

Math 186, Winter 2020, Prof. Tesler
Homework #4, Due Wednesday February 5, 2020

Note: If you would like to use your homework to study for the exam, please photocopy it before turning it in.

Larsen & Marx **Sixth Edition:**

3.4# 16

3.5# 28, 30, 31

3.6# 2, 5, 15

3.7# 1, 7, 9*, 38, 40 (See note below on 3.7.9.)

3.8# 3(b) (Note that each term of the sum is the same after simplification.)

3.9# 20

3.11# 2, 4

and the problems below: H-401, H-402, H-403.

*For problem 3.7.9, in addition to what it asks, also (i) compute the marginal pdfs of X and Y ; (ii) determine if X and Y are dependent or independent.

Problem H-401. 36 independent offspring are produced from an $Rr \times Rr$ cross of pea plants. R =round peas, r =wrinkled, with R dominant.

- (a) Compute the expected number of offspring with wrinkled peas.
- (b) Compute the variance and the standard deviation of the quantity in (a).
- (c) Compute the probability that the the number of offspring with wrinkled peas is exactly the expected number computed in (a).
- (d) Redo (a) and (c) for the case when there are 35 independent offspring instead of 36.

Problem H-402. Rods coming off an assembly line have length L , which is a continuous random variable between 5 and 10 feet. The probability density is proportional to the length.

There should not be any unknown constants in your final answers to any part of this question, e.g., constants left as "c" or another name; any constants you compute need to be plugged in.

- (a) Determine the formulas for the pdf and cdf of L . Be sure to account for all real numbers.
- (b) Graph the pdf and cdf.
- (c) Determine the 60th percentile and the median of L .
- (d) Compute the expected value and the standard deviation of L .
- (e) The *mode* of a random variable X is the value of X with the highest probability density. What is the mode of L ? What is the mode of $X = 35 - L$?

Problem H-403. Two pea plants with genotype $TtRr$ are crossed and yield 18 offspring.

T/t determines the plant height: T =tall, t =short, and T is dominant.

R/r determines the pea shape: R =round, r =wrinkled, and R is dominant.

Genes T and R are on different chromosomes.

Use the multinomial distribution to determine the probability that 7 offspring are tall and round, 4 are tall and wrinkled, 5 are short and round, and 2 is short and wrinkled.