Sec 9-7: Probability of Multiple Events (Compound Events)

2 or more events happening at the same time or one right after the other.

In general, when you are finding the probability of two or more events:

AND → Multiply

OR → Add

Independent Events

When the outcome of one event does NOT affect the outcome of a second event

Dependent Events

When the outcome of one event DOES affect the outcome of a second event

Is each pair of events *Dependent* or *Independent* ?

1.
You walk by the kitchen counter and see a plate of cookies. You randomly take a cookie and eat it. A minute later you walk by and randomly take another cookie.

DEP

2.
At the tennis match a player randomly selects a tennis ball to serve but feels it is too squishy so they throw it back into the ball bag and grab another ball to serve.

INDEP

3.
The office calls to a room and asks the teacher to send a random student to the office to help with something. After the student leaves the teacher randomly selects a student to answer the next question.

DEP

Probability of Two Independent Events A and B:

$$P(A \text{ and } B) = P(A) \bullet P(B)$$

Probability of Two Dependent Events A and B:

$$P(A \text{ and } B) = P(A) \bullet P(B \text{ after } A)$$

In your car you have the following coins:
12 pennies, 4 nickels, 3 dimes, and 6 quarters.

1. You take one coin at random, put it in the parking meter then take another coin at random and put it in the parking meter.
Find each probability as a fraction:

1. P(dime and then quarter) = $\frac{3}{25} \cdot \frac{6}{24} = \frac{18}{600}$

2. P(nickel and dime and nickel)= $\frac{4}{25} \cdot \frac{3}{24} \cdot \frac{3}{23} \quad \frac{36}{13800}$

In a bag there are the following suckers:
6 grape, 8 cherry, and 2 lemon.

2. You reach in and randomly grab a sucker. You look at it and decide you don't want that flavor so you toss it back in and grab another sucker randomly.
Find this probability as a fraction:

1. P(lemon and grape) = $\frac{2}{16} \cdot \frac{6}{16} = \frac{12}{256}$

2. P(grape and grape and cherry)= $\frac{6}{16} \cdot \frac{6}{16} \cdot \frac{8}{16}$
$= 288/4096$

2. Find each probability as a fraction.

a) There are 12 freshmen and 9 sophomores in a gym class. You are picking sides and get to pick first, selecting two people at random. Find the probability that the two people you pick are freshmen.

P(freshman and freshman)=

$$\frac{12}{21} \cdot \frac{11}{20} = \frac{132}{420}$$

b) In a class there are 11 boys and 13 girls. You pick a random student to go the office and get some tissues. When that student returns you pick a random person to answer the next question. Find the probability that you pick a girl and then a boy.

P(girl and boy)= $\frac{13}{24} \cdot \frac{11}{24} = \frac{143}{576}$

Mutually Exclusive Events:

When two events CAN'T happen at the same time.

Not Mutually Exclusive means:

When two events CAN happen at the same time.

Is each pair of events mutually exclusive?

They CAN happen at the same time

They CAN'T happen at the same time?

1. Driving your car and texting.

They CAN happen at the same time

No.

2. Driving your car and riding your bike.

They CAN'T happen at the same time

Yes

3. Pick two numbers. They they turn out to have a sum of 5 and a product of zero.

They CAN happen at the same time

No

4. Pick two numbers. They turn out to have an odd product and an odd sum.

Yes

They CAN'T happen at the same time

Probability of Two Events that are Mutually Exclusive Events:

$$P(A \text{ or } B) = P(A) + P(B)$$

$$P(A \text{ and } B) = 0$$

Probability of Two Events that are NOT Mutually Exclusive:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A) \bullet P(B)$$

1. P(Green or Blue)

$\frac{3+3}{12} = \frac{6}{12}$

2. P(Red or Odd)

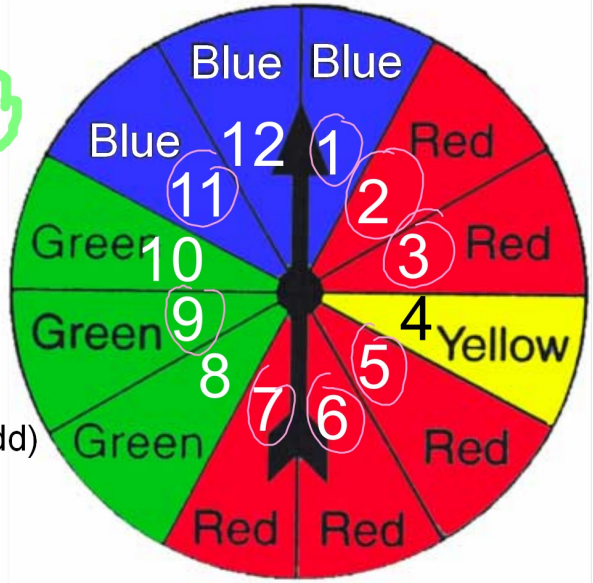
$\frac{8}{12} = \frac{5+6-3}{12}$

3. P(Green and Even)

$\frac{2}{12}$

4. P(Multiple of 4 and odd)

$\frac{0}{12}$



A survey was taken asking people to pick their favorite kind of movier from the three listed below. They could only pick one.

	Cartoon	Action	Mystery	
Child	55	15	6	76
Adult	12	28	31	71
	67	43	37	147

1. P(Cartoon or Mystery) $= \frac{67+37}{147}$ $\frac{104}{147}$

2. P(Mystery and Action) $= \frac{0}{147}$

3. P(Cartoon and Child) $= \frac{55}{147}$

4. P(Adult or Action) $\frac{71+43-28}{147}$ $= \frac{86}{147}$

Mutually Exclusive

Not Mutually Exclusive