AP Statistics Ch 7 Test 1213 CONGRESS has high expectations
Congress/Virmani Period: Date:
Multiple-Choice Calculator & Green Packet OK

1. A random variable is:

E

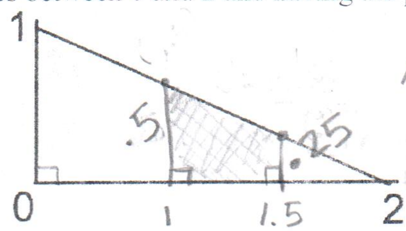
a. A hypothetical list of the possible outcomes of a random phenomenon.
b. Any phenomenon in which outcomes are equally likely.
c. Any number that changes in a predictable way in the long run.
d. A variable used to represent the outcome of a random phenomenon.
e. A variable whose value is a numerical outcome associated with a random phenomenon.

$y = -\frac{1}{2}x + 1$

2. Suppose X is a continuous random variable taking values between 0 and 2 and having the probability density curve shown. $P(1 < X < 1.5)$ is:

E

a. 0.75
b. 0.50
c. 0.33
d. 0.25
e. 0.1875



$A = \frac{1}{2}(.5)(.5 + .25)$

$A = \boxed{.1875}$

3. In a particular game, a fair die is tossed. If the number of spots showing is either 4 or 5, you win \$1. If the number of spots showing is 6, you win \$4. If the number of spots showing is 1, 2, or 3, you win nothing. Let X be the amount that you win on a single play of the game. The standard deviation of X is:

B

a. 1
b. 1.414
c. 1.5
d. 2
e. 2.167

X	0	1	4
P(x)	3/6	2/6	1/6

$\mu_X = \$1$

$\boxed{\sigma_X = \$1.414}$

4. A fair coin is tossed a large number of times. Assuming tosses are independent, which of the following is true?

B

a. Once the number of flips is large enough (usually about 10,000), the number of heads will always be exactly half of the total number of tosses.
b. The proportion of heads will be about ½, and this proportion will tend to get closer and closer to ½ as the number of tosses increases.
c. As the number of tosses increases, any run of heads will be balanced by a corresponding run of tails so that the overall proportion of heads is ½.
d. If the number of heads is greater than the number of tails for the first 5000 tosses, then the number of tails will be greater than the number of heads for the next 5000 tosses.
e. All of the above.

5. A fourth-grade teacher gives homework every night in both mathematics and language arts. The time to complete the math homework has a mean of 10 minutes and a standard deviation of 3 minutes. The time to complete the language arts assignment has a mean of 12 minutes and a standard deviation of 4 minutes. Assuming the times to complete homework assignments in math and language arts are independent, the standard deviation of the time required to complete the entire homework assignment is:

B

a. 7 minutes.
b. 5 minutes.
c. 4 minutes.
d. 3 minutes.
e. 2.1 minutes.

$\mu_{x+y} = \mu_x + \mu_y$

$\sigma_{x+y} = \sqrt{\sigma_x^2 + \sigma_y^2} = \sqrt{3^2 + 4^2} = \sqrt{9+16} = \sqrt{25} = \boxed{5}$

skip

6. The weight of medium-sized tomatoes selected at random from a bin at the local supermarket is a normal random variable with mean 10 ounces and standard deviation 1 ounce. Suppose two tomatoes are chosen at random from the bin and the weights of the chosen tomatoes are independent. The difference in the weights of the two tomatoes selected is a random variable with the following distribution:
   a. N(0, 0.5).
   b. N(0, 1.41).
   c. N(0, 2).
   d. N(0, 4).
   e. Uniform with mean 0.

7. A psychologist studied the number of puzzles subjects were able to solve in a five-minute period while listening to soothing music. Let X be the number of puzzles completed successfully by a subject. The psychologist found that X had the following probability distribution:

X	1	2	3	4
P(X)	0.2	0.4	0.3	0.1

E

The probability that a randomly chosen subject completes at least two puzzles in the five-minute period while listening to soothing music is:
   a. 0.2
   b. 0.3
   c. 0.4
   d. 0.7
   e. 0.8

$.4 + .3 + .1 = .8$

8. The following are parts of the probability distributions for the random variables X and Y.

X	1	2	3	4
$P(X)$	.25	?	.35	? .25

Y	1	2	3
$P(Y)$	.3	.5	?

E

.15 .2

If X and Y are independent and probability of $P(X = 2 \cap Y = 3) = .03$, what is $P(X = 4) = ?$

a. 15 b. ..20 c. .30 d. .1 e. .25

$P(X=2 \cap Y=3) = P(X=2) \cdot P(Y=3)$

$.03 = P(X=2) \cdot .2$

$P(X=2) = .15$

9. Which of the following data sets is not continuous?
   a. The gallons of gasoline in a car
   b. The time it takes to drive to Gunn
   c. The number of goals scored by a soccer team
   d. The distance traveled daily by a Palo Alto bus
   e. The amount of time it takes to run a mile

C

10. The amount of time children spend playing video games per day is normally distributed. The time that boys spend playing video games per day has mean 73 minutes and standard deviation 11 minutes and the time that girls spend playing video games per day has mean 46 minutes and standard deviation 26 minutes. Find the probability that boys spend more time playing video games per day than girls.
   a. 0.17
   b. 0.50
   c. 0.77
   d. 0.83
   e. 0.96

D

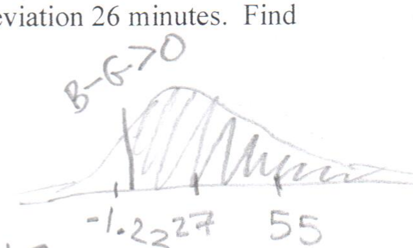
$\mu_{B-G} = 73 - 46 = 27$

$\sigma_{B-G} = \sqrt{11^2 + 26^2}$

$= 28.23$

B > G

B − G > 0



Ncdf

$P(B-G>0) = (0, \infty, 27, 28.23)$

$= .8306$

AP Statistics 1213 CONGRESS has a high probability of doing well
Congress/Virmani Period: Date:
Free Response. Show work for full credit. Calculators OK

1. Here are the counts (in thousands) of earned degrees in the US in a recent year, classified by level and by the sex of the degree recipient:

	Bachelor's	Master's	Professional	Doctorate	Total
Female	616	194	30	16	856
Male	529	171	44	26	770
Total	1145	365	74	42	1626

a. If you choose a degree recipient at random, what is the probability that the person you choose is a woman?

$P(W) = \frac{856}{1626} = \boxed{0.53}$

b. What is the probability that you choose a woman, given that the person chosen received a professional degree?

$P(W|P) = \frac{30}{74} = \boxed{0.41}$

c. Are the events "choose a woman" and "choose a professional degree recipient" independent? Justify your choice.

$P(W \cap P) \overset{?}{=} P(W) \cdot P(P)$

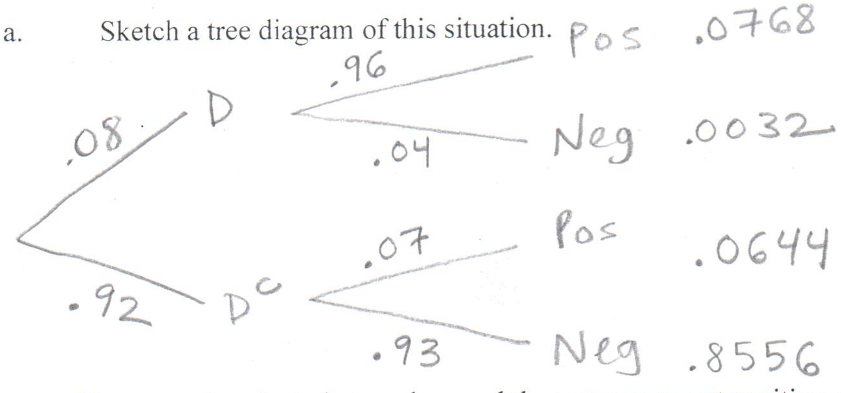
$\frac{30}{1626} \overset{?}{=} \frac{856}{1626} \cdot \frac{74}{1626}$

$0.018 \neq 0.024$

Woman and Professional degree are dependent.

2. Heart disease is the number one killer today. Suppose that 8% of the patients in a small town are known to have heart disease. And suppose that a test is available that is positive in 96% of the patients with heart disease, but is also positive in 7% of patients who do not have heart disease.

a. Sketch a tree diagram of this situation.



b. If a person is selected at random and the test comes out positive, what is the probability that the person actually has heart disease?

$P(D|Pos) = \frac{P(D \cap Pos)}{P(Pos)} = \frac{.0768}{.0768 + .0644} = \boxed{.5439}$

6 red
5 even
5 odd

3. A jar contains red tags numbered 1 through 6 and white tags numbered 1 through 4. One tag is drawn at random. Write the sample space.

$S = \{R1, R2, R3, R4, R5, R6, W1, W2, W3, W4\}$ $n=10$

Calculate the following probabilities:

a. P(red)

$\frac{6}{10} = \boxed{\frac{3}{5}}$

b. P(even)

$\frac{5}{10} = \boxed{\frac{1}{2}}$

c. P(red and even)

$\boxed{\frac{3}{10}}$

d. P(red or even)

$P(R) + P(E) - P(R \cap E) = \frac{6}{10} + \frac{5}{10} - \frac{3}{10} = \frac{8}{10} = \boxed{\frac{4}{5}}$

e. P(neither red nor even)

$P(R^c \cap E^c) = \frac{2}{10} = \boxed{\frac{1}{5}}$

f. P(even given red)

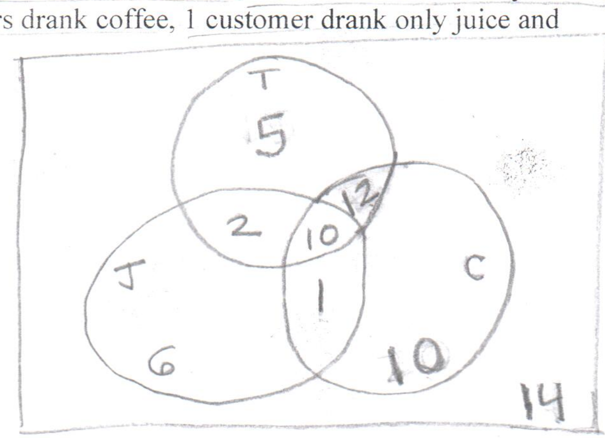
$\frac{P(E \cap R)}{P(R)} = \frac{3}{10} \Big/ \frac{6}{10} = \frac{3}{10} \cdot \frac{10}{6} = \boxed{\frac{1}{2}}$

g. P(less than 4 given odd)

$\frac{P(<4 \cap O)}{P(O)} = \frac{4}{10} \Big/ \frac{5}{10} = \boxed{\frac{4}{5}}$

4. A survey of 60 people was taken at a local coffee shop and the following results were given: 12 customers drank only tea and coffee, 6 customers drank only juice, 29 customers drank tea, 2 customers drank only tea and juice, 10 customers drank tea, coffee and juice, 33 customers drank coffee, 1 customer drank only juice and coffee.

a. Create a Venn diagram for the above situation.



b. How many customers did not drink juice, tea or coffee?

14 customers

c. How many customers drank only tea?

5 customers

5. The Brigham Young University statistics department is performing randomized comparative experiments to compare teaching methods. Response variables include students' final exam scores and a measure of their attitude toward statistics. One study compares two levels of technology for large lectures: standard (whiteboard) and technology (Smartboard). The individuals in the study are the eight professors in a basic statistics course. Suppose the lecturers are as follows:

Lecturer	Lecturer	Lecturer	Lecturer
Hilton 3	Tolley 8	Hadfield 2	Ramirez 7
Christensen 1	Mason 6	Jones 4	Kato 5

Randomly select four individuals to be the lecturers in this study using the random number table below. Describe your randomization process.

71487 09984 29077 14683 61683 47052 62224 51025

Assign one-digit numbers 1-8 alphabetically by last name. No repeats. Select one-digit numbers from random number table. List names chosen.

7 - Ramirez
1 - Christensen
4 - Jones
8 - Tolley