

Unit 2 – Introduction to Probability
Homework #3 (Unit 2 – Introduction to Probability)

Due Date: Monday September 28, 2015
Last submission date for credit: Monday October 5, 2015

1. **This exercise gives you practice with some of the basics of probability calculations. See unit 2 notes, section 4, “The Basics”, especially pp 7-14.**

Let A and B denote two independent genetic traits. Suppose the probability that an individual will exhibit trait A is $\frac{1}{2}$ and the probability that an individual will exhibit trait B is $\frac{3}{4}$. What is the probability that an individual will exhibit

- (a) Both traits?
- (b) Neither trait?
- (c) trait A but not trait B?
- (d) trait B but not trait A?
- (e) exactly one trait?

2. **This exercise gives you practice with the multiplication rule. For this, see unit 2 notes, section 7. “The Multiplication Rule - The Basics”, especially pages 24-29. Tip - This is about the general multiplication rule and not the special case where the events are independent.**

Suppose you are told that $\text{pr}(\text{right eye is blue}) = \frac{1}{3}$ and $\text{pr}(\text{left eye is blue}) = \frac{1}{3}$. Confirm for yourself what you know by intuition, namely that $\text{pr}(\text{person is blue eyed}) = \frac{1}{3}$ by solving for $\text{pr}(\text{blue right eye and blue left eye})$. **NOTE – In doing your work, assume that a person’s two eyes are always the same color**

3. **This exercise gives you practice with Bayes Rule. See unit 2 notes, section 8, “Conditional Probability”, especially section 8.d, “Bayes Rule”, pages 32-34.**

A physician develops a diagnostic test that is positive for 95% of the patients who have disease and is positive for 10% of the patients who do not have disease. Of patients tested, 20% actually have disease. Suppose you evaluate a patient by administering this diagnostic test and obtain a positive result. Using the information given, calculate the probability that this patient has disease.