

MDM4U – Unit 5 Probability Distributions

A. Identify the distribution type:

1. Number of attempts until you roll a 4	Geometric
2. 4 jellybeans are drawn without replacement.	Hypergeometric
3. The probability of a bean germinating is 0.6. At the same time , you plant 78 beans, one in each pot.	Binomial
4. Waiting time before someone answers the phone	Geometric
5. 8 people are chosen for a team.	Hypergeometric
6. What is the probability you hit a red light 3 days in a row ?	Binomial
7. You roll 8 dice at the same time.	Binomial
8. The heights of maple trees are normally distributed.	Normal
9. 6 students form a committee.	Hypergeometric
10. Let X be the number of times Tyler makes a basket during the 10 attempts.	Binomial
11. Roll one regular 6 side dice.	Uniform
12. Choose 2 adults to sit in 6 seats.	Hypergeometric
13. Roll a pair of six-sided dice until you roll doubles"	Geometric
14. The probability of the photocopier jamming is 0.8. You want a probability distribution for 7 photocopies, one after another.	Binomial
15. A family has 6 children . One parent has dimples, so the children have a probability of 0.4 of inheriting dimples.	Binomial
16. One parent has dimples so the children have a probability of 0.4 of inheriting dimples. How many children will they need to have until they have one with dimples?	Geometric
17. You shuffle a card deck. Draw out eight cards without replacement and see how many hearts you have.	Hypergeometric
18. Spin a spinner with 10 equal sections.	Uniform
19. You shuffle a card deck. Draw out eight cards, replacing each one , and see how many hearts you have.	Binomial
20. You are choosing 2 spotted kittens from a litter of 5 spotted and 6 non-spotted kittens.	Hypergeometric
21. Let X be the number of names Akhila draws until she draws an employee's name who does not have pierced ears.	Geometric
22. Throw a dart at a dart board with 20 equal sections.	Uniform
23. You have a 3-question multiple choice test with 5 options for each question.	Binomial

B. In a Binomial Distribution:

You have a 3-question multiple choice test, with 5 options for each question. What is the probability you get 2 right?

24. What is X ?	The number of successes. You get 2 questions right.
25. What is n ?	The number of trials. There are 3 questions.
26. What is p ?	The probability of success. $1/5$ probability of guessing correctly.
27. What is q ?	The probability of failure. $4/5$ probability of guessing correctly.

C. In a Geometric Distribution:

Summer job selling by telephone. Nine out of ten hang up before they can give a sales pitch.

28. What is x ?	The number of events until a success occurs. The number of phone calls until can deliver sales pitch.
29. What is p ?	The probability of success. $1/10$ people allow sales pitch.
30. What is q ?	The probability of failure. $9/10$ people don't allow sales pitch.

D. In a Hypergeometric Distribution:

Adults in the van. 10 adults, 8 children. 6 seats in van, 2 for adults.

31. What is x ?	The number of successful things you want. 2 adults will go in the van.
32. What is n ?	The total number of things to choose from. 18 people in total.
33. What is a ?	The number of successful things to choose from. 6 adults.
34. What is r ?	The total number of places to put things. 6 seats in the van.

E. In a Uniform Distribution:

6 sides on the dice.

35. What is n ?	How many of the equal section there are. 6 sides
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F. Convert the decimal to a percentage.

36. 0.5	50%
37. 0.05	5%
38. 5	500%
39. 0.34	34%
40. 0.01	1%
41. 0.002	0.2%
42. 1	100%

G. Convert the percentage to a decimal.

43. 10%	0.1
44. 23%	0.23
45. 5%	0.05
46. 100%	1
47. 0.6%	0.006

H. What is q? (the probability of the opposite)

48. If P is a percentage?	Subtract from 100
49. If P is a decimal?	Subtract from 1
50. If P is a fraction?	Subtract from 1
51. $p = 20\%$	$q = 80\%$
52. $p = 6\%$	$q = 94\%$
53. $p = 97\%$	$q = 3\%$
54. $p = 0.3$	$q = 0.7$
55. $p = 0.49$	$q = 0.51$
56. $p = 0.25$	$q = 0.75$
57. $p = 0.01$	$q = 0.99$
58. $p = 0.93$	$q = 0.07$
59. $p = 1/12$	$q = 11/12$
60. $p = 6/7$	$q = 1/7$
61. $p = 3/4$	$q = 1/4$
62. $p = 3/20$	$q = 17/20$

I. Identify the term for each.

63.The calculation to answer: “how many red marbles will you get on average?”	Expected Value
64.Measure of spread in a probability distribution.	σ
65.Mound-shaped discrete probability distributions.	Binomial Hypergeometric
66.Mound-shaped continuous probability distribution.	Normal
67.Left-skewed probability distribution.	None really (maybe binomial with weird n and p)
68.Right-skewed probability distribution.	Geometric
69.Another term for the weighted mean.	Expected Value
70.A trial at the basis of the binomial distribution.	Bernoulli
71.Long-term average level of a random variable based on its probability distribution	Expected Value
72.Discrete or continuous: Number of chairs.	Discrete
73.Discrete or continuous: Temperature.	Continuous
74.Discrete or continuous: Height of tree.	Continuous
75.Discrete or continuous: Amount of students.	Discrete
76.The most likely the result of the next trial of a statistical experiment.	Expected Value
77.A mathematical function that describes the probability of different possible values of a variable	Probability Distribution
78.The distribution type of the random bug walk.	Geometric
79.A use of the random bug walk.	Modelling sub-atomic particle motion.
80.First row of Pascal’s triangle.	1
81.Second row of Pascal’s triangle.	1, 1
82.Third row of Pascal’s triangle.	1, 2, 1
83.Sum of the third row of pascal’s triangle	$4 = 2^2 = 2^{\text{row}-1}$
84.Formula for the nth row of pascal’s triangle.	$2^{\text{row}-1}$
85.Another term for a weighted average.	Expected Value
86.All outcomes for a given process and their probabilities.	Probability Distribution

J. Identify why each is important.

87.Expected Value	It is the most likely the result of the next trial of a statistical experiment.
88.Probability Distributions	<ol style="list-style-type: none"> 1. Help us to understand the frequency of all outcomes of a situation. 2. They show which outcomes are more likely. 3. We can use them to predict what to expect. 4. Their Histograms allow us to visualize the probabilities of all outcomes.
89.Binomial Distribution	Models Bernoulli trials: <ol style="list-style-type: none"> (a) Independent events. (b) Each succeeds or fails (c) With a specific probability
90.Geometric Distribution	Models probability of success after a specific number of failures. Used to see how long you need to wait until something occurs.
91.Hyper-Geometric Distribution	Models the probability of success for a number of dependent draws (or that occur without replacement).
92.Uniform Distribution	Models a series of outcomes, all with equal probability.
93.Random-walk simulation	<ol style="list-style-type: none"> a. Used to model and understand complex physics. b. Also models random events related to chaos theory (weather, stock markets)

K. In the formula, what does each piece mean?

94.Binomial Distribution	<p>p = probability of a single event's success</p> <p>q = opposite of p. probability of single event's failure.</p> <p>n = number of events</p> <p>x = the specific number of successes (eg $P(x=2)$... 2 red jellybeans)</p>
95.Geometric Distribution	<p>p = probability of a success on a single trial</p> <p>q = opposite of p. probability of single event's failure.</p> <p>x = number of trials – 1. (eg. $P(x=0)$... first try)</p>
96.Hyper-Geometric Distribution	<p>n = total number of things to choose from</p> <p>r = total number of places to put them</p> <p>a = number in the subgroup you are looking for</p> <p>x = specific number from the subgroup on this trial</p>
97.Uniform Distribution	<p>\min = lowest value you can roll.</p> <p>\max = highest value you can roll.</p> <p>n = number of sides on the dice</p> <p>note: x is not used in any formulas</p>

L. Excel

98. How do you find q?	= 1 – (cell with p)
99. What is the formula for combinations?	= combin(A1, B1)
100. What is the symbol for exponents?	^
101. What is the formula for square root?	= sqrt(A1)
102. What is the formula for adding up probabilities?	= sum(A1:A4)
103. When do cells need the \$?	<ul style="list-style-type: none">- When they are the p, q, n, r in the formula. They don't change.- X can't have the \$. It changes.- \$ is only used if the formula fills right