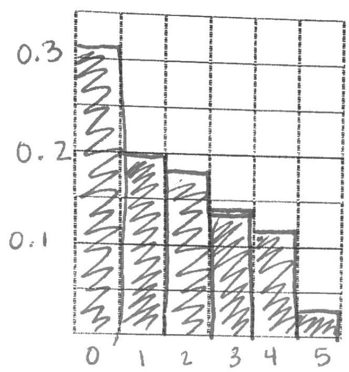
Quiz 6.1B

AP Statistics Name:

1. The probability distribution below is for the random variable X = number of medical tests performed on a randomly selected outpatient at a certain hospital.

X	0	1	2	3	4	5
$P(X)$	0.33	0.20	0.18	0.14	0.12	0.03

(a) Make a histogram of this probability distribution in the grid:



(b) Describe $P(X \le 3)$ in words and find its value.

The probability that an outpatient undergoes no more than 3 medical tests.

$P(X \le 3) = P(X=1) + P(X=2) + P(X=3) + P(X=0)$

$= .20 + .18 + .14 + .33$

$= .85$

(c) Express the event "performing at least two tests" in terms of X and find its probability.

$P(X \ge 2) = P(X=2) + P(X=3) + P(X=4) + P(X=5)$

$= .18 + .14 + .12 + .03$

$= 0.47$

2. The mean height of players in the National Basketball Association is about 79 inches and the standard deviation is 3.5 inches. Assume the distribution of heights is approximately Normal. Let H = the height of a randomly-selected NBA player. Find and interpret $P(H > 74)$.

$P(H > 74) = P\left(z > \frac{74-79}{3.5}\right) = P(z > -1.43)$

$= .9236$

There is a 92.36% chance that a randomly-selected NBA player's height is greater than 74 inches.

3. Man Hong is running the balloon darts game at the school fair. He has blown up hundreds of balloons with notes about prize tickets inside them. Twelve percent of the notes say "You win 5 tickets," twenty percent say "You win 3 tickets," and the rest say "Sorry, try again!" After each play, he replaces the popped balloon with another one bearing the same note. Let T = the number of tickets won by a randomly selected player of this game.

(a) Give the probability distribution for T.

T	0	3	5
P(T)	0.68	0.20	0.12

(b) Find and interpret the mean of T, μ_T.

$\mu_T = 0(0.68) + 3(0.20) + 5(0.12) = 1.2$ Tickets

The average number of tickets won by contestants over a long period of time.

(c) Find and interpret the standard deviation of T, σ_T.

$\sigma_T = \sqrt{0.68(0-1.2)^2 + .2(3-1.2)^2 + .12(5-1.2)^2}$

$= 1.833$ Tickets

The average distance from the mean for each individual contestant is approximately 1.8 Tickets.

Quiz 6.2B AP Statistics Name:

1. A casino operator has invented a new game of "skill" and chance called Grab All You Can. Here's how it works: a contestant reaches his right hand into a jar of dimes and grabs as many as he can in one handful. Then he does the same thing with his left hand in a jar of quarters. Research with many volunteers has determined that the mean number of dimes drawn is 68 with a standard deviation of 9.5, and the mean number of quarters is 42, with a standard deviation of 5.8.

   (a) If D = the amount of money, in dollars, that a randomly-selected contestant grabs from the "dime grab," find the mean and standard deviation of D.

   $\mu_D = 0.10(68) = \$6.80$

   $\sigma_D = 0.10(9.5) = \$0.95$

   (b) If T = the total amount of money, in dollars, that a contestant grabs from both jars, find the mean and standard deviation of T.

   $\mu_T = 0.10(68) + 0.25(42) = \$17.30$

   $\sigma_T = \sqrt{(0.10 \cdot 9.5)^2 + (0.25 \cdot 5.8)^2} = \$1.73$

   (c) The casino operator plans to charge \$20 for one round of play (that is, one grab from each jar). If G = how much the contestant gains from one round of play, find the mean and standard deviation of G.

   $\mu_G = \$17.30 - \$20 = \$-2.70$ (a net loss)

   $\sigma_G = \$1.73$ (not changed by subtracting a constant)

2. Suppose that the mean height of policemen is 70 inches with a standard deviation of 3 inches. And suppose that the mean height for policewomen is 65 inches with a standard deviation of 2.5 inches.
   If heights of policemen and policewomen are Normally distributed, find the probability that a randomly selected policewoman is taller than a randomly selected policeman.

   $\mu_D = 5$ $\sigma_D = \sqrt{3^2 + 2.5^2} = 3.91$

   $P(D<0) = P\left(z < \frac{0-5}{3.91}\right) = P(z < -1.28) = 0.1003$

Quiz 6.3B

AP Statistics

Name:

1. Determine whether each random variable described below satisfies the conditions for a binomial setting, a geometric setting, or neither. Support your conclusion in each case.

   (a) A high school principal goes to 10 different classrooms and randomly selects one student from each class. X = the number of female students in his group of 10 students.

   Neither - probability of success is different in each trial

   (b) You are on Interstate 80 in Pennsylvania, counting the occupants in every fifth car you pass. Let Z = the number of cars you pass before you see one with more than two occupants.

   geometric

2. A manufacturer produces a large number of toasters. From past experience, the manufacturer knows that approximately 2% are defective. In a quality control procedure, we randomly select 20 toasters for testing.

   (a) Determine the probability that exactly one of the toasters is defective.

   $P(X=1) = \binom{20}{1}(0.02)^1(0.98)^{19} = 0.2725$

   (b) Find the probability that at most two of the toasters are defective.

   $P(X \leq 2) =$ binomcdf $(20, .02, 2) = 0.9929$

   (c) Let X = the number of defective toasters in the sample of 20. Find the mean and standard deviation of X.

   $\mu_X = np = (20)(0.02) = 0.4$

   $\sigma_X = \sqrt{np(1-p)} = \sqrt{(20)(.02)(.98)} = .63$

$(X \geq 2) = 1 - P(0) - P(1) = 0.80$

2. a $3C + 2C + 0.4 \ldots$

3. Suppose that 20% of a herd of cows is infected with a particular disease.

(a) What is the probability that the first diseased cow is the 3rd cow tested?

$(0.8)^2(0.2) = 0.128$

(b) What is the probability that 4 or more cows would need to be tested until a diseased cow was found?

P(no diseased cows in first 3 trials) =

$P(\text{failure}) = (0.8)^3 = .512$

a $3C+2C+0.4$ ... $P(0)-P(1)=0.80$

Test 6B AP Statistics Name:

Part 1: Multiple Choice. *Circle the letter corresponding to the best answer.*

1. In the town of Tower Hill, the number of cell phones in a household is a random variable W with the following distribution:

W	0	1	2	3	4	5
$P(W)$	0.1	0.1	0.25	0.3	0.2	0.05

The probability that a randomly-selected household has at least two cell phones is
(a) 0.20. (b) 0.25. (c) 0.55. (d) 0.70. (e) 0.80.

2. A random variable Y has the following distribution:

Y	-1	0	1	2
$P(Y)$	3C	2C	0.4	0.1

has to add up to 1

The value of the constant C is:
(a) 0.10. (b) 0.15. (c) 0.20. (d) 0.25. (e) 0.75.

3. A rock concert producer has scheduled an outdoor concert. If it is warm that day, she expects to make a \$20,000 profit. If it is cool that day, she expects to make a \$5000 profit. If it is very cold that day, she expects to suffer a \$12,000 loss. Based upon historical records, the weather office has estimated the chances of a warm day to be 0.60; the chances of a cool day to be 0.25. What is the producer's expected profit?
(a) \$5,000
(b) \$11,450
(c) \$13,000
(d) \$13,250
(e) \$15,050

$(20{,}000)(.60)+(5000)(.25)-(12{,}000)(.15)=\boxed{11{,}450}$

4. Roll one 10-sided die 12 times. The probability of getting exactly 4 eights in those 12 rolls is given by

(a) $\binom{10}{4}\cdot\left(\frac{1}{10}\right)^4\cdot\left(\frac{9}{10}\right)^8$

(b) $\binom{10}{4}\cdot\left(\frac{1}{10}\right)^4\cdot\left(\frac{9}{10}\right)^6$

(c) $\binom{12}{4}\cdot\left(\frac{1}{10}\right)^4\cdot\left(\frac{9}{10}\right)^6$

(d) $\binom{12}{4}\cdot\left(\frac{1}{10}\right)^4\cdot\left(\frac{9}{10}\right)^8$

(e) $\binom{12}{4}\cdot\left(\frac{1}{10}\right)^8\cdot\left(\frac{9}{10}\right)^4$

$\binom{n}{k}(p)^k(1-p)^{k-1}$

$= 0.80$

5. The variance of sum of two random variables X and Y is
(a) $\sigma_X + \sigma_Y$.
(b) $(\sigma_X)^2 + (\sigma_Y)^2$.
(c) $\sigma_X + \sigma_Y$, but only if X and Y are independent.
(d) $(\sigma_X)^2 + (\sigma_Y)^2$, but only if X and Y are independent.
(e) None of these.

z-score

$z = \frac{325-250}{50} = 1.5$

6. Let the random variable X represent the weight of male black bears before they begin hibernation. Research has shown that X is approximately Normally distributed with a mean of 250 pounds and a standard deviation of 50 pounds. What is $P(X > 325$ pounds)?
(a) 0.0668 (b) 0.2514 (c) 0.7486 (d) 0.8531 (e) 0.9332

7. A set of 10 cards consists of 5 red cards and 5 black cards. The cards are shuffled thoroughly and you turn cards over, one at a time, beginning with the top card. Let Y be the number of cards you turn over until you observe the first red card. The random variable Y has which of the following probability distributions?
(a) the Normal distribution with mean 5
(b) the binomial distribution with $p = 0.5$
(c) the geometric distribution with probability of success 0.5
(d) the uniform distribution that takes value 1 on the interval from 0 to 1
(e) none of the above

geometric, but since there's no replacement, it violates independence

8. A factory makes silicon chips for use in computers. It is known that about 90% of the chips meet specifications. Every hour a sample of 18 chips is selected at random for testing and the number of chips that meet specifications is recorded. What is the approximate mean and standard deviation of the number of chips meeting specifications?
(a) $\mu = 1.62$; $\sigma = 1.414$
(b) $\mu = 1.62$; $\sigma = 1.265$
(c) $\mu = 16.2$; $\sigma = 1.62$
(d) $\mu = 16.2$; $\sigma = 1.273$
(e) $\mu = 16.2$; $\sigma = 4.025$

$\mu_X = np = (18)(.9) = 16.2$

$\sigma_X = \sqrt{(18)(.9)(.1)} = 1.273$

9. In order for the random variable X to have a geometric distribution, which of the following conditions must X satisfy?
I $p < 0.5$
II The number of trials is fixed.
III Trials are independent.
IV The probability of success has to be the same for each trial.
V All outcomes in the sample space are equally likely.

(a) III and IV (b) II, III, IV, and V (c) I and III
(d) I, III, and V (e) II and III