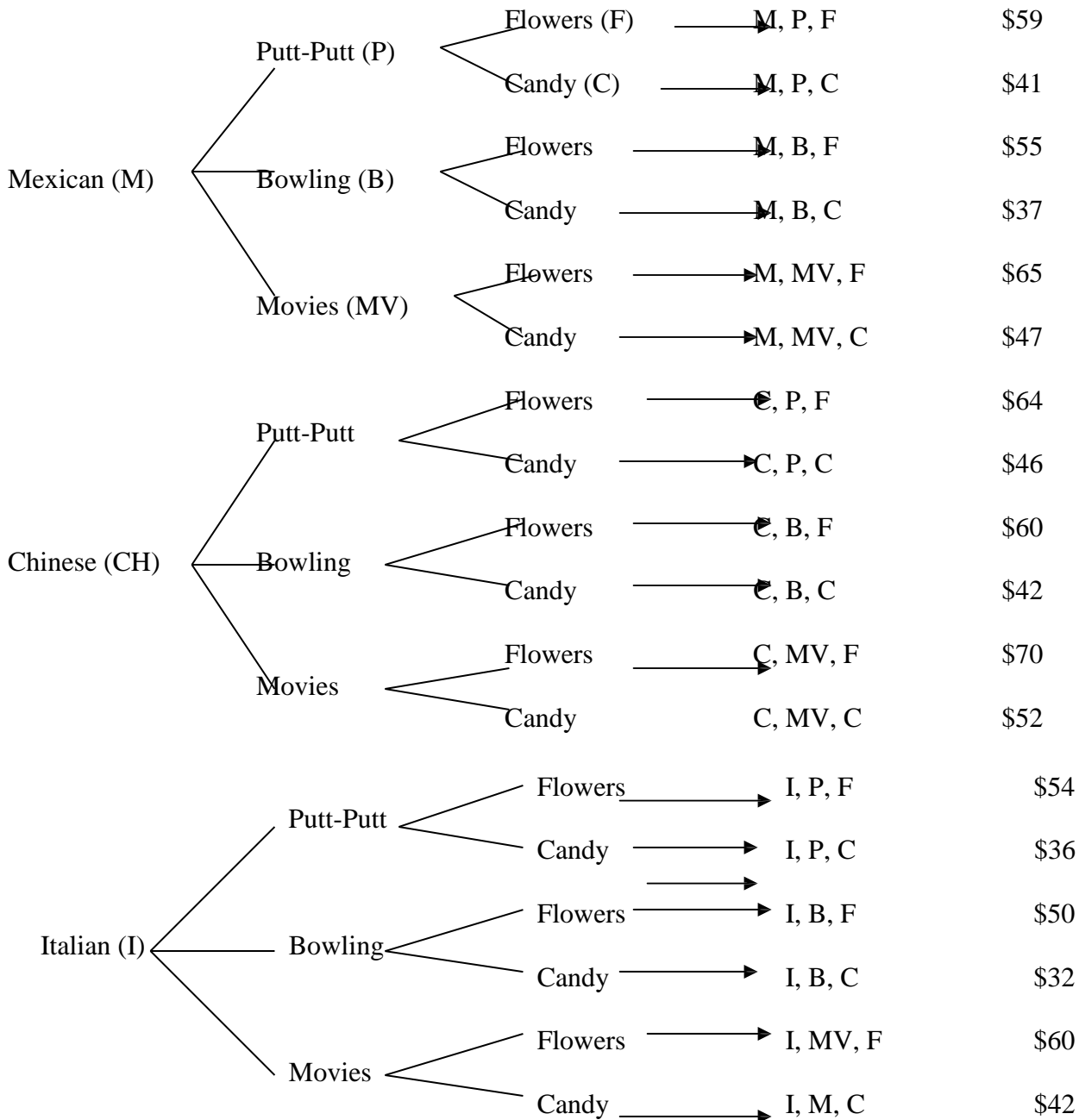- Taxi → Train, Taxi → $265

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? $\frac{3}{6}$ or $\frac{1}{2}$

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.*

"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? _18 _____
2. Draw a tree diagram to illustrate the choices.

Mexican (M)	Putt-Putt (P)	Flowers (F)	M, P, F	$59
		Candy (C)	M, P, C	$41
	Bowling (B)	Flowers	M, B, F	$55
		Candy	M, B, C	$37
	Movies (MV)	Flowers	M, MV, F	$65
		Candy	M, MV, C	$47

Chinese (CH)	Putt-Putt	Flowers	C, P, F	$64
		Candy	C, P, C	$46
	Bowling	Flowers	C, B, F	$60
		Candy	C, B, C	$42
	Movies	Flowers	C, MV, F	$70
		Candy	C, MV, C	$52

Italian (I)	Putt-Putt	Flowers	I, P, F	$54
		Candy	I, P, C	$36
	Bowling	Flowers	I, B, F	$50
		Candy	I, B, C	$32
	Movies	Flowers	I, MV, F	$60
		Candy	I, M, C	$42

"Happy Birthday to You" Answer Key (continued)

Dinner for Two	Activity Cost for Two	Gift Cost
Mexican - $20	Putt-Putt - $14	Flowers - $25
Chinese - $25	Bowling - $10	Candy - $7
Italian - $15	Movies - $20	

3. If all the possible outcomes are equally likely, what is the probability that the date will cost at least
    $50? $\dfrac{10}{18}$ or $\dfrac{5}{9}$

4. What is the maximum cost for the date? $70

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

6. To the nearest dollar what is the average cost for this date? $51

7. What is the probability that the date costs exactly $60? $\dfrac{2}{18}$ or $\dfrac{1}{9}$

8. What is the probability that the date costs under $40? $\dfrac{3}{18}$ or $\dfrac{1}{6}$