Practice Midterm 1

MA3160, Fall 2017

September 26, 2017

1 Multiple choice, 10 points

1. An iPhone password can be made up of any 4 digit combination. How many different passwords are possible?

   (a) 4^{10}

   (b) 10^4

   (c) $10 \times 9 \times 8 \times 7$

2. If A and B are disjoint events, then $P(A \cup B) = P(A) + P(B)$.

   (a) True

   (b) False

3. A school of 70 students has awards for the top math, English, history and science student in the school. How many ways can these awards be given if each student can only win one award?

   (a) 70^4

   (b) $70 \times 69 \times 68 \times 67$

   (c) $\frac{70 \times 69 \times 68 \times 67}{4}$

4. If A and B are independent events, then $P(A \cap B) = P(A)P(B)$

   (a) True

   (b) False

5. If X, Y are random variables, we always have $E(XY) = E(X)E(Y)$

   (a) True

   (b) False

6. A, B are events such that $P(A) = 0.5$ and $P(B) = 0.1$, $P(A \cap B) = 0.2$. What is $P(A \cup B)$?

(a) 0.6

(b) 0.4

(c) $\sqrt{\pi}$

7. Suppose that A and B are pairwise disjoint events for which $P(A) = 0.2$ and $P(B) = 0.5$. What is the probability that B occurs but A does not?

   (a) 0.5

   (b) 0.4

   (c) 0.3

8. In a seminar attended by 13 students, what is the probability that at least two of them have birthday in the same month?

   (a) $\frac{13}{12}$

   (b) 1

   (c) $\frac{12}{13}$

9. Two dice are simultaneously rolled. Consider the events

$$A = \{ \text{ the sum is 7 } \}, B = \{ \text{ the second is 1 } \}.$$

   Are they independent ?

   (a) Yes

   (b) No

10. If A, B are events, then we always have $P(A \mid B) = P(B \mid A)$.

2 Exercises, 10 points

1. Suppose the test for disease A is 98 % accurate in both directions and 1% of the population is disease A positive. If someone tests positive, what is the probability they actually are disease A positive?

2. Landon is 80% sure he forgot his textbook either at the Union or at Monteith. He is 40% sure that the book is at the union, and 40% sure that it is at Monteith. Given that Landon already went to Monteith and noticed his textbook is not there, what is the probability that it is at the Union?

3. Suppose you are organizing your textbooks on a book shelf. You have 2 chemistry books, 5 math books, 5 history books and 6 English books.

   (a) How many ways can you order the textbooks if you must have math books first, English books second, chemistry third, and history fourth?

(b) How many ways can you order the books if each subject must be ordered together?