5.2 Independent & Dependent Events

$\boxed{\text{old}}$ Mutually Exclusive & Overlapping Events

Let's consider a deck of cards.
52 cards, 4 suits, 13 cards in suit.

① What's probability Jordan will pick 2 red cards?

P(red card) and P(red card) = P(red) * P(red) = $\frac{26}{52} * \frac{26}{52} = \frac{1}{4} = .25$

Mutually Exclusive

25%

② What's probability Jordan will pick a red and a jack?

P(red) and P(jack) = P(red) * P(jack) = $\frac{26}{52} * \frac{(4-2)}{(52-2)} = \frac{26}{52} * \frac{2}{50}$

Overlapping

$= \frac{1}{50} = .02$

2%

$\boxed{\text{new}}$ Independent & Dependent Events

- Independent Events – "A" occurring does NOT affect the probability of "B" occurring.

note: Calculating probability is <u>not</u> being affect.

with replacement

This was created by Keenan Xavier Lee - 2014. See my website for more information, lee-apcalculus.weebly.com.

[Example] Maria has a bag full of marbles — 4 red marbles, 8 grey marbles, 3 blue marbles, 5 yellow marbles.

1. What's the probability Maria first draws a blue marbles, then secondly draws a grey marble with replacement?

$P(\text{blue}) \text{ and } P(\text{grey}) = P(\text{blue}) * P(\text{grey}) = \frac{3}{52} * \frac{8}{52} = \frac{3}{338} \approx .008$

.8%

- Dependent Events – "A" occurring affects the probability of "B" occurring

<u>note:</u> Calculating Probability will be effected (subtracting will happen)

Without replacement

[Example] Maria has a bag full of marbles — 4 red marbles, 8 grey marbles, 3 blue marbles, 5 yellow marbles.

2. What's the probability Maria first draws a blue marbles, then secondly draws a grey marble without replacement?

$P(\text{blue}) \text{ and } P(\text{grey}) = P(\text{blue}) * P(\text{grey}) = \frac{3}{52} * \frac{8}{51} = \frac{2}{221} \approx .009$

.9%

Determining if events are INDEPENDENT

If an event is independent, then $P(A \cap B) = P(A) * P(B)$

Substitute what's given & verify that the left side equal right side.

[Example] Let event M = taking a math class. Let event S = taking science class. Then let event M&S = taking a math & science class. Suppose P(Math) = 0.6, P(Science) = 0.5 and P(Math and Science) = 0.3. Are Math & Science independent?

$$P(A \cap B) = P(A) * P(B)$$
$$P(\text{Math and Science}) = P(\text{Math}) * P(\text{Science})$$
$$0.3 = 0.6 * 0.5$$
$$0.3 = 0.3 \checkmark \text{ True}$$

So, taking math class & taking science class are independent of each other.