

Practice 5. Broward College

Answers from imathesis.com.

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Determine whether the following is a probability distribution. If not, identify the requirement that is not satisfied.

- 1) If a person is randomly selected from a certain town, the probability distribution for the number,  $x$ , of siblings is as described in the accompanying table. 1) \_\_\_\_\_

$x$	$P(x)$
0	0.27
1	0.28
2	0.23
3	0.10
4	0.06
5	0.02

A/ Sum of  $p(x) = 0.96$ ; therefore, not a prob dist. (It should be  $= 1$  )

Find the mean and the standard deviation of the given probability distribution.

- 2) Mean: 1.68 Standard deviation: 1.28

$x$	$P(x)$
0	0.23
1	0.20
2	0.37
3	0.06
4	0.14

Use Calc, enter  $x$  as L1;  $P(x)$  as L2

Answer the question.

- 3) Focus groups of 13 people are randomly selected to discuss products of the Yummy Company. It is determined that the mean number (per group) who recognize the Yummy brand name is 10.1, and the standard deviation is 0.55. Would it be unusual to randomly select 13 people and find that fewer than 7 recognize the Yummy brand name? 3) A

A) Yes: 7 is less than min usual value. B) No

Min usual value = mean  $- 2SD = 10.1 - 2(0.55) = 9$  max usual value = mean +  $2SD = 11.2$

Assume that a researcher randomly selects 14 newborn babies and counts the number of girls selected,  $x$ . The probabilities corresponding to the 14 possible values of  $x$  are summarized in the given table. Answer the question using the table.

Probabilities of Girls

$x(\text{girls})$	$P(x)$	$x(\text{girls})$	$P(x)$	$x(\text{girls})$	$P(x)$
0	0.000	5	0.122	10	0.061
1	0.001	6	0.183	11	0.022
2	0.006	7	0.209	12	0.006
3	0.022	8	0.183	13	0.001
4	0.061	9	0.122	14	0.000

- 4) Find the probability of selecting 9 or more girls. 4) D  
 A) 0.122                      B) 0.001                      C) 0.061                      D) 0.212

Add up  $p(x)$  from 9 to 14 = 0.212

Provide an appropriate response.

- 5) In a game, you have a  $\frac{1}{20}$  probability of winning \$76 and a  $\frac{19}{20}$  probability of losing \$9. What is your expected value? 5) D  
 A) \$12.35                      B) -\$8.55                      C) \$3.80                      D) -\$4.75

$E(x) = \text{Prize} * P(\text{winning}) - \text{Cost of playing} * P(\text{losing}) = 76 * \frac{1}{20} - 9 * \frac{19}{20} = -4.75$

Determine whether the given procedure results in a binomial distribution. If not, state the reason why.

- 6) Rolling a single die 36 times, keeping track of the "fives" rolled. Binomial: 6) B  
 A) Not binomial: the trials are not independent. \*Only two outcomes (five or no five)  
 B) Procedure results in a binomial distribution. \*Fixed number of trials (36)  
 C) Not binomial: there are too many trials. \*Prob of success is constant ( $\frac{1}{6}$ )  
 D) Not binomial: there are more than two outcomes for each trial. \*Trials are independent of one another

Assume that a procedure yields a binomial distribution with a trial repeated  $n$  times. Use the binomial probability formula to find the probability of  $x$  successes given the probability  $p$  of success on a single trial. Round to three decimal places.

- 7)  $n = 4, x = 3, p = \frac{1}{6}$  Formula:  $P(x) = nC_x(p)^x(q)^{n-x} = 0.015$   
 $q = 1 - \frac{1}{6} = \frac{5}{6}$  Calc: Binomialpdf ( $n, p, x$ ) = 0.015 7) C  
 A) 0.004                      B) 0.012                      C) 0.015                      D) 0.023

- 8)  $n = 5, x = 2, p = 0.70$  8) D  
 A) 0.198                      B) 0.464                      C) 0.700                      D) 0.132  
 Same procedure as #7

Find the indicated probability. Round to three decimal places.

- 9) A test consists of 10 true/false questions. To pass the test a student must answer at least 9 questions correctly. If a student guesses on each question, what is the probability that the student will pass the test? 9) A  
 A) 0.011                      B) 0.999                      C) 0.010                      D) 0.001

At least 9 implies having 9 or 10 correct. Find  $P(9)$ ,  $P(10)$ , add up:  $0.00976 + 0.000976 = 0.01073$

- 10) A car insurance company has determined that 8% of all drivers were involved in a car accident last year. Among the 14 drivers living on one particular street, 3 were involved in a car accident last year. If 14 drivers are randomly selected, what is the probability of getting 3 or more who were involved in a car accident last year? 10) B  
 A) 0.096                      B) 0.926                      C) 0.074                      D) 0.407

3 or more, implies adding prob from 3 to 14. Alternative:  $P(3 \text{ or more}) = 1 - [(P(0) + P(1) + P(2))]$

Find the indicated probability. Find Binomcdf for  $x=2$ , that's cumulative from 0 to 2 = 0.904;  $1 - .904 = 0.096$

- 11) The brand name of a certain chain of coffee shops has a 57% recognition rate in the town of Coffleton. An executive from the company wants to verify the recognition rate as the company is interested in opening a coffee shop in the town. He selects a random sample of 10 Coffleton residents. Find the probability that exactly 4 of the 10 Coffleton residents recognize the brand name. 11) B  
 A) 0.106                      B) 0.140                      C) 0.000667                      D) 0.0604

This is binomial with  $n=10, p=0.57, x=4$

- 12) An archer is able to hit the bull's-eye 55% of the time. If she shoots 8 arrows, what is the probability that she gets exactly 4 bull's-eyes? Assume each shot is independent of the others. 12) C  
 A) 0.172                      B) 0.0915                      C) 0.263                      D) 0.00375

Binomial pdf with  $n=8, p=0.55$  and  $x=4$ .

- 13) A tennis player makes a successful first serve 46% of the time. If she serves 8 times, what is the probability that she gets exactly 3 first serves in? Assume that each serve is independent of the others. 13) C  
 A) 0.147                      B) 0.0973                      C) 0.250                      D) 0.00447

Binomial pdf with  $n=8, p=0.46$  &  $x=3$ .

Find the mean,  $\mu$ , for the binomial distribution which has the stated values of  $n$  and  $p$ . Round answer to the nearest tenth.

14)  $n = 37$ ;  $p = 0.2$

A)  $\mu = 7.7$

B)  $\mu = 8.1$

C)  $\mu = 7.4$

D)  $\mu = 6.9$

14)     C    

mean for binomial dist =  $n * p = 37 * 0.2 = 7.4$

Find the standard deviation,  $\sigma$ , for the binomial distribution which has the stated values of  $n$  and  $p$ . Round your answer to the nearest hundredth.

15)  $n = 41$ ;  $p = 0.2$

A)  $\sigma = 5.83$

B)  $\sigma = 0.15$

C)  $\sigma = 6.68$

D)  $\sigma = 2.56$

15)     D    

Std Dev = Square root of  $(n * p * q)$ ;  $q = 1 - p = 1 - 0.2 = 0.8$

Use the given values of  $n$  and  $p$  to find the minimum usual value  $\mu - 2\sigma$  and the maximum usual value  $\mu + 2\sigma$ . Round your answer to the nearest hundredth unless otherwise noted.

16)  $n = 103$ ,  $p = 0.26$

A) Minimum: -12.85; maximum: 66.41

B) Minimum: 35.68; maximum: 17.88

C) Minimum: 22.33; maximum: 31.23

D) Minimum: 17.88; maximum: 35.68

16)           

Min = mean - 2 SD =  $26.78 - 2(4.45) = 17.88$

Max = mean + 2 SD =  $26.78 + 2(4.45) = 35.68$

Note: Find the mean using procedure in 14); the SD, using formula in 15).