## **AP Statistics** PRACTICE TEST (Chapters 5 & 6)

**Probability & Random Variables** 

**MULTIPLE CHOICE (1 point each)** 

1)

Block

Name

1)

## b) $\frac{1}{3} + \left(\frac{1}{3}\right)^9$ c) $\frac{1}{3} - \left(\frac{1}{3}\right)^9$ d) $\frac{1}{10}$ e) $\frac{9}{10}$ a) $\frac{1}{3}$

2) A friend has placed a large number of plastic disks in a hat and invited you to select one a random. He informs you that they have numbers on them, and that one of the following is the probability model for the number on the disk you have chosen. Which one is it?

a)	Number of Disk	s 1	2	3	4 5	]	b)	Number of Dis	ks 🗆	1 2	3	4 5	
	Probability	1		$\frac{1}{4}$	$\frac{1}{4}$ $\frac{1}{4}$			Probability		1 2	3	4 5	
				4	4 4								
c)	Number of Disks	1	2	3	4	5	d) [	Number of Disks	1	2	3	4	5
	Probability	0.1	0.2	0	0.3	0.4	ĺ	Probability	0.10	0.11	0.25	0.05	0.26
e)	Number of Disks	1	2	3	4	5							

The probability that you will be ticketed for illegal parking on campus is about 1/3. During the last nine days, you

have illegally parked every day and have NOT been ticketed. Today, on the 10th day, you again decide to park illegally. Assuming the outcomes are independent from day to day, the probability that you will be caught is

For 3 – 5, use the two-way table that gives information on juniors and seniors at a high school and the means they typically get to scho

ool.		Car	Bus	Walk	Total
	Juniors	146	106	48	300
	Seniors	146	64	40	250
	Total	292	170	88	550

- You select one student from this group at random. What is the probability that this student typically 3) 3)\_ takes a bus to school? a) 0.256 b) 0.309 c) 0.353 d) 0.455 e) 0.604
- 4) You select one student from this group at random. If the student says he is a junior, what is the probability 4)\_ that he walks to school?

a) 0.073 b) 0.160 c) 0.455 d) 0.660 e) 0.833

- You select one student from this group at random. Which of the following statements is true about the 5) events "Typically walks to school" and "Junior?"
  - a) The events are mutually exclusive and independent.
  - b) The events are not mutually exclusive but they are independent.
  - c) The events are mutually exclusive, but they are not independent.
  - d) The events are not mutually exclusive, nor are they independent.
  - e) The events are independent, but we do not have enough information to determine if they are mutually exclusive.
- 6) People with type O-negative blood are universal donors. That is, any patient can receive a transfusion of O-negative blood. Only 7.2% of the American population has O-negative blood. If 10 people appear at random to give blood, what is the probability that at least 1 of them is a universal donor?
  - a) 0 b) 0.280 c) 0.526 d) 0.720 e) 1

6)

2)\_

5)\_\_\_\_\_

7)	(We will ignore	e the small number	of deaths among of	ther races.) Diabete	e, 12% were black, and 2% were Asian. s caused 2.8% of deaths among whites, omly chosen death was due to diabetes	
	a) 0.96	b) 0.107	c) 0.042	d) 0.038	e) 0.030	
8)			-		and mixed up. One dark morning you is the probability that the two socks	8)
	a) 0.075	b) 0.250	c) 0.500	d) 0.531	e) 0.567	
estima how m	te how much the uch damage it su	y will have to pay stains in accidents insurance compar	in claims on cars of Let C be a random y. The probability of C \$0 \$	each make and mod variable that repre- distribution of C is g 500 \$1000 \$2	levels, insurance companies must del, based on the value of the car and esents the cost of a randomly selected iven below.	9)
	a) \$155	b) \$595	c) \$875	d) \$645	e) \$495	
10)	<ul> <li>represents exp</li> <li>a) If the comp</li> <li>b) The maximum</li> <li>c) The compariant</li> <li>d) If the comp approximat</li> <li>e) If the comp</li> </ul>	ected value you for any insures 10 cars um cost to the con ny must insure at lo any insures a large rely Exp(C).	ound in question 9). s of this model, they apany for insuring th east Exp(C) of these number of these ca number of these ca	know they will incu is car model is Exp(d cars to make a profi rs, they can expect f		10)
11)	I. II. III.	After 10 minu the Rate of P (no exertion a You measure VO2 is genera You measure	ates on an exercise b erceived Exertion (R at all) to 20 (maximu VO2, the maximum ally between 2.5 lite the maximum heart	vicycle, you ask the s PE) scale. RPE range im exertion). volume of oxygen c rs per minute and 6 rate (beats per min		11)
			iscrete random varia			
	a) I	b) II	c) I, III	d) I, II, III	<ul> <li>e) None of the statements descri a discrete random variable.</li> </ul>	bes
12)	$\mu_{A} = 3.5, \ \sigma_{A} =$	-	and $\sigma_B = 2.29$ . If D	-	of an 8-sided die, then $-A$ ,	12)

a)  $\mu_D = 1$ ,  $\sigma_D = 4.000$ b)  $\mu_D = 1$ ,  $\sigma_D = 0.058$ c)  $\mu_D = 1$ ,  $\sigma_D = 2.858$ d)  $\mu_D = 1$ ,  $\sigma_D = 1.523$ e)  $\mu_D = 1$ ,  $\sigma_D = 2.000$ 

with end	ough salmonella ba		ess if improperly o	cooked. Chickens ar	of frozen chickens are con e delivered to grocery sto	
13)	The probability th	hat a certain crate l	nas more than 4 co	intaminated chicken	s is	13)
	a) 0.0424	b) 0.0686	c) 0.8889	d) 0.9313	e) 0.9576	
14)	The mean and sta a) $\mu = 7$ ; $\sigma = 2$ b) $\mu = 7$ ; $\sigma = 2$ c) $\mu = 7$ ; $\sigma = 5$ d) $\mu = 7.2$ ; $\sigma =$ e) $\mu = 7.2$ ; $\sigma =$	2.24 2.68 .04 5.2.24	f the number of co	ntaminated chicken:	; in a crate are	14)
15)	a) The number o b) In a shuffled d c) The number o d) The number o		ved in a one-hour p over one card at a t eginning at a rando random digits.	period time from the top of omly selected startir	the deck until you get an ng point in a table of rando	
complet For 16 – probabil who <u>has</u>	e sentences will be 18, use the follow ity that a randoml the flu also has a	e part of how each ing scenario: Supp ly-selected student high fever is 0.90.	question is graded lose your school is has the flu is 0.35 But there are othe	d. in the midst of a flu , and the probabilit er illnesses making t	epidemic. The	ting your answers in context and
probabil 16)	-	ability that a rando		a high fever is 0.12.	a high fever?	16)
17)		nt walks into the nu ability that he or sh		high fever.		17)

18) At this school, are having the flu and having a high fever independent? Explain mathematically why you said independent or not independent. 18)\_\_\_\_\_

determi	20, use the following scenario: Meadowbrook School surveys the families of its students and nes the following: if a family is chosen at random, the probability that they own a dog is 0.38, ability they own a cat is 0.23, and the probability they own both a dog and a cat is 0.12.	
19)	What is the probability that a randomly selected family owns a dog or a cat?	19)
20)	Given that a randomly selected family owns a dog or a cat, what is the probability that they own a cat?	20)
	24, use the following information: The Census Bureau reports that 27% of California residents were side the United States.	
21)	Suppose that you randomly choose 4 Californians. What is the probability that exactly 1 of the chosen Californians were born outside the U.S.?	21)
22)	Suppose that you randomly choose 100 Californians. What is the probability that at least 25 of the chosen Californians was born outside the U.S.?	22)
23)	Find and <u>interpret</u> the expected number of foreign-born people in a randomly selected sample of size 100.	23)
24)	Find and <u>interpret</u> the standard deviation of the number of foreign-born people in a randomly selected sample of size 100.	24)

For 25 – 26, use the following scenario: The weight of adult men is approximately Normally distributed with a mean of 190 pounds and a standard deviation of 30 pounds.

If you randomly select three men, what are the mean and standard deviation 25) of the sum of their weights?

An elevator in a small apartment building has a maximum weight capacity of 600 pounds. 26) If three randomly selected adult men get on the elevator, what is the probability that they exceed the maximum capacity?

For 27 – 28, use the following scenario: As a special promotion for its 20-ounce bottle of soda, a soft drink company printed a message on the inside of each cap. Some of the caps said, "Please try again," while others said, "You're a winner!" The company advertised the promotion with the slogan "1 in 6 wins a prize." Suppose the company is telling the truth and that every 20-ounce bottle of soda it fills has a 1-in-6 chance of being a winner. Alan decides to keep buying one 20-ounce bottle of the soda at a time until he gets a winner.

27) Find the probability that he buys exactly 5 bottles.

28) Find the probability that he buys no more than 8 bottles.

27)\_\_\_\_\_

28)

25)\_\_\_\_\_

26)

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	e) Number of Disk	ks 1 2 3	4 5				
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7)	Of people who d (We will ignore t 4.4% among blad	he small numl	ber of deat	hs amon	ng other r	aces.) Dia	betes cau	sed 2.8% o	f deaths a	mong whites	nde anaista	2
	is about						an a		10.84	- <	592	
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8)	In your top dress pull two socks fr match?										8)	
									10'15	1- 15		1 64
	a) 0.075	b) 0.250	c)	0.500		d) 0.531		e) 0.567				
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estimat how m	10, use the followi te how much they uch damage it sust me model to the in	will have to pa ains in accider	ay in claims nts. Let C b	s on cars be a rand	s of each dom varia	make and able that r	model, bar epresents	ased on the the cost o	e value of	the car and	nad uc Stadytoji Notatin	
		ľ	P(C)	0.60	0.05	0.13	0.22					6
9)	The expected va	lue of C is	5x. P:								9)	IS
	a) \$155	b) \$595		\$875		d) \$645		e) \$495				-2
	a) 3133	01 2000	<b>C</b> )	<i>9015</i>		u) 9049		C) 9433				
10)		lowing is the b	19			ed value?	(In the ch	oices below	w, "Exp( <i>C</i> )	יי	10)_	$\sim$
10)	<ul> <li>represents expendent</li> <li>a) If the comparison</li> <li>b) The maximur</li> <li>c) The company</li> <li>d) If the comparison</li> <li>approximate</li> </ul>	ted value you ny insures 10 c n cost to the c must insure a ny insures a lan ly Exp(C).	ars of this company fo t least Exp( rge number	uestion model, ti r insurin (C) of the r of these	9). hey know g this car ese cars t e cars, th	v they will model is to make a tey can exp	incur 10 × Exp(C) per profit. pect the co	< Exp(C) in o car. ost per car	costs. to average		10 <u>)</u>	V 1 o.m., 2 – 6 m 9 Masleys yes
10)	<ul> <li>represents experience</li> <li>a) If the comparience</li> <li>b) The maximum</li> <li>c) The company</li> <li>d) If the comparience</li> <li>approximate</li> <li>e) If the comparience</li> </ul>	ted value you ny insures 10 c n cost to the c must insure a ny insures a lan ly Exp(C).	a found in q cars of this i company fo it least Exp( rge number rge number	uestion model, ti r insurin (C) of the r of these	9). hey know g this car ese cars t e cars, th	v they will model is to make a tey can exp	incur 10 × Exp(C) per profit. pect the co	< Exp(C) in o car. ost per car	costs. to average	e indi e dar j	in ond a	2.10.14
10)	<ul> <li>represents experience</li> <li>a) If the comparience</li> <li>b) The maximum</li> <li>c) The company</li> <li>d) If the comparience</li> <li>approximate</li> <li>e) If the comparience</li> </ul>	ted value you ny insures 10 c n cost to the c must insure a ny insures a lan ly Exp(C). ny insures a lan	a found in q cars of this i company fo it least Exp( rge number rge number	uestion model, ti r insurin (C) of the r of these	9). hey know g this car ese cars t e cars, th	v they will model is to make a tey can exp	incur 10 × Exp(C) per profit. pect the co	< Exp(C) in o car. ost per car	costs. to average	e indi e dar j	er over a ornot er fa e ano toale	2.10.14
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For 13 - 14, use the following information: It has been estimated that about 30% of frozen chickens are contaminated with enough salmonella bacteria to cause illness if improperly cooked. Chickens are delivered to grocery stores in crates of 24. Assume the chickens are independently selected for inclusion in the crate. P(x74) -P(XSY) - (27) (.3) (.7) The probability that a certain crate has more than 4 contaminated chickens is 13) e) 0.9576 a) 0.0424 b) 0.0686 c) 0.8889 d) 0.9313 The mean and standard deviation of the number of contaminated chickens in a crate are 14) M= 24 (.3) 7.2 a)  $\mu = 7; \sigma = 2.24$ b)  $\mu = 7; \sigma = 2.68$ 5 - V24(3)(1) - 2,24 c)  $\mu = 7; \sigma = 5.04$ d)  $\mu = 7.2; \sigma = 2.24$ e)  $\mu = 7.2; \sigma = 5.04$ 15) Which of the following random variables is geometric? 15) RITS a) The number of phone calls received in a one-hour period when 0) hashelded at and the are are at at a for the top of the deal will you get on nee a not integration c) The number of digits I will read beginning at a randomly selected starting point in a table of random digits until I find a 7. d) The number of 7s in a row of 40 random digits. not became e) All four of the above are geometric random variables. FREE RESPONSE (3 points each). Drawing pictures, showing organized work, and writing your answers in context and complete sentences will be part of how each question is graded. For 16 – 18, use the following scenario: Suppose your school is in the midst of a flu epidemic. The probability that a randomly-selected student has the flu is 0.35, and the probability that a student who has the flu also has a high fever is 0.90. But there are other illnesses making the rounds, and the probability that a student who doesn't have the flu does have a high fever is 0.12. What is that a randomly selected student at this school has a high fever? 16) 16) Draw a tree diagram to help. 10 = .315  $\frac{100}{F_{LU}} = \frac{100}{10} = \frac{100}{100} = \frac{100}{100}$ P(Feer) = .315+,071 8015 Suppose a student walks into the nurse's office with a high fever. 17) 17) What is the probability that he or she has the flu? P(Flo | fevor) = -385 -343 At this school, are having the flu and having a high fever independent? 18) Explain clearly why you say independent or not independent.  $P(Fever | Flus) \stackrel{?}{=} P(Fever)$   $\frac{315}{.55} = .393$   $q \neq .393$ P(FWIFErer) = P(FW) .8015 7 .35

26 For 19 - 20, use the following scenario: Meadowbrook School surveys the families of its students and determines the following: if a family is chosen at random, the probability that they own a dog is 0.38, the probability they own a cat is 0.23, and the probability they own both a dog and a cat is 0.12. as ended to see the probability they own both a dog and a cat is 0.12. What is the probability that a randomly selected family owns a dog or a cat? 19) 19) 28+.23-.17 Dog a. Day 11. Given that a randomly selected family owns a dog or a cat, what is the probability that they own a cat? 20) 20) P (cent lown ) = .23 P( cot and do int) Plan - cat) For 21 - 24, use the following information: The Census Bureau reports that 27% of California residents were born outside the United States. 21) ,4201 Suppose that you randomly choose 4 Californians. What is the probability that exactly 1 of the 21) chosen Californians were born outside the U.S.? 22) .7091 Suppose that you randomly choose 100 Californians. What is the probability that at least 25 of 22) the chosen Californians was born outside the U.S.? P(X >25)= 1-P(X524)-1-[(... C1.)(.27)] tor 16 - 38, und the following scenario: autoring that scenario years and a 1- 2909 1091 23) Find and interpret the expected number of foreign-born people in a randomly selected sample 23) of size 100. In samples of 100 the average number of foreign born recidents will be (100)(.27) = 27 about 27 subjected a student success had the numbers Find and interpret the standard deviation of the number of foreign-born people in a randomly 24) 24) selected sample of size 100. In somples of 100, the number of foreign born residents will be about 4.44 away from the mean. 1(100)(27)(.73) =4.44

For 25 – 26, use the following scenario: The weight of adult men is approximately Normally distributed with a mean of 190 pounds and a standard deviation of 30 pounds.

25) If you randomly select three men, what are the mean and standard deviation of the sum of their weights?  $S = 5m \sigma S$  3 mer

Ms = 190+190+190 = 570 O's = 132+33+32 = 51.9615

Ms = 570 pounds 251 0's= 51.9615 ponds

26) 2810

27) 0804

28)

1674

An elevator in a small apartment building has a maximum weight capacity of 600 pounds. If three randomly selected adult men get on the elevator, what is the probability that they exceed the maximum capacity? Y= Sum of 3 men

P(Y>600)=P(Z>600-570)=P(Z>.58)=1-,7190

For 27 – 28, use the following scenario: As a special promotion for its 20-ounce bottle of soda, a soft drink company printed a message on the inside of each cap. Some of the caps said, "Please try again," while others said, "You're a winner!" The company advertised the promotion with the slogan "1 in 6 wins a prize." Suppose the company is telling the truth and that every 20-ounce bottle of soda it fills has a 1-in-6 chance of being a winner. Alan decides to keep buying one 20-ounce bottle of the soda at a time until he gets a winner.

27)

26)

 $P(Y=k) = (-p)^{k-1} p$ Find the probability that he buys exactly 5 bottles.

P(Y=5)=(1-2)-(2)= .0804

28)

Find the probability that he buys no more than 8 bottles.

P(Y58)= (1-6) (-16) = -7674

1,=1,2,34,5,6,78