

Mathematics 1550H – Introduction to probability

TRENT UNIVERSITY, Winter 2015

Quizzes

**Quiz #1.** Thursday, 15 January, 2015. [10 minutes]

1. The following problem appeared online some years ago. [Its origins are unknown to your instructor.]

If you choose an answer to this question at random, what is the chance you will be correct?

- A) 25%
- B) 50%
- C) 60%
- D) 25%

Explain, as completely (and correctly!) as you can just what is going on in this problem. [5]

**Quiz #2.** Thursday, 22 January, 2015. [10 minutes]

1. A fair standard six-sided die is rolled twice. What is the probability that at least one of the two rolls came up with an odd number?

**Quiz #3.** Thursday, 29 January, 2015. [10 minutes]

An edition of the *Rise and Fall of the Roman Vampire*<sup>†</sup> has seven volumes, numbered 1 to 7.

1. How many ways are there to arrange the seven volumes on three shelves? (Including the possibilities that one or two shelves have no volumes.) [2.5]
2. How many ways are there to choose a group of three volumes out of the seven if the group must contain exactly one even-numbered volume. (The order in which the volumes of the group are chosen does not matter.) [2.5]

**Quiz #4.** Thursday, 5 February, 2015. [15 minutes]

Do *one* (1) of the following questions.

1. Four cards are drawn, one at a time and without replacement from a standard 52-card deck. Let  $A$  be the event that the four cards are of different suites, so each suite occurs once among the four cards, and  $B$  is the event that all four cards are of the same kind. What are  $P(A|B)$  and  $P(B|A)$ ?
2. Suppose  $S$  is a sample space and  $A$  and  $B$  are events such that  $A \cup B = S$  and  $P(A) = P(B) = \frac{5}{8} = 0.625$ . What is  $P(A|B)$ ? [5]

**Quiz #5.** Thursday, 12 February, 2015. [15 minutes]

Suppose  $X$  is a continuous random variable with probability density function

$$f(x) = \begin{cases} 0 & \text{if } x < 0 \text{ or } x > 1 \\ 2x & \text{if } 0 \leq x \leq 1 \end{cases}.$$

Let  $A$  be the event that  $X \leq \frac{1}{2}$  and  $B$  be the event that  $X \geq \frac{1}{4}$ .

1. Compute  $P(A)$ . [2]
2. Compute  $P(B|A)$ . [3]

---

<sup>†</sup> With apologies to the perpetrators of the Bugs Bunny cartoon *Transylvania 6-5000*.

**Quiz #6.** *Take-Home! [Due in class on Thursday, 12 March.]*

Meredith Mortiser wishes to use a saw to cut a wooden cube, with sides 30 *cm* long, into 27 cubes, each with sides 10 *cm* long. Meredith can do this easily by making six cuts through the cube, keeping the pieces together in the cube shape.

$-e^{i\pi}$ . Can Meredith reduce the number of necessary cuts by rearranging the pieces after each cut? If so, how? If not, why not? [5]

**Quiz #7.** ~~Thursday, 12~~ *Tuesday, 17 March, 2015. [15 minutes]*

A fair coin is tossed three times, and  $X$  is the number of heads that occur.

1. What is the probability function  $p(x) = P(X = x)$  of the random variable  $X$ ? [3]
2. Compute the expected value  $E(X)$  of  $X$ . [2]

**Quiz #8.** *Thursday, 19 March, 2015. [15 minutes]*

Let  $X$  be a continuous random variable with density function  $f(x) = \begin{cases} \frac{3}{4}(1-x^2) & -1 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$ .

1. Compute the expected value  $E(X)$  of  $X$ . [3]
2. Compute the variance  $V(X)$  of  $X$ . [2]

**Quiz #9.** *Thursday, 26 March, 2015. [10 minutes]*

1. A forest is populated by trees whose ages have a mean of  $\mu = 30$  years and a standard deviation of  $\sigma = 4$  years. What is the maximum possible value of the probability that a randomly chosen tree is either no more than 25 years or not less than 35 years old? [5]