

(Due Wednesday 10/10/2018 right before class)

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(Your homework shall be stapled if it contains multiple pages.)

FALL/2018/MA526: HOMEWORK 7

Instructor: Guangqu Zheng¹; Grader: Chessa Mccalla²

Total points: 20.

Q1 (4pt) Suppose X is a random variable with $\mathbb{E}[X] = 50$ and $\text{Var}(X) = 25$. Calculate the following quantities.

(a) $\mathbb{E}[X^2]$ (b) $\mathbb{E}[2X + 10]$ (c) $\mathbb{E}[(X + 1)^2]$ (d) $\text{Var}[-2X]$

Q2 (4pt) Compute the probability $\mathbb{P}(\mu - 2\sigma < X < \mu + 2\sigma)$, where X has the density function

$$f(x) = \begin{cases} 6x(1-x), & 0 < x < 1, \\ 0 & \text{elsewhere.} \end{cases}$$

(The constant $\mu = \mathbb{E}[X]$ and $\sigma = \sqrt{\text{Var}(X)}$.) Compare with the result given in the Chebyshev's theorem.

Q3 (3pt) A nationwide survey of college seniors by the University of Michigan revealed that almost 70% disapprove of daily pot smoking, according to a report in *Parade*. If 12 seniors are selected at random and asked their opinion, find the probability that the number who disapprove of smoking pot daily is

- (a) anywhere from 7 to 9;
- (b) at most 5;
- (c) not less than 8.

Q4 (2pt) From a lot of 10 missiles, 4 are selected at random and fired. If the lot contains 3 defective missiles that will not fire, what is the probability that (a) all 4 will fire? (b) at most 2 will not fire?

Q5 (3pt) A foreign student club lists as its members 2 Canadians, 3 Japanese, 5 Italians, and 2 Germans. If a committee of 4 is selected at random, find the probability that

- (a) all nationalities except Italian are represented. (1pt)
- (b) only three nationalities are represented. (2pt)

Q6 (4pt) The refusal rate for telephone polls is known to be approximately 20%. A newspaper report indicates that 50 people were interviewed before the first refusal. (a) Comment on the validity of the report. Use a probability in your argument. (b) What is the expected number of people interviewed before a refusal?

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