

Math 483 HW 8, 2023. Due Monday, Sept. 25. Quiz 3 is Friday, Sept. 25. Find $E(Y)$ and $V(Y)$ using an MGF. Should have discrete and continuous random variables. In particular, know how to do binomial and Poisson computations. Find $E[g(Y)]$. **Two pages problems A)-I).**

A) 4.59abc a) Find the value of z_o such that $P(Z > z_o) = 0.5$.

b) Find the value of z_o such that $P(Z < z_o) = 0.8643$.

c) Find the value of z_o such that $P(-z_o < Z < z_o) = 0.90$.

comment: These are backwards calculations. In c) there is a tie, so z_o is an average of two table values.

B) 4.63a A company that manufactures and bottles apple juice uses a machine that automatically fills 16-ounce bottles. There is some variation in the amounts of liquid dispensed into the bottles. The amount dispensed is approximately normally distributed with mean 16 ounces and standard deviation 1 ounce. What proportion of bottles will have more than 17 ounces?

comment: Forwards calculation.

C) 4.68a The grade point averages of a large population of college students is approximately normally distributed with mean 2.4 and standard deviation 0.8. What fraction of the students will possess a grade point average in excess of 3.0?

comment: Forwards calculation.

D) 4.69 Refer to problem C). If students possessing a grade point average less than 1.9 are dropped from the college, what percentage of the students will be dropped?

comment: Forwards calculation. There is a tie, so average the probabilities corresponding to -0.62 and -0.63 .

E) 4.73 The width of bolts of fabric is normally distributed with mean 950 mm and standard deviation 10 mm.

a) What is the probability that a randomly chosen bolt has a width between 947 and 958 mm?

b) What is the approximate value of C such that a randomly chosen bolt has width less than C with probability 0.8531?

comment: a) is a forwards and b) a backwards calculation.

F) 4.74b Scores on an examination are assumed to be normally distributed with mean 78 and variance 36. Suppose that students scoring in the top 10% of this distribution receive an A. What is the minimum score a student must achieve to earn an A grade?

comment: Backwards calculation. Convert variance to SD.

G) 4.88 The magnitude of earthquakes recorded in a region of North America can be modeled as having an exponential distribution with mean 2.4, as measured on the Richter scale. Find the probability that an earthquake striking this region will

a) exceed 3.0 on the Richter scale.

b) Fall between 2.0 and 3.0 on the Richter scale.

comment: Recall u-substitution. Assume that infinite limits are allowed and that $\exp(-\infty) = 0$. Get 0.2865 and 0.1481.

H) 4.96a Suppose Y has probability density function

$$f(y) = \begin{cases} ky^3 e^{-y/2} & \text{if } y > 0 \\ 0, & \text{otherwise,} \end{cases}$$

Find the value of k that makes $f(y)$ a pdf.

comment: Match the pdf $f(y)$ with a gamma distribution.

I) 4.105a Four-week summer rainfall totals in a section of the Midwest United States have approximately a gamma distribution with $\alpha = 1.6$ and $\beta = 2.0$. Find the mean and variance of the four-week rainfall totals.

comment: Use p. 186.

Ash, C. (1993), *The probability tutoring book : an intuitive course for engineers and scientists (and everyone else!)*, IEEE Press, NY. (519.2 A819P Does counting, probability, expectation and double integrals better than the M483 text.)