

MATH-1110 (DUPRÉ) FALL 2010 TEST 2 ANSWERS

**FIRST: PRINT YOUR LAST NAME IN LARGE CAPITAL LETTERS ON THE UPPER RIGHT CORNER OF THIS SHEET.**

**SECOND: PRINT YOUR FIRST NAME IN CAPITAL LETTERS DIRECTLY UNDERNEATH YOUR LAST NAME.**

**THIRD: WRITE YOUR FALL 2010 MATH-1110 LAB DAY DIRECTLY UNDERNEATH YOU FIRST NAME.**

Suppose that Sam is a college student taking both calculus and physics. Given that he receives an A in calculus there is a 90 percent chance that he also receives an A in physics, whereas if he does not receive an A in calculus, there is only a 60 percent chance he receives an A in physics. There is a 30 percent chance that Sam receives an A in calculus.

1. What is the chance that Sam receives an A in calculus and an A in physics?

**ANSWER:** Let  $M$  be the statement that Sam receives an A in calculus and let  $N$  be the statement that he receives an A in physics. We are given

$$P(N|M) = .9,$$
$$P(N| \text{not } M) = .6$$

and

$$P(M) = .3.$$

Using the **MULTIPLICATION RULE**

$$P(M \& N) = P(N|M)P(M) = (.9)(.3) = .27.$$

**FINAL ANSWER: .27**

2. What is the chance that Sam receives an A in physics and does not receive an A in calculus?

**ANSWER:** Since  $P(M) = .3$  we must have  $P(\text{not } M) = .7$  so using the **MULTIPLICATION RULE** again

$$P(N \& \text{not } M) = P(N| \text{not } M)P(\text{not } M) = (.6)(.7) = .42.$$

**FINAL ANSWER: .42**

3. What is the chance that Sam receives an A in physics?

**ANSWER:** Since  $N$  is logically the same as  $(N \& M)$  or  $(N \& \text{not } M)$ , and at most one of the statements  $N \& M$ ,  $N \& (\text{not } M)$  is true, it follows that the answer is simply the sum of the previous two answers:

$$P(N) = P(N \& M) + P(N \& [\text{not } M]) = .27 + .42 = .69$$

**FINAL ANSWER: .69**

4. Given that Sam receives an **A** in physics, what is the chance he also receives an **A** in calculus?

**ANSWER:** Since the **MULTIPLICATION RULE** guarantees

$$P(M\&N) = P(M|N)P(N),$$

it follows that

$$P(M|N) = \frac{P(M\&N)}{P(N)} = \frac{.27}{.69} = \frac{9}{23}.$$

**FINAL ANSWER:** 9/23

5. Suppose that a box contains 7 **RED** blocks and 5 **BLUE** blocks and a color blind lab assistant is removing the blocks from the box one after another without replacement. Given that the third block removed is **RED**, what is the chance that the second block removed is **BLUE**?

**ANSWER:** Since there are 12 blocks in the box to start and as we know the third block drawn will be red, this means there are only 11 blocks whose fate is unknown to us and of those 11 blocks there are 5 which are blue, so the probability that the second is blue given the third is red would simply be

$$P(2^{nd} B | 3^{rd} R) = \frac{5}{11}.$$

**FINAL ANSWER:** 5/11