Unit 2 Day 5

Probability

Multiplication Rule with

Conditional Probability

Feb 1-9:16 AM

"At least" probabilities — Example

(*Think complements and multiplication all wrapped up into one.)

A coin is tossed 3 times. Find the probability of getting **at least one** tails.

#1 Find complement for the at least one . . .

#2 power for the # of events

#3 subtract from 1

$P(\text{not tails}) = \frac{1}{2}$

$P(\text{not tails } 3x) = \left(\frac{1}{2}\right)^3 = \frac{1}{2^3} = \frac{1}{8}$

$1 - P(\text{not tails } 3x) = 1 - \frac{1}{8} = \frac{7}{8}$

$1 - \left(\frac{1}{2}\right)^3$

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II. "At least" probabilities — Example

If 2 cards are drawn from a deck and replaced, find the probability of getting **at least one** face card. 12

#1 not face cards 40/52

#2 power of events

$1 - \left(\frac{10}{13}\right)^2 = \frac{69}{169}$

0.408

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II. "At least" probabilities — Example

You roll a single die 4 times. Find the probability of rolling **at least one** 5.

not getting a 5

$1 - \left(\frac{5}{6}\right)^4 = \frac{671}{1296}$

0.518

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II. "At least" probabilities — Example

It is found that 6% of all automobiles on the road have defective brakes. If 5 automobiles are stopped and checked by the safety patrol, find the probability that **at least one** will have defective brakes.

$1 - (0.94)^5 = 0.266$

26.6%

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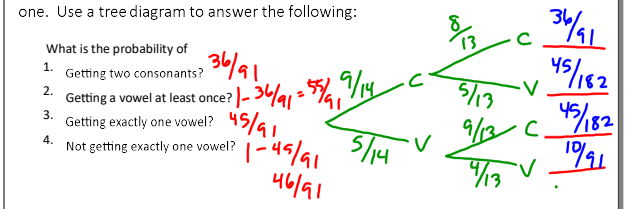
Using a tree diagram — Example

A bag contains 14 counters with the letters of the word TRANSFORMATION written on them. A counter is chosen at random and not replaced before choosing another one. Use a tree diagram to answer the following:

What is the probability of

1. Getting two consonants? $\frac{36}{91}$
2. Getting a vowel at least once? $1 - \frac{36}{91} = \frac{55}{91}$
3. Getting exactly one vowel? $\frac{45}{91}$
4. Not getting exactly one vowel? $1 - \frac{45}{91} = \frac{46}{91}$



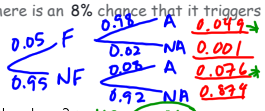
Jan 31-9:58 AM

Using a tree diagram

Example

An airport screens bags for forbidden items, and an alarm is supposed to be triggered when a forbidden item is detected.

- Suppose that 5% of bags contain forbidden items.
- If a bag contains a forbidden item, there is a 98% chance that it triggers the alarm.
- If a bag doesn't contain a forbidden item, there is an 8% chance that it triggers the alarm.



What is the probability of:

a. A bag having a forbidden item and triggering the alarm? 0.049 (4.9%)

b. A bag containing a forbidden item, given that it triggers the alarm?

$$\frac{0.049}{0.049+0.076} = \frac{0.049}{0.125} = 0.392$$

39.2%

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