

Aim: What's the difference between independent and dependent events? Date: \_\_\_\_\_

Do Now: Consider a bag of cards made up of 2 blue cards, 2 green cards and 1 yellow card.

- a) What is the probability of selecting a blue card?  $\frac{2}{5}$
- b) What is the probability of selecting a yellow card?  $\frac{1}{5}$

} Simple Events

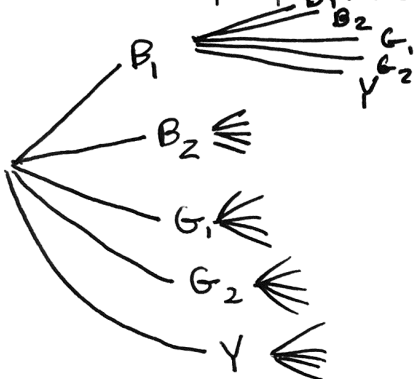
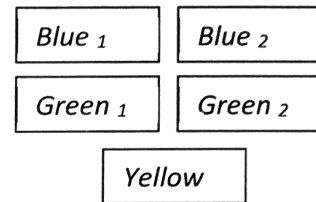
## Compound Probability

A **compound event** is an event that is comprised of two or more other events.

*We can use sample spaces to find probabilities of compound events.*

Consider the situation from the Do Now.

Let's create a sample space for choosing two cards *with replacement*.



- a) How many outcomes are there?

25

- b) What is the probability of selecting a blue card then a green card?

$$\frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25}$$

- c) What is the probability of selecting two blue cards?

$$\frac{2}{5} \cdot \frac{2}{5} = \frac{4}{25}$$

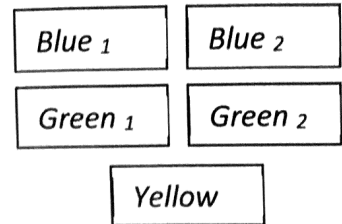
- d) What is the probability of selecting two yellow cards?

$$\frac{1}{5} \cdot \frac{1}{5} = \frac{1}{25}$$

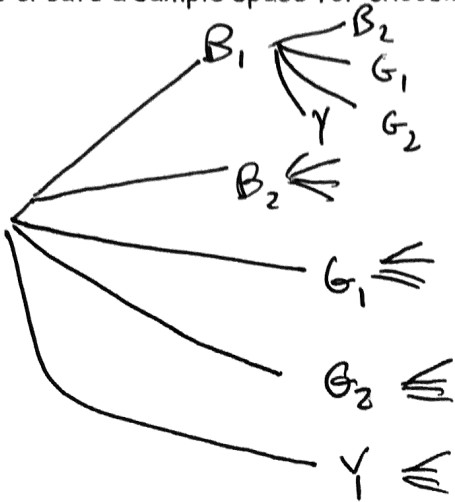
**Independent Events** - A series of events is independent if the occurrence of **one event does not affect the probability** of the occurrence **of the other events**.

To find the probability of a series of independent events, multiply the probabilities of both events.

$$P(\text{A then B}) = P(\text{A}) \times P(\text{B})$$



Let's create a sample space for choosing two cards *without replacement*.



20

a) How many outcomes are there?

20

b) What is the probability of selecting a blue card then a green card?

$$\frac{2}{5} \cdot \frac{2}{4} = \frac{4}{20}$$

c) What is the probability of selecting two blue cards?

$$\frac{2}{6} \cdot \frac{1}{5} = \frac{2}{30}$$

d) What is the probability of selecting two yellow cards?

$$\frac{1}{6}$$

**Dependent Events** - A series of events is dependent if the occurrence of the first event affects the probability of the second event occurring.

The probability of two dependent events occurring is the product of the probability of the first event and the probability of the second event, given that the first event occurred.

$$P(A \text{ then } B) = P(A) \times P(B \text{ after } A)$$

Summary:

**Independent Events**

- Pick and replace *or* return
- Denominator always stays the same after each "pick"
- The item has the same probability of being picked each time
- **Key Words:** replace, return, put back

**Dependent Events**

- Pick and keep/do not replace *or* return
- Denominator decreases after each "pick" (*numerator may or may not decrease*)
- The item has a better probability of being "picked" each time until the probability reaches 1
- **Key Words:** keep, do not return, do not replace

Examples:

Find the probability of each compound event using a product.

1. A jar contains 6 blue, 3 red, 5 green, and 2 yellow candies.

a) P(two red candies) if the first is replaced

$$\frac{3}{16} \cdot \frac{3}{16} = \frac{9}{256}$$

b) P(one yellow candy, one blue candy) if the first is replaced

$$\frac{2}{16} \cdot \frac{6}{16} = \frac{12}{256}$$

c) P(two blue candies) if the first is not replaced

$$\frac{6}{16} \cdot \frac{5}{15} = \frac{30}{240}$$

d) P(three green candies) if the first and second are not replaced

$$\frac{5}{16} \cdot \frac{4}{15} \cdot \frac{3}{14} = \frac{60}{3360}$$

e) P(two green candies, one red candy) if the first two are replaced

$$\frac{5}{16} \cdot \frac{5}{16} \cdot \frac{3}{16} = \frac{75}{4096}$$

2. You have two quarters, one dime and three nickels in your pocket. You reach into your pocket, choose a coin, look at it and put it back. You choose a second coin.

a) What is the probability that you will choose a quarter then a nickel?

$$\frac{2}{6} \cdot \frac{3}{6} = \frac{6}{36}$$

b) What is the probability that you will choose the dime two times in a row?

$$\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$$

c) What is the probability you will choose two quarters in a row?

$$\frac{2}{6} \cdot \frac{2}{6} = \frac{4}{36}$$

If you do not return the first coin to your pocket, find the following probabilities.

d) What is the probability you will choose two quarters in a row?

$$\frac{2}{6} \cdot \frac{1}{5} = \frac{2}{30}$$

e) What is the probability that you will choose a dime two times in a row?

$$\frac{1}{6} \cdot \frac{0}{5} = \frac{0}{30}$$