

Mean

Question: 1

Find 10 positive Numbers

Handwritten calculation on lined paper:

First 10 positive Numbers

$$\text{Mean} = \frac{1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10}{10} = \frac{55}{10}$$

Mean = 5.5

Ans

Mean of discrete data

Question: 2

Question 1: Find the mean of the following distribution, which contains the quiz results of the students.

Marks	25	43	38	42	33	28	29	20
Number of students	20	1	4	2	15	24	28	6

Solution

Marks (x_i)	Number of students (f_i)	$f_i x_i$
25	20	500
43	1	43
38	4	152
42	2	84
33	15	495
28	24	672
29	28	812
20	6	120
Sum =	100	2878

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{2878}{100} = 28.78$$

Ans

Mean of continuous data

Question No:3

Question 2: The table below shows the results of an examination taken by 110 students.

Class	0-10	10-20	20-30	30-40	40-50
Frequency	12	28	32	25	13

Solution:

Solution

Class (x_i)	Frequency (f_i)	Class Mark (x_i)	$d_i = x_i - a$	$f_i d_i$
0-10	12	5	$5 - 25 = -20$	-240
10-20	28	15	$15 - 25 = -10$	-280
20-30	32	$25 = a$	$25 - 25 = 0$	0
30-40	25	35	$35 - 25 = 10$	250
40-50	13	45	$45 - 25 = 20$	260
Total	$\Sigma f_i = 110$			$\Sigma f_i d_i = -10$

Assumed mean = $a = 25$

Mean of data :

$$\bar{x} = a + \frac{\Sigma f_i d_i}{f_i} = 25 + \frac{-10}{110}$$
$$= 25 - \left(\frac{10}{110} \right)$$
$$= \frac{275 - 1}{11}$$

\bar{x}

$= 24.9$
Ans

Median

Question 1:

Find the Median of following.

Find median of the following

2, 31, 55, 3, 5, 3, 7, 8, 11, 27, 37, 49

Solution

Ascending Order

2, 3, 3, 5, 7, 8, 11, 27, 31, 37, 49, 55

$n = 12$

$n/2 = 6^{\text{th}} \text{ value} = 8$

$n/2 + 1 = 7^{\text{th}} \text{ value} = 11$

Median = $\frac{8+11}{2} = 9.5$

Ans

Median of discrete data

Question 2:

The following data are the weights of students in a class. Find the median weights of the students

Weight(kg)	10	20	30	40	50	60	70
Number of Students	4	7	12	15	13	5	4

Solution

Weight (kg) x_i	Frequency f_i	Cumulative frequency (C_{f_i})
10	4	4
20	7	11
30	12	23
40	15	38
50	13	51
60	5	56
70	4	60
total	$N = 60$	

$$\text{Mediam} = \frac{N+1}{2} = \frac{61}{2} = 30.5$$

The cumulative frequency greater than 30.5 is 38. The value of x corresponding to 38 is 40. So, the median = 40

Median of continuous data

Question : 3

The following data attained from a garden records of certain period Calculate the median weight of the apple

Weight in grams	410 - 420	420 - 430	430 - 440	440 - 450	450 - 460	460 - 470	470 - 480
Number of apples	14	20	42	54	45	18	7

Solution

Weight in grams	Number of apples	Cumulative frequency
410 - 420	14	14
420 - 430	20	34
430 - 440	42	76
440 - 450	54	130
450 - 460	45	175
460 - 470	18	193
470 - 480	7	200
Total	$N = 200$	

$$\frac{N}{2} = \frac{200}{2} = 100$$

Median Class = 440 - 450

$$\text{Median} = l + \frac{N/2 - m}{f} \times c$$

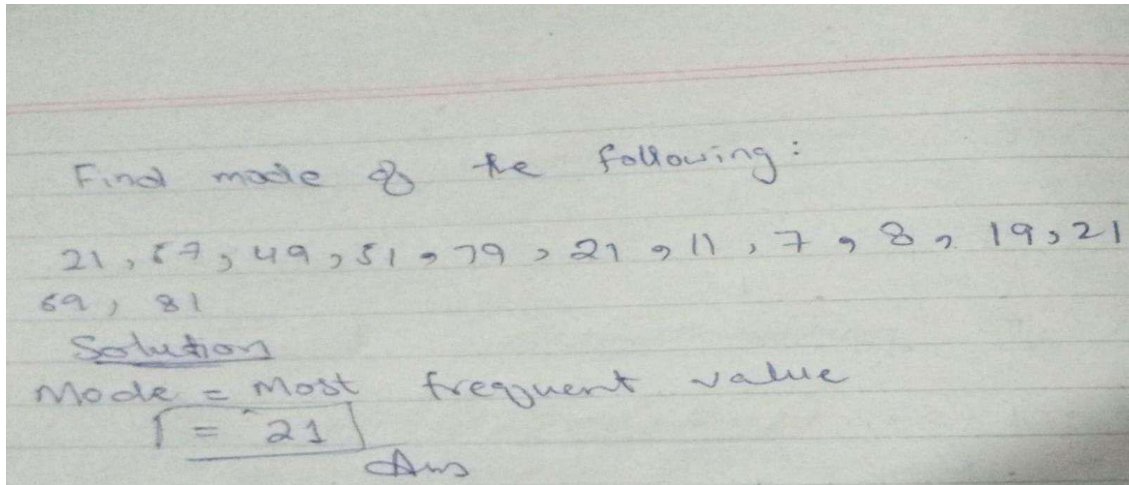
$$l = 440, N/2 = 100, m = 76, f = 54, c = 10$$

$$\boxed{\text{Median} = 444.44 \text{ g}}$$

Ans

Mode

Question No: 1



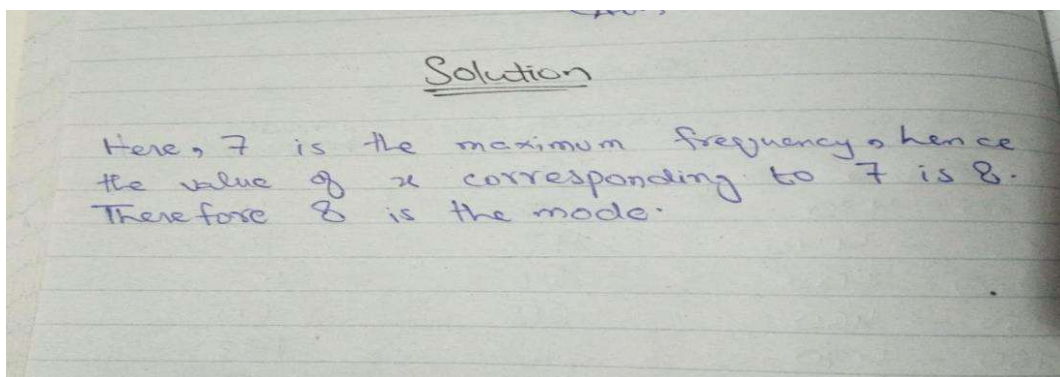
Mode of discrete data

Question: 2

Example 5.24

Calculate the mode from the following data

Days of Confinement	6	7	8	9	10
Number of patients	4	6	7	5	3



Mode of continuous data

Question No:3

The following data relates to the daily income of families in an urban area. Find the modal income of the families.

Income (₹)	0-100	100-200	200-300	300-400	400-500	500-600	600-700
No. of persons	5	7	12	18	16	10	5

Solution

Income	No. of persons (f)
0-100	5
100-200	7
200-300	12
300-400	18
400-500	16
500-600	10
600-700	5

Mode = $1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times C$

The highest freq. is 18, the modal class is 300-400

Here $l = 300$, $f_0 = 12$, $f_1 = 18$, $f_2 = 16$

$$\begin{aligned} \text{Mode} &= 300 + \frac{(18 - 12)}{2 \times 18 - 12 - 16} \times 100 \\ &= 300 + \frac{6}{36 - 28} \times 100 \\ &= 375 \end{aligned}$$

The modal income of ~~the~~ families is 375.

Probability

Question: 1

1. Out of 300 students in a school, 95 play cricket only, 120 play football only, 80 play volleyball only and 5 play no games. If one student is chosen at random, find the probability that

- (i) he plays volleyball
- (ii) he plays either cricket or volleyball
- (iii) he plays neither football nor volleyball.

Solution

Total number of trials = 300 (total students)
no. of times a cricket player chosen = 95
" " " " volleyball " " = ~~120~~ 80
" " " " football " " = 120
" " " " student chosen who play no game = 5

(i)

The probability of getting a player who plays volleyball

$$P(\text{volleyball}) = \frac{\text{no. of times a volleyball player chosen}}{\text{Total Number of trial}}$$
$$= \frac{80}{300}$$

$P(\text{volleyball}) = \frac{4}{15} \text{ Ans}$

(ii)

The probability of getting a player who plays either cricket or volleyball

$$= \frac{\text{no. of times a cricket or volleyball Player can be chosen}}{\text{Total no. of trials}}$$

$$= \frac{95 + 80}{300}$$

$$= \frac{175}{300}$$

$$= \frac{7}{12} \text{ Ans}$$

(iii)

The probability of getting a player who plays neither football nor volleyball

$$= \frac{300 - 120 - 80}{300}$$

$$= \frac{100}{300}$$

$$= \frac{1}{3} \text{ Ans}$$

Question :2

2. The blood group of 60 students of a class recorded as below.

Blood Group	A	B	AB	O
Number of Students	12	20	10	18

A student of the class is selected at random.

- (i) What is the probability that the selected student has blood group O?
(ii) What is the probability that the selected student does not have blood group O?

Solution

A student of the class is selected at random

(i)

Total number of trials = 60 (total student)

Number of students having blood group O = 18. So, probability of the student's blood group being O

$$= \frac{\text{Freq. of Favourable Trials}}{\text{Total Number of Trials}}$$
$$= \frac{\text{Number of Students having Blood O}}{\text{Total Number of Trials}}$$
$$= \frac{18}{60} \Rightarrow \frac{3}{10} \text{ Ans}$$

(ii)

$$\begin{aligned} &= \frac{\text{total no. of students} - \text{No. of student having blood Group O}}{\text{total no. of students}} \\ &= \frac{60 - 18}{60} = \frac{42}{60} = \frac{7}{10} \text{ Ans} \end{aligned}$$

Question: 3

4. A bag contains 8 red balls and some white balls. If the probability of drawing a white ball is half of the probability of drawing a red ball then find the number of white balls in the bag.

Solution

Let the no. of balls = n

The number of red balls = 8

Therefore, the possible number of outcomes = $n + 8$

Probability of drawing white ball = $\frac{n}{n+8}$

The probability of drawing a red ball = $\frac{8}{n+8}$

now, from questions

$$\frac{n}{n+8} = \frac{1}{2} \cdot \frac{n}{n+8}$$

$$\text{or, } n = 4$$

So, number of white ball in the bag is 4.

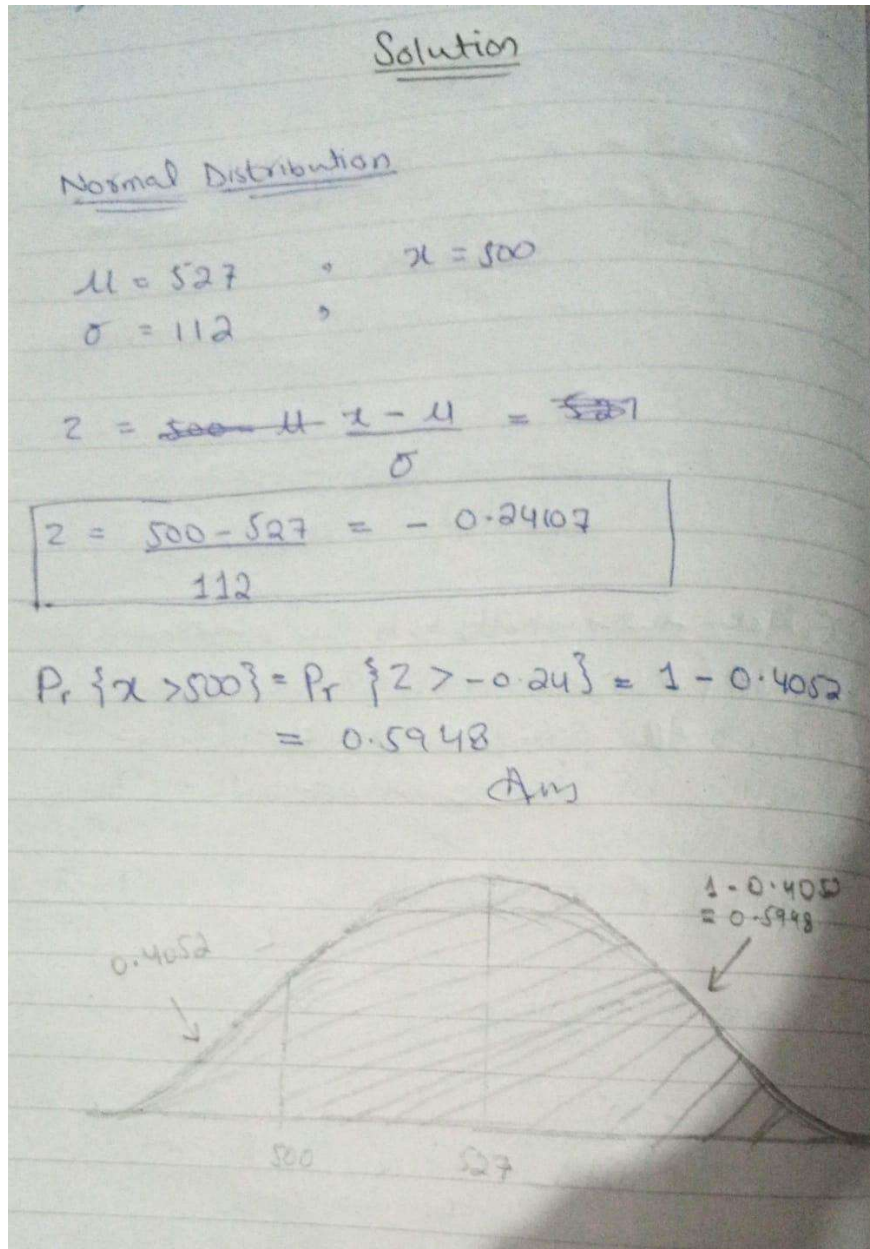
Distribution

Normal Distribution

Question No:1

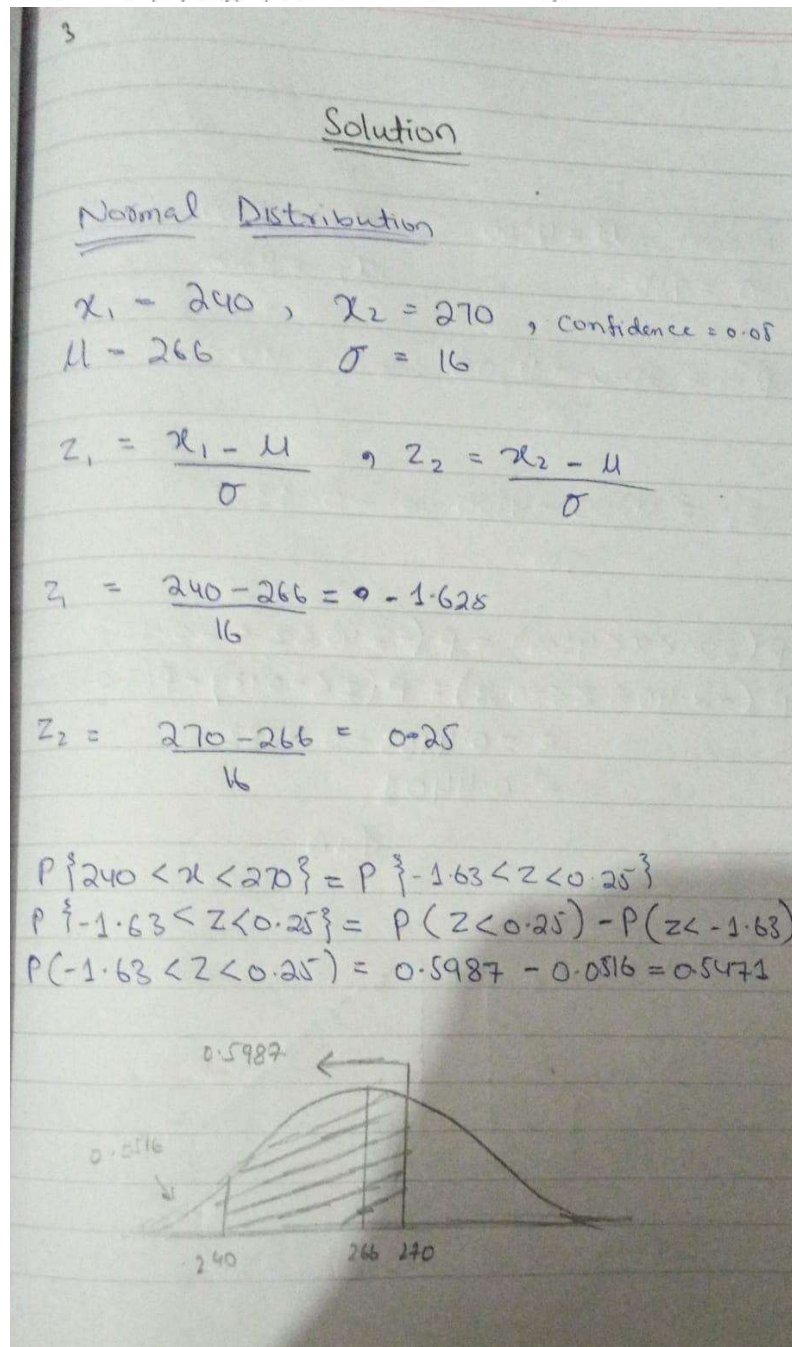
1. Most graduate schools of business require applicants for admission to take the Graduate Management Admission Council's GMAT examination. Scores on the GMAT are roughly normally distributed with a mean of 527 and a standard deviation of 112. What is the probability of an individual scoring above 500 on the GMAT?


$$1 - 0.4052 =$$



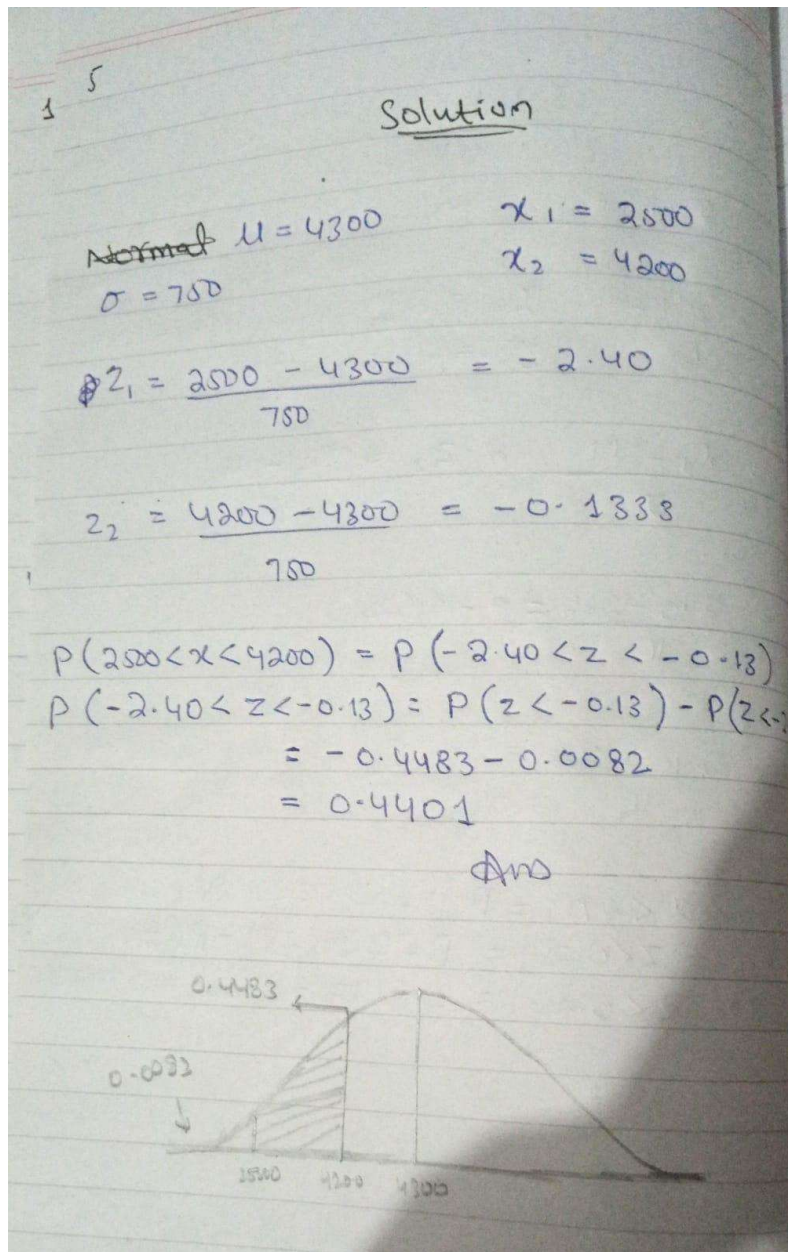
Question No:2

The length of human pregnancies from conception to birth approximates a normal distribution with a mean of 266 days and a standard deviation of 16 days. What proportion of all pregnancies will last between 240 and 270 days (roughly between 8 and 9 months)?



Question No:3

The average number of acres burned by forest and range fires in a large New Mexico county is 4,300 acres per year, with a standard deviation of 750 acres. The distribution of the number of acres burned is normal. What is the probability that between 2,500 and 4,200 acres will be burned in any given year?



Binomial Distribution

Question No:1

Let's say that 80% of all business startups in the IT industry report that they generate a profit in their first year. If a sample of 10 new IT business startups is selected, find the probability that exactly seven will generate a profit in their first year.

1

Solution

we know that

$$n=10, x=7, p=0.80, q=0.20$$
$$P(x=7) = \frac{10!}{7!(10-7)!} (0.80)^7 (1-0.80)^{10-7}$$
$$= 0.2013 \quad \text{or} \quad 20.13\%$$

Ans

Question No: 2

Your basketball team is playing a series of 5 games against your opponent. The winner is those who wins more games (out of 5).

Let assume that your team is much more skilled and has 75% chances of winning. It means there is a 25% chance of losing.

What is the probability of your team get 3 wins?

Solution

we know that:

$$n = 5, p = 0.75, q = 0.25, x = 3$$
$$P(x=3) = \frac{5!}{3!(5-3)!} (0.75)^3 (1-0.7)^{5-3}$$
$$= 0.264 \quad \text{or} \quad 26.4\%$$

Question No:3

A box of candies has many different colors in it. There is a 15% chance of getting a pink candy. What is the probability that exactly 4 candies in a box are pink out of 10?

Solution

we know that

$$n=10, x=4, P=0.15, q=0.85$$

$$P(x=4) = \frac{10!}{4!(10-4)!} (0.15)^4 (1-0.15)^{10-4}$$

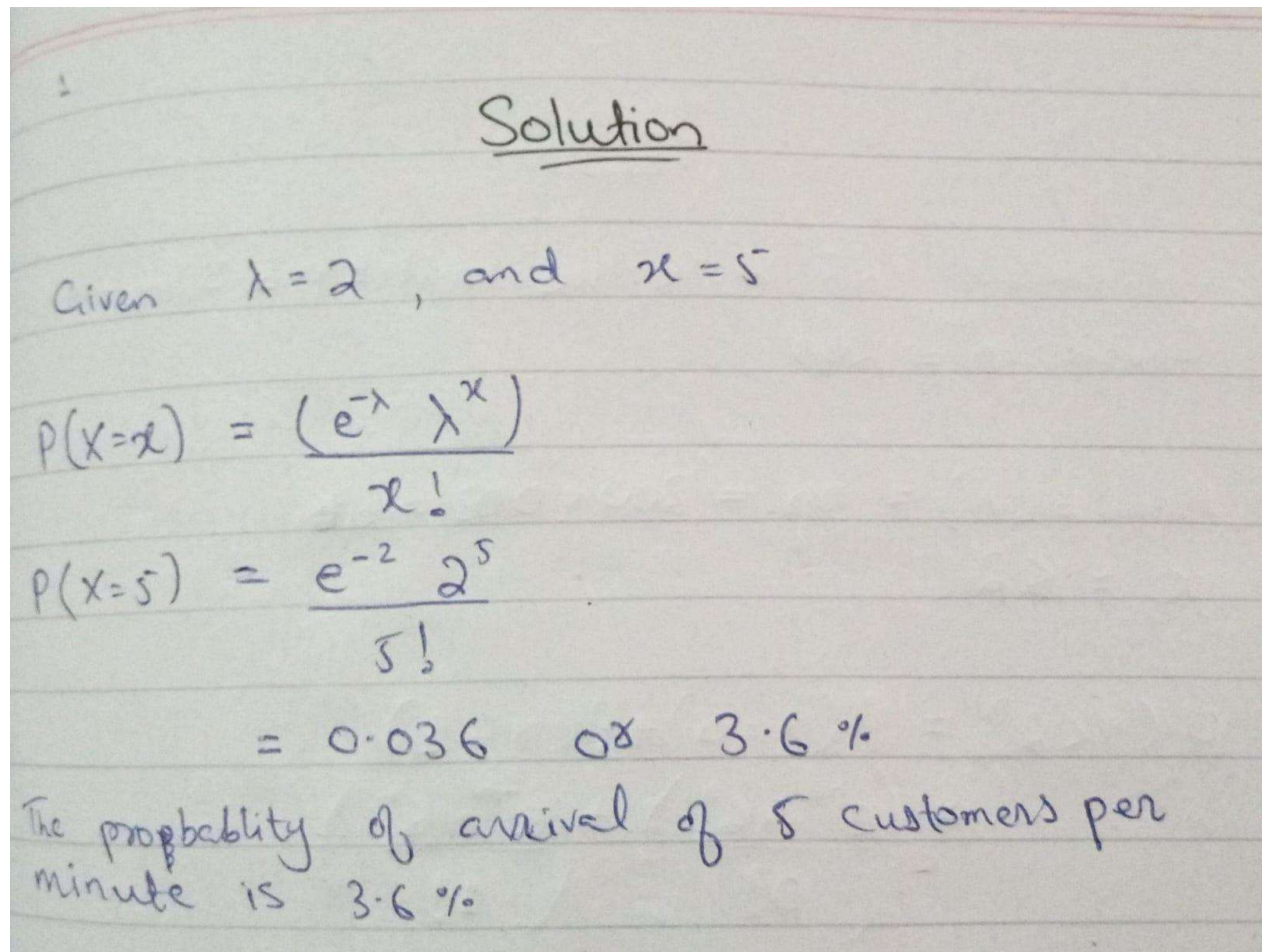
$$= 0.04 \text{ or } 4\%$$

Binomial Distribution

Question No:1

Example 1: In a cafe, the customer arrives at a mean rate of 2 per min. Find the probability of arrival of 5 customers in 1 minute using the Poisson distribution formula.

Solution



The image shows a handwritten solution on lined paper. At the top, the word 'Solution' is underlined. Below it, the given values are written: 'Given $\lambda = 2$, and $x = 5$ '. The Poisson probability formula is written as $P(X=x) = \frac{(e^{-\lambda} \lambda^x)}{x!}$. Then, the calculation for $x=5$ is shown: $P(X=5) = \frac{e^{-2} 2^5}{5!}$. This is followed by the decimal result: $= 0.036$ or 3.6% . Finally, a concluding sentence states: 'The probability of arrival of 5 customers per minute is 3.6%'.

Solution

Given $\lambda = 2$, and $x = 5$

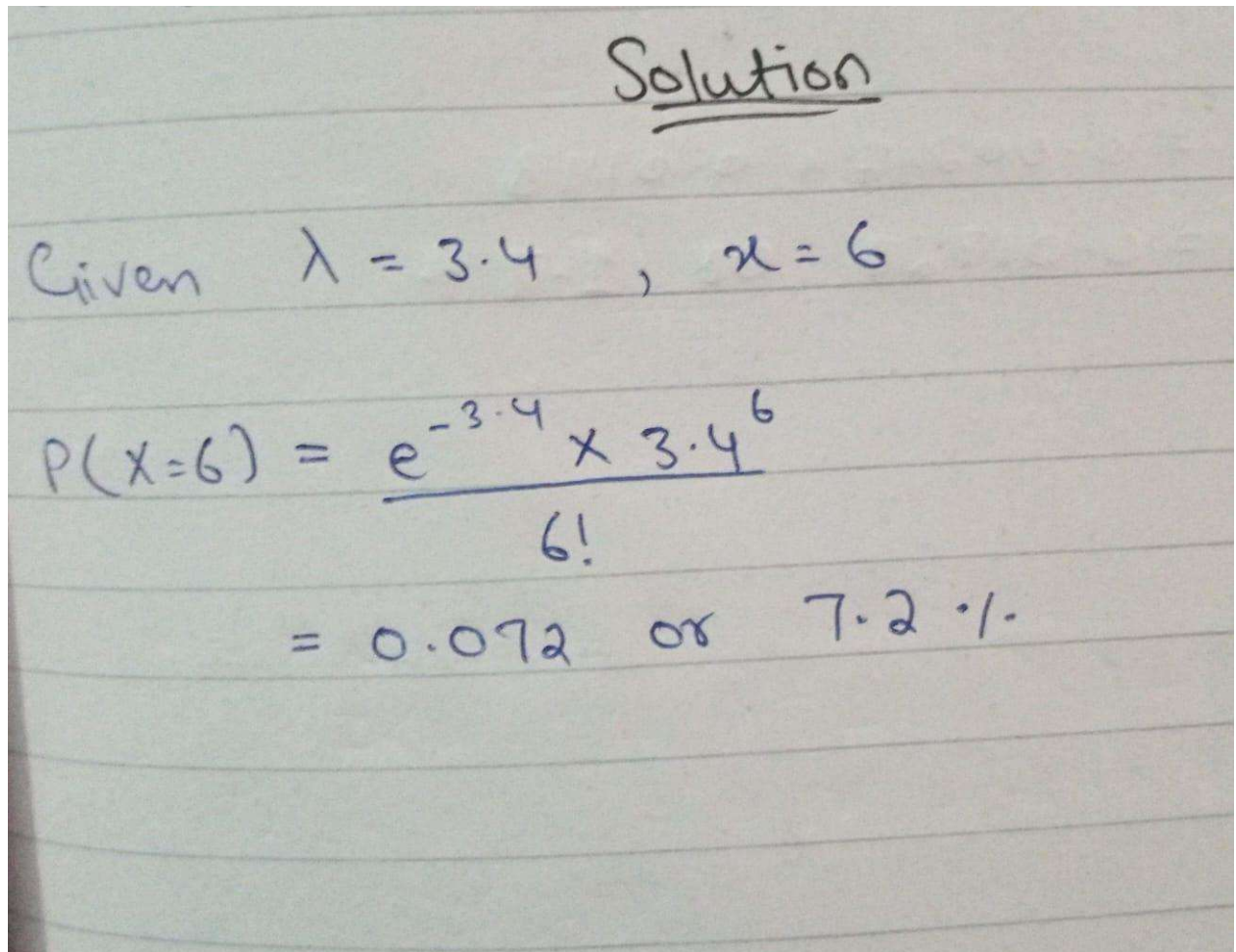
$$P(X=x) = \frac{(e^{-\lambda} \lambda^x)}{x!}$$
$$P(X=5) = \frac{e^{-2} 2^5}{5!}$$
$$= 0.036 \text{ or } 3.6\%$$

The probability of arrival of 5 customers per minute is 3.6%

Question No:2

Example 2: Find the mass probability of function at $x = 6$, if the value of the mean is 3.4.

Solution:



Solution

Given $\lambda = 3.4$, $x = 6$

$$P(X=6) = \frac{e^{-3.4} \times 3.4^6}{6!}$$
$$= 0.072 \text{ or } 7.2\%$$

Question No:3

Example 3: If 3% of electronic units manufactured by a company are defective. Find the probability that in a sample of 200 units, less than 2 bulbs are defective.

Solution:

Solution

Probability of defective unit = $p = 3/100 = 0.03$
Given $n = 200$

$$\text{Mean } (\lambda) = np = 200 \times 0.03 = 6$$
$$x = < 2$$

$$P(X < 2) = P(X=0) + P(X=1)$$
$$= \left(\frac{e^{-6} \times 6^0}{0!} \right) + \left(\frac{e^{-6} \times 6^1}{1!} \right)$$

$$= 0.00247 + 0.0148$$

$$P(X < 2) = 0.01727 \quad \text{or} \quad 1.7\%$$