Math 2
Unit 6 Day 4 Notes – Compound Probability

Name: Key
Date: _____

Independent Events	two events where the 2nd event does not affect the 1st event
Dependent Events	two events where the 2nd event does affect the 1st event

Example: Suppose a die is rolled and then a coin is tossed.

1. Explain why these events are independent

   rolling a die has not affect on flipping a coin

2. Fill in the table to describe the sample space.

	Roll 1	Roll 2	Roll 3	Roll 4	Roll 5	Roll 6
Head	H1	H2	H3	H4	H5	H6
Tails	T1	T2	T3	T4	T5	T6

3. How many outcomes are there for rolling the die? 6
4. How many outcomes are there for tossing the coin? 2
5. How many outcomes are there in the sample space of rolling the die and tossing the coin? 12
6. Is there another way to decide how many outcomes are in the sample space?

   $6 \cdot 2 = 12$

Probability of Independent Events	$P(A \cap B) = P(A) \cdot P(B)$

Example: Use the table from questions #1-6.

	Roll 1	Roll 2	Roll 3	Roll 4	Roll 5	Roll 6
Head	H1	H2	H3	H4	H5	H6
Tails	T1	T2	T3	T4	T5	T6

1. P(rolling a 3) = $1/6$
2. P(tails) = $1/2$
3. P(rolling a 3 AND getting tails) = $1/6 \cdot 1/2 = 1/12$
4. P(rolling an even) = $3/6 = 1/2$
5. P(heads) = $1/2$
6. P(rolling an even AND getting heads) = $1/2 \cdot 1/2 = 1/4$

Multiplication Rule of Probability	$P(A \text{ and } B) = P(A) \cdot P(B)$

Example:

7. At City High School, 30% of students have part-time jobs and 25% of students are on the honor roll. What is the probability that a student chosen at random has a part-time job and is on the honor roll? Write your answer in context.

.3 · .25 = .075

Example: The following table represents data collected from a grade 12 class in DEF High School

Plans after High School

Gender	University	Community College	Total
Males	28	56	84
Females	43	37	80
Total	71	93	164

Suppose 1 student was chosen at **random** from the grade 12 class.

8. What is the probability that the student is female?

$80/164 = 20/41$ or .488

9. What is the probability that the student is going to university?

$71/164$ or .433

Now suppose 2 people both randomly chose 1 student from the grade 12 class. Assume that it's possible for them to choose the same student. (repetition is allowed)

10. What is the probability that the first person chooses a student who is female and the second person chooses a student who is going to university?

$(20/41) \cdot (71/164) = \frac{355}{1681}$ or .211

Example: Suppose a card is chosen at random from a deck of cards, replaced, and then a second card is chosen.

11. Would these events be independent? How do we know?

Yes; card is replaced in the deck

12. What is the probability that both cards are 7s?

$(\frac{4}{52}) \cdot (\frac{4}{52}) = \frac{1}{169}$ or .006

Probability of Dependent Events

Determine whether the events are independent or dependent

13. Selecting a marble from a container and selecting a jack from a deck of cards. I
14. Rolling a number less than 4 on a die and rolling a number that is even on a second die. I
15. Choosing a jack from a deck of cards and choosing another jack, without replacement. D
16. Creating a seating chart for your math class. D

- We cannot use the multiplication rule for finding probabilities of dependent events because the one event affects the probability of the other event occurring.
- Instead, ***we need to think about how the occurrence of one event will affect the sample space of the second event to determine the probability of the second event occurring***.
- Then we can multiply the new probabilities.

Example: Suppose a card is chosen at random from a deck, the card is NOT replaced, and then a second card is chosen from the same deck. What is the probability that both will be 7's?

17. This is similar to the earlier example, but these events are dependent! How do we know?

    Because once we choose one 7, there are only 3 7's left

18. How does the first event affect the sample space of the second event?

    There is one less card in the deck

19. Calculate the probability that both cards will be 7's

    $(4/52) \cdot (3/51) = 1/221$ or .005

20. A box contains 5 red marbles and 5 purple marbles. What is the probability of drawing 2 purple marbles and 1 red marble in succession *without replacement*?

    $(5/10) \cdot (4/9) \cdot (5/8) \cdot (4/7) = 5/63$ or .079

21. In Example 20, what is the probability of first drawing all 5 red marbles in succession and then drawing all 5 purple marbles in succession *without replacement*?

    $(5/10) \cdot (4/9) \cdot (3/8) \cdot (2/7) \cdot (1/6) \cdot (5/5) \cdot (4/4) \cdot (3/3) \cdot (2/2) \cdot (1/1) = 1/252$ or .004

On Your Own

#1-3 When rolling two number cubes…

1. What is the probability of rolling a sum that is greater than 7?

2. What is the probability of rolling a sum that is odd?

3. Are the events, rolling a sum greater than 7, and rolling a sum that is odd, independent? Justify your response.

#4-6 Determine if the events are independent or not. Explain your reasoning.

4. Flipping a coin and getting heads and rolling a number cube and getting a 4

5. When rolling a pair of number cubes consider the events: getting a sum of 7 and getting doubles

6. From a standard deck of cards consider the events: draw a diamond, shuffling the deck then drawing a heart.

7. You have a box with 3 blue marbles, 2 red marbles, and 4 yellow marbles. You are going to pull out one marble, record its color, put it back in the box and draw another marble. What is the probability of pulling out a red marble followed by a blue marble?

8. Consider the same box of marbles as in the previous example. However in this case, we are going to pull out the first marble, leave it out, and then pull out another marble. What is the probability of pulling out a red marble followed by a blue marble?