

Quiz 2 (15 points)
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Answer all questions. Show all your working neatly and indicate your answers clearly.

1. (8 points) The following table represents the proportion of students enrolled in Grades 9-12 in public high schools in the District of Columbia in Fall, 2006.

X (Grade Level)	P(x)
9	0.355
10	0.240 (Recall: $\mu_X = \sum xP(x)$ and $\sigma_X = \sqrt{\sum (x - \mu)^2 P(x)}$)
11	0.221
12	0.184

- (a) Verify that this is a discrete probability distribution for the random variable X.

$$0.355 + 0.240 + 0.221 + 0.184 = 1$$

- (b) What is the probability that a randomly selected high-school student is in the 9th Grade?

$$0.355$$

- (c) Compute and interpret the mean of the random variable X.

$$\begin{aligned} \mu_X &= 0.355(9) + 0.24(10) + 0.221(11) + 0.184(12) \\ &= 10.234 \end{aligned}$$

- A randomly selected student is expected to be in the 10th grade
- (d) Compute the standard deviation of the random variable X.

x	x - μ	(x - μ) ²	P(x)	(x - μ) ² P(x)
9	-1.234	1.5228	.355	.541
10	-.234	.0548	.24	0.013
11	.766	.5868	.221	0.13
12	1.766	3.1188	.184	.574

$$\sigma = \sqrt{1.2587} = 1.12$$

THERE IS ANOTHER QUESTION ON THE OTHER SIDE OF THE PAPER!!

2. (7 points) It is known that 55% of students in a four-year college are female. Suppose 9 students are randomly selected and the number of females is recorded. (Recall: For a binomial distribution: $P(x) = {}_n C_x p^x (1-p)^{n-x}$, $\mu = np$, and $\sigma = \sqrt{np(1-p)}$.)

(a) Find the probability that exactly 7 are female.

$$P(7) = 0.111$$

(b) Find the probability that less than 3 are female.

$$\begin{aligned} P(X < 3) &= P(0) + P(1) + P(2) = P(X \leq 2) \\ &= 0.0008 + 0.0083 + 0.0407 \\ &= .0498 \end{aligned}$$

(c) Find the probability that between 2 and 4, inclusive, are female.

$$\begin{aligned} P(2 \leq X \leq 4) &= P(2) + P(3) + P(4) \\ &= .0407 + .116 + .2128 \\ &= .3695 \end{aligned}$$

(d) Find the mean and standard deviation of the random variable X, the number of female students.

$$\begin{aligned} \mu &= np = 9(.55) = 4.95 \\ \sigma &= \sqrt{np(1-p)} = \sqrt{9(.55)(.45)} \\ &= \sqrt{2.2275} = 1.492 \end{aligned}$$

THE END