

# MA 162: Finite Mathematics - Section 7.5

Fall 2014

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## Announcements:

- Homework 7.4 due Friday at 6pm.
- Homework 7.5 due Tuesday at 6pm.
- Exam #3 is Monday night from 5-7pm. Same room assignments as before.

## 7.5 - Conditional Probability

- A conditional probability is the probability of an event occurring given that another event has already occurred.
- Essentially what happens is that we are making the sample space smaller for the second event.
- Therefore we get:

$$P(B|A) = \frac{\text{Number of elements in } A \cap B}{\text{Number of elements in } A}$$

- This is equivalent to

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

## 7.5 - Conditional Probability with Playing Cards

- Two cards are drawn in succession (without replacement) out of a standard deck of 52 cards.
- What is the probability that the second card is a diamond, given that the first card drawn is not a diamond?
  
- What is the probability that the second card is a diamond, given that the first card is a diamond?
  
- What is the probability that the second card is a diamond?

## 7.5 - Tree Diagram

## 7.5 - Three stage conditional probability

Three cards are drawn in succession (without replacement) out of a standard deck of 52 cards. What is the probability that the third card is a king?

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## 7.5 - Conditional Probability with Urns

Five black balls and four white balls are placed in an urn. Two balls are then drawn in succession without replacement. What is the probability that the second ball is white?

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## 7.5 - Independent Events

- Independent events are events that do not affect the outcome of each other.
- The examples from today so far have all been dependent. The probability of the second event occurring depends on what happens with the first event.
- Don't confuse this with *mutually exclusive* events.
- If  $A$  and  $B$  are independent events, then

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

- Two events  $A$  and  $B$  are independent if and only if

$$P(A \cap B) = P(A)P(B)$$

## 7.5 - Tan, #22

A card is drawn from a well-shuffled deck of 52 playing cards. Let  $E$  denote the event that the card drawn is an ace and let  $F$  be the event that the card drawn is a diamond. Determine whether  $E$  and  $F$  are independent events.

## 7.5 - Flipping Coins

- Flip a fair coin 5 times. What is the probability that the third flip is heads?
- Flip a fair coin 5 times. What is the probability that the third flip is heads given that the previous flip was tails?
- A fair coin is flipped 20 times and comes up heads every time. What is the probability that the next coin is tails?

## 7.5 - Accident Severity

	Unharmmed	Mild Injury	Severe Injury
Seatbelt	306	107	18
No Seatbelt	166	214	63

- Find  $P(U)$ .
- Find  $P(N)$ .
- Find  $P(U \cap N)$ .
- Find  $P(U|N)$ .
- Are  $U$  and  $N$  independent?
- Explain the difference between  $P(U|N)$  and  $P(N|U)$ .