

## Chapter 6 Free Response

Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

### Question #1

For an upcoming concert, each customer may purchase up to 3 child tickets and 3 adult tickets. Let  $C$  be the number of child tickets purchased by a single customer. The probability distribution of the number of child tickets purchased by a single customer is given in the table below.

$c$	0	1	2	3
$p(c)$	0.4	0.3	0.2	0.1

- (a) Compute the mean and the standard deviation of  $C$ .
- (b) Suppose the mean and the standard deviation for the number of adult tickets purchased by a single customer are 2 and 1.2, respectively. Assume that the numbers of child tickets and adult tickets purchased are independent random variables. Compute the mean and the standard deviation of the total number of adult and child tickets purchased by a single customer.
- (c) Suppose each child ticket costs \$15 and each adult ticket costs \$25. Compute the mean and the standard deviation of the total amount spent per purchase.

## Question #2

Men's shirt sizes are determined by their neck sizes. Suppose that men's neck sizes are approximately normally distributed with mean 15.7 inches and standard deviation 0.7 inch. A retailer sells men's shirts in sizes S, M, L, XL, where the shirt sizes are defined in the table below.

Shirt size	Neck size
S	$14 \leq \text{neck size} < 15$
M	$15 \leq \text{neck size} < 16$
L	$16 \leq \text{neck size} < 17$
XL	$17 \leq \text{neck size} < 18$

- (a) Because the retailer only stocks the sizes listed above, what proportion of customers will find that the retailer does not carry any shirts in their sizes? Show your work.
- (b) Using a sketch of a normal curve, illustrate the proportion of men whose shirt size is M. Calculate this proportion.
- (c) Of 12 randomly selected customers, what is the probability that exactly 4 will request size M ? Show your work.

### Question #3

There are 4 runners on the New High School team. The team is planning to participate in a race in which each runner runs a mile. The team time is the sum of the individual times for the 4 runners. Assume that the individual times of the 4 runners are all independent of each other. The individual times, in minutes, of the runners in similar races are approximately normally distributed with the following means and standard deviations.

	Mean	Standard Deviation
Runner 1	4.9	0.15
Runner 2	4.7	0.16
Runner 3	4.5	0.14
Runner 4	4.8	0.15

- (a) Runner 3 thinks that he can run a mile in less than 4.2 minutes in the next race. Is this likely to happen? Explain.
- (b) The distribution of possible team times is approximately normal. What are the mean and standard deviation of this distribution?
- (c) Suppose the team's best time to date is 18.4 minutes. What is the probability that the team will beat its own best time in the next race?