

Math 160 Sp10 Lowman, Monday Week 11

Note Title

4/5/2010

## Probability Examples:

Example: In a certain region it is known that the chances of finding oil is 0.01 (1%).

There is a test that can be used to test in advance for oil. When there is oil the test will give a positive (ie correct) result 90% of the time. When there is not oil the test will give

a negative (correct) result 80% of the time.

If you perform the test for and the results are positive for oil, what is the probability that oil will actually be found?

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The given information can be summarized as follows:

$$P(0) = P(0|1) = 0.01$$

$$P(+|0) = 90\% = .90$$

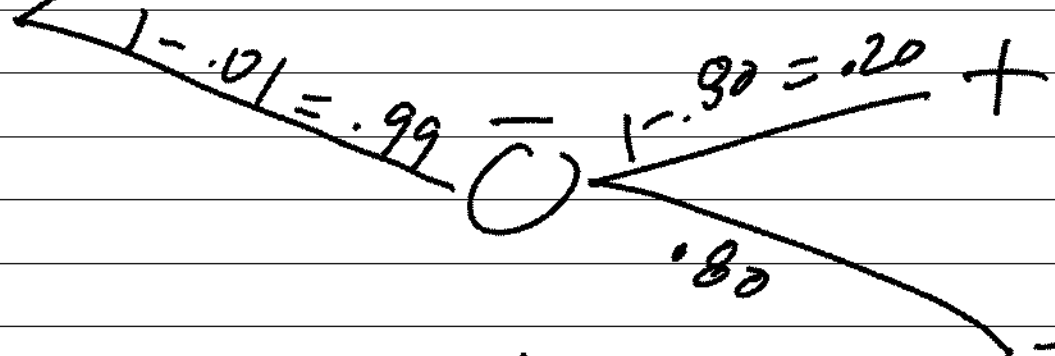
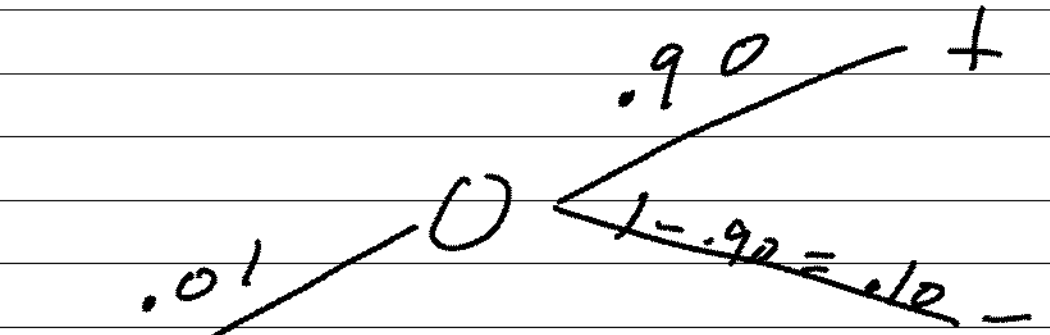
$$P(-|\bar{0}) = 80\% = .80$$

$$P(0|+) = ?$$

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It is easy to solve this problem using only formulas and definitions.

However, when some of the given probabilities are conditional probabilities a tree is often a convenient tool for organizing the problem.



Use the definition of conditional probability and use the tree.

$$P(O|+) = \frac{P(O \cap +)}{P(+)} \quad \begin{array}{l} \leftarrow \text{get these from} \\ \text{the tree.} \end{array}$$

$$P(O \cap +) = (.01)(.90) \quad \text{Incorrect result}$$

$$P(+)=P(O \text{ and } +)+P(\bar{O} \text{ and } +)$$
$$= (.01)(.90) + (.99)(.20)$$

$$P(O|+) = \frac{(.01)(.90)}{(.01)(.90) + (.99)(.20)} = 0.04348$$

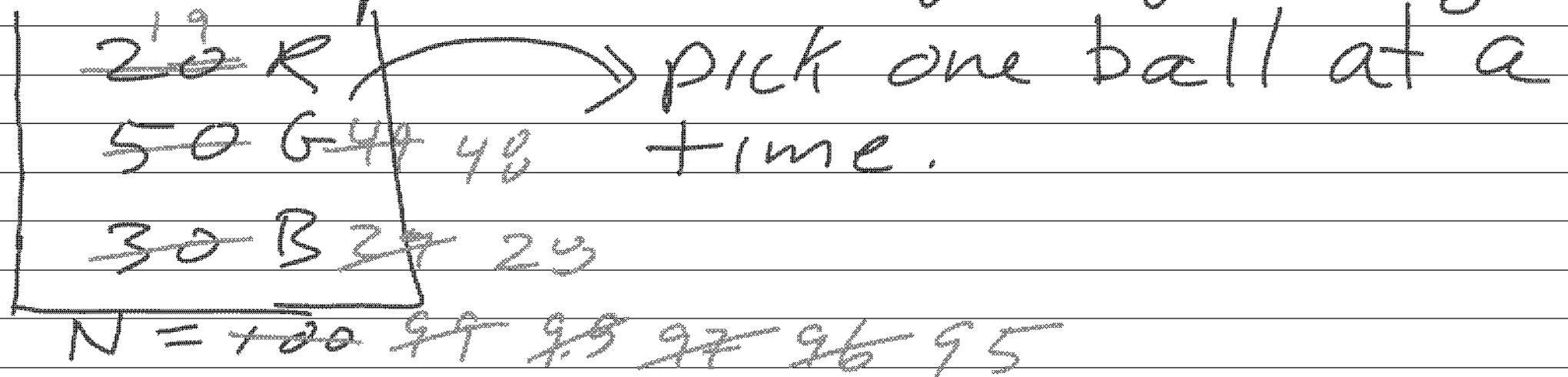
$$P(O|+) \approx 4\% \quad \text{Should you drill for oil?}$$

One way to interpret the probability is this: Under these conditions if you drill for oil 100 times you should expect to find oil only four times on average.

Example: A box has  
20 Red Balls, 50 Green Balls  
and 30 Blue Balls. ( $N=100$  Balls)

Six balls are picked at random one at a time (w/o replacement)  
 Find the Probability of getting (R, G, B, B, G, B) Order Matters.

Draw a picture (always a goat king food).





$$P = \frac{20}{100} \cdot \frac{50}{99} \cdot \frac{30}{98} \cdot \frac{29}{97} \cdot \frac{49}{96} \cdot \frac{28}{95}$$

= \_\_\_\_\_ (finish the calculation.)

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