



**School of Information Technology**

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Module	:	Business Statistics
Topic	:	Discrete Probability Distribution

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Learning Outcomes:

By the end of this lesson, you should be able to

1. Identify characteristics of a probability distribution.
2. Calculate the mean, variance and expected value of a discrete probability distribution.
3. Identify characteristics of a Binomial and Poisson distribution through the assumptions for each distribution.
4. Calculate probabilities, mean and standard deviation of the Binomial and Poisson distribution using relevant formulas.
5. Solve real-life business problems by applying concepts of discrete, Binomial and Poisson distribution.



x, No. cars sold	0	1	2	3	4
$P(X=x)$	0.1	0.2	0.3	0.3	0.1

- (a) Compute the expected value.
- (b) What is the variance of the distribution?

## Part 2: Binomial Distribution

### QUESTION 5

Given that  $X \sim B(10, 0.3)$ , calculate the following:

- (a) mean
- (b) variance
- (c)  $P(X \leq 2)$
- (d)  $P(X > 8)$

### QUESTION 6

A recent study by Singapore Police revealed that only 60 percent of the Singaporean drivers wear seat belts. In order to confirm this, a sample of 10 drivers on the expressway is selected.

- (a) Explain if this situation fits the assumptions of Binomial distribution.
- (b) Compute the probability that exactly 7 are wearing seat belts.
- (c) Compute the probability that 7 or fewer of the drivers are wearing seat belts.

### QUESTION 7

A company manufactures toy robots. 1 out of 100 toy robot is damaged during the manufacturing process. You purchased 35 toy robots.

- (a) Compute the probability that exactly 4 robots were damaged.
- (b) Compute the probability at least 1 toy robot was damaged.
- (c) Compute the mean and standard deviation of robots that were damaged.

### QUESTION 8

A firm owns cameras. Each camera has an 8% probability of not working. 20 cameras were randomly selected for inspection. What is the probability that:

- (a) 5 cameras will not work.?
- (b) all the cameras will work?

### QUESTION 9

A recent survey found that 32% of all the Small and Medium Enterprises [SMEs] in Singapore are ready to adopt digital technologies in their business. Out of 10 randomly selected firms, what is the probability that

- (a) less than two SMEs are ready to adopt digital technologies in their business?
- (b) at least two SMEs are ready to adopt digital technologies in their business?
- (c) What is the expected number and standard deviation of SMEs which are ready to adopt digital technologies in their business?

**Part 3: Poisson Distribution****QUESTION 10**

Given that  $X \sim P_0(3)$ , calculate the following:

- (a) mean                      (b) variance  
 (c)  $P(X \leq 2)$             (d)  $P(X \geq 3)$

**QUESTION 11**

On average, a household receives 1.8 junk mails per day. Using the Poisson formula, find the probability that a randomly selected household receives

- (a) exactly 3 junk mails on a certain day,  
 (b) at most 2 junk mails on a certain day.

**QUESTION 12**

A budget airline receives an average of 9.7 complaints per day from its passengers. Using the Poisson formula, find the probability that on a certain day this airline will receive

- (a) exactly 5 complaints.  
 (b) at least 3 complaints.

**QUESTION 13**

A customer service department receives an average of 1.6 telephone calls in any 10-minute interval. Find the probability that the department receives

- (a) no calls in any 10-minute interval.  
 (b) at most 1 calls in any 5-minute interval.  
 (c) more than 2 calls in any 15-minute interval.

**QUESTION 14**

During a graduation ceremony in NYP, guests arrive at an average of 30 per hour. What is the probability that

- (a) at least 2 guests will arrive in any particular minute?  
 (b) 3 guests will arrive in any particular minute?

**SUPPLEMENTARY QUESTIONS****QUESTION 15**

Find the mean, variance and standard deviation of the random variable in the following probability distribution:

$k$	0	1	2	3	4
$P(X = k)$	0.54	0.16	0.06	0.04	0.20

**QUESTION 16**

A recent survey conducted by the police showed that at 35% of Singaporean drivers exceeded the speed limit allowed on the expressway. Given that the speed of cars follow a binomial distribution, a random sample of 7 drivers was surveyed.

- (a) Compute the probability that fewer than 3 drivers exceeded the speed limit.
- (b) Compute the probability that exactly 4 drivers exceeded the speed limit.

**QUESTION 17**

On average, six students per hour use a printer in the computer lab. Compute the probability that:

- (a) No one will use the printer during a ten-minute interval.
- (b) Exactly one student will use the printer during a five-minute interval
- (c) Compute the mean and standard deviation of printer used for half an hour.

**Answers:**

Q1(a)

Number of children	0	1	2	3
$P(X = x)$	60/139	56/139	19/139	4/139

- (b) (i) 0.403 (ii) 0.165 (iii) 0.432 (iv) 0.568
- Q2 (b) 2.508
- Q3 (a) 0.06 (b) mean = 0.44, standard deviation = 0.852
- Q4 (a) 2.1 (b) 1.29
- Q5 (a) 3 (b) 2.1 (c) 0.383 (d) 0.000144
- Q6 (b) 0.215 (c) 0.8327
- Q7 (a) 0.0004 (b) 0.2966 (c) 0.5886
- Q8 (a) 0.0145 (b) 0.1887
- Q9 (a) 0.1206 (b) 0.8794 (c) Expected number = 3.2, standard deviation = 1.4751
- Q10 (a) 3 (b) 3 (c) 0.423 (d) 0.577
- Q11 (a) 0.161 (b) 0.731
- Q12 (a) 0.0439 (b) 0.996
- Q13 (a) 0.202 (b) 0.809 (c) 0.430
- Q14 (a) 0.0902 (b) 0.0126
- Q15 mean = 1.2, variance = 2.52, standard deviation = 1.59
- Q16 (a) 0.5323 (b) 0.1442
- Q17 (a) 0.3679 (b) 0.3033 (c) mean = 3, standard deviation = 1.7321