

MDM4U – Sample Test 5 – Distributions – December 1, 2023

Name: _____

Knowledge	Application	Communication	Thinking	Total	Percent
25	25	22	20	92	%

Knowledge

1. A spinner has 5 sections is spun. Find the distribution and the expected value. /5

$X \sim \text{Uniform}(n= \underline{\hspace{2cm}})$

(a) $E(x) =$ _____

x	x=1 (red)	x=2 (blue)	x=3 (yellow)	x=4 (green)	x=5 (purple)
P(x)					

2. You have a bag of 12 marbles, 5 are blue. You pull out 3 marbles without replacement. /8

$X \sim \text{Hypergeometric}(n=12, a=5, r=3)$. Thus, $E(x) = ra/n =$ _____

- (a) When you draw out 3 marbles how many blue ones will you get on average?

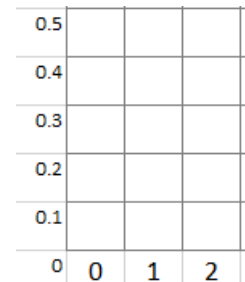
- (b) What is the probability of getting 0 blue marbles?

x	0 blue	1 blue	2 blue	3 blue
$C(a,x)$ Blue marbles	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$
$C(n-a, r-x)$ Not-blue	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$
Numerator $C(a,x) * C(n-a, r-x)$				
$C(n,r)$ Total	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$
P(x) = num / C(n,r)				

3. A spinner has 2 red spaces out of 5 total. You spin it twice. Graph the distribution. Label the axis. /7

$X \sim \text{Binomial}(n=2, p = 0.4)$. Thus $q =$ _____

x	0 spins red	1 spin red	2 spins red
$C(n,x)$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$	$C(\underline{\hspace{1cm}}, \underline{\hspace{1cm}}) =$
p^x	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$
q^{n-x}	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$
P(x)			



4. You are rolling a dice until you get a 6. What is the probability that it will take less than 3 rolls? /5

$X \sim \text{Geometric}(p = 0.167)$, Thus $q =$ _____

- (a) What is the probability of getting a 6 in less than 3 rolls?

x	x=0 (1 st roll)	x=1 (2 nd roll)
q^x	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$	$\underline{\hspace{1cm}} \wedge \underline{\hspace{1cm}} =$
p		
P(x) = $q^x p$		



Application

5. For each box where it is possible: (a) sub in the values in the formula and (b) evaluate fully.

/21

	$P(x=2)$	$E(x)$	σ
$X \sim \text{Uniform } (n = 7)$			
$X \sim \text{Geometric } (p = 0.4)$			
$X \sim \text{Binomial } (n = 6, p = 0.3)$			
$X \sim \text{HyperGeo } (n = 6, r = 3, a = 5)$			

6. What are the formulas found in the indicated cells of this spreadsheet?

/9

	A	B	C	D	E	F	G
1	Binomial Distribution						
2	(a) Fill in n, p and q						
3	n	5	p	0.3	q	0.7	
4							
5	(b) Create the probability distribution for 5 dice.						
6	x	0	1	2	3	4	5
7	C part	1	5	10	10	5	1
8	p part	1	0.3	0.09	0.027	0.008	0.002
9	q part	0.168	0.24	0.343	0.49	0.7	1
10	P(x)	0.168	0.36	0.309	0.132	0.028	0.002
11							
12	(c) Calculate the E(x) and standard deviation						
13	E(x)	1.5	σ	1.025			
14							
15	(d) Calculate these probabilities using sum						
16	P(x>=3)	0.163					

F3	
B7	
B8	
B9	
B10	
B13	
D13	
B16	

Thinking

All questions should be organized using titles. If formulas are used, they should be shown.

11. How many ways can you spell each day of the week starting from the top and going to the bottom? /5

(a) Total:

```

      T
     U  U
    E  E  E
   S  S  S  S
  D  D  D
 A  A
  Y
    
```

(b) Total:

```

      M
     O  O
    N  N  N
   D  D  D  D
  A  A  A  A  A
 Y  Y  Y  Y  Y  Y
    
```

12. Why can't these be calculated? Circle the problematic value and explain why it is a problem. /6

$X \sim \text{Uniform } (n = 2); \text{ min} = 10, \text{ max} = 12$	$X \sim \text{Binomial } (n = 0.39, p = 0.39)$	$X \sim \text{HyperGeo } (n = 12, r = 14, a = 3)$

13. In a raffle, there are 6 prize chickens worth \$100, 4 turkeys worth \$200, a pony worth \$500 and an okapi worth \$1000. 400 tickets are sold. /9

Item	Chicken	Turkey	Pony	Okapi	No Win	Σ
Value (x)						
Frequency						
P(x)						
x*P(x)						

What is the expected value of a ticket to the consumer?

If the raffle organizers wish to make a profit of 50% on the raffle, how much should they charge per ticket?