

MATH 130.05: Elements of Statistics I

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 data represents the number of students enrolled in Grades 9-12 in public high schools in the District of Columbia in Fall, 2006.

X (Grade Level)	Frequency
9	6508
10	4391
11	4047
12	3367

(Recall: $\mu_X = \sum xP(x)$ and $\sigma_X = \sqrt{\sum (x - \mu)^2 P(x)}$.)

- (a) Construct a discrete probability distribution for the random variable X.

Total = 18313 ✓✓

X	P(X)
9	.355
10	.240
11	.221
12	.184

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

$P(9) = .355$ ✓✓

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

$$\mu_X = 9(.355) + 10(.24) + 11(.221) + 12(.184)$$

$$= 10.234$$
 ✓

A randomly selected student is expected to be in the 10th grade ✓

- (d) Compute the standard deviation of the random variable X.

X	$x - \mu$	$(x - \mu)^2$	P(x)	$(x - \mu)^2 P(x)$
9	-1.234	1.5228	.355	.541
10	-.234	.0548	.240	0.013
11	.766	.5868	.221	.130
12	1.766	3.1188	.184	.574

$\therefore \sigma = \sqrt{1.258}$
 $= 1.12$

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 6 are female.

$$P(6) = {}_9 C_6 (.55)^6 (.45)^3 = .212 \checkmark$$

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

$$\begin{aligned} P(X < 3) &= P(X \leq 2) \\ &= 0.05 \checkmark \end{aligned}$$

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

$$\begin{aligned} P(2 \leq X \leq 4) &= P(2) + P(3) + P(4) & \Bigg| &= P(\cancel{X} \leq 4) - P(X \leq 1) \\ &= .0407 + .1160 + .2128 & \Bigg| &= .37858 - 0.00908 \\ &= .3695 \checkmark & \Bigg| &= .3695 \end{aligned}$$

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

$$\text{mean} = 9(.55) = 4.95 \checkmark$$

$$\begin{aligned} \text{Standard deviation} &= \sqrt{9(.55)(.45)} = \sqrt{2.2275} \\ &= 1.492 \checkmark \end{aligned}$$

THE END