Binomial Probability Distribution

Q#6: The probability that a salesman will make sale on a call is 0.3. If he makes 7 calls on a given day,

a) find the probability that he makes
- **(i) Exactly three sales**
- **(ii) At most three sales**
- **(iii) At least three sales**

b) Prepare a probability distribution.

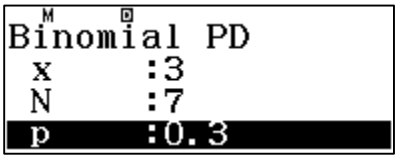
Solution

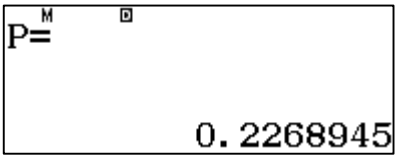
a) Finding probabilities.

(i) Exactly three sales

Press [MENU] [7] [4] and select [2]

Enter [3] in x, [7] in N and [0] [•] [3] in p and press [=]

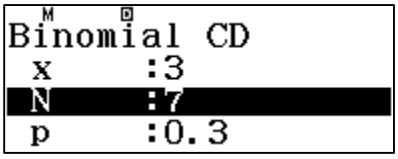


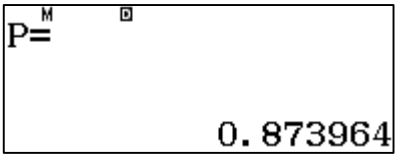


(ii) At most three sales

Press [MENU] [7] [▼] [1] [2]

And enter the data as shown below





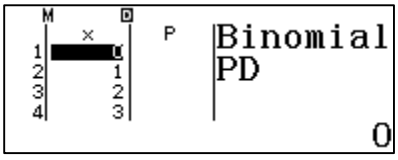
(iii) At least three sales

Find probability of 2 or less than 2 using the above method then subtract the answer from 1

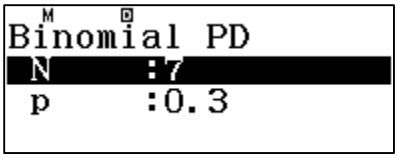
c) <u>Prepare a probability distribution.</u>

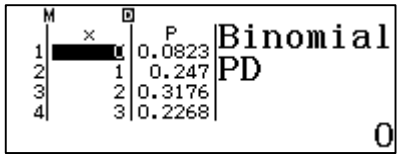
Press [MENU] [7] [4] and select [1]

Enter x values from 0 to 7 and press [=]



Then enter N = 7 and p = 0.3 and press [=]





Poisson Probability Distribution

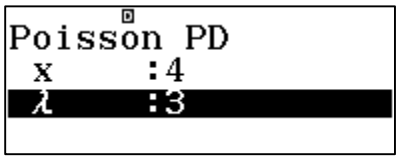
Q#7: The average no of cars passing through a certain point is 3 per day. Find the probability that on a given day

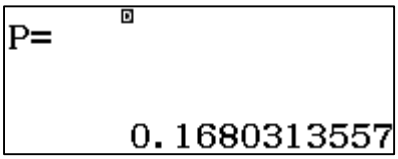
i) Exactly 4 cars will pass through.
ii) At most 4 cars will pass through.
iii) More than 4 cars will pass through.

Solution

i) <u>Exactly 4 cars will pass through.</u>

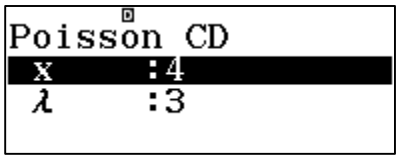
Press MENU 7 ▼ 2 to enter Poisson distribution and then select 2.
Enter 4 in x value and 3 in mean filed then press =.

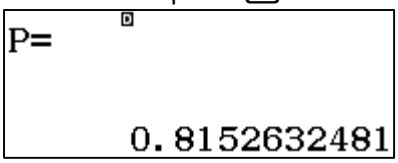




ii) <u>At most 4 cars will pass through.</u>

Press MENU 7 ▼ 3 to enter Poisson distribution and then select 2.
Enter 4 in x value and 3 in mean filed then press =.





iii) <u>More than 4 cars will pass through.</u>

Subtract the answer of part (ii) from 1

Normal Distribution

Q#8: The marks of students in a statistics test conducted by sir Asad at Academy of excellence are normally distributed with mean of 15 marks and standard deviation of 3 marks.

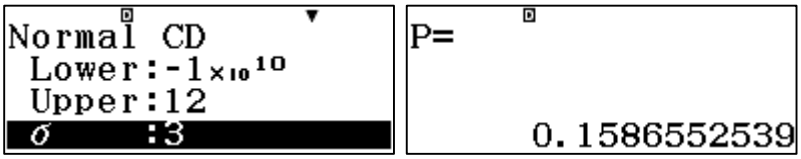
a) If a student is selected randomly, find the probability that the students secured
   i) Less than 12 marks
   ii) More than 12 marks
   iii) Between 12 and 16 marks
b) Only 10% of the students failed in the above mentioned test. Find the passing marks.
c) 12% of the students got scholarship for the whole year by Academy of excellence. Find the lowest marks secured by the scholarship holders.

Solution

a) Normal Distribution calculations

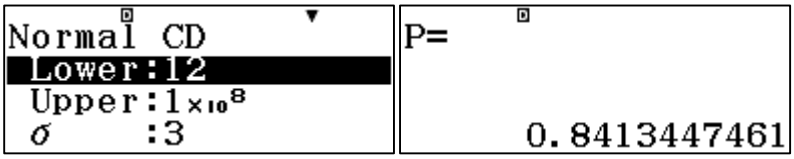
i) **Less than 12 marks**

Press MENU and select 7 and then 2 to enter inverse normal calculation mode.
Type lower limit as -1000000000, upper limit 12, mean 15 and SD 3 and press =.



ii) **More than 12 marks**

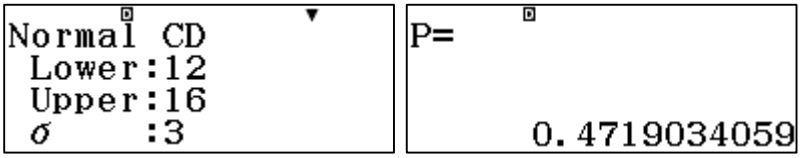
Press MENU and select 7 and then 2 to enter inverse normal calculation mode.
Type lower limit as 12, upper limit 1000000000, mean 15 and SD 3 and press =.



Alternate method is to subtract the answer of part (i) from 1

iii) **Between 12 and 16 marks**

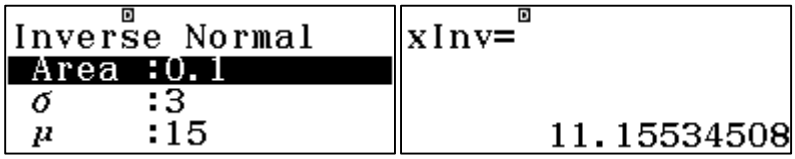
Press MENU and select 7 and then 2 to enter inverse normal calculation mode.
Type lower limit as 12, upper limit 16, mean 15 and SD 3 and press =.



b) Inverse Normal calculation

Press MENU and select 7 and then 3 to enter inverse normal calculation mode.

In Area type 0.1 (as 10% = 0.1) and press = and then 3 in σ field and 15 in μ field.

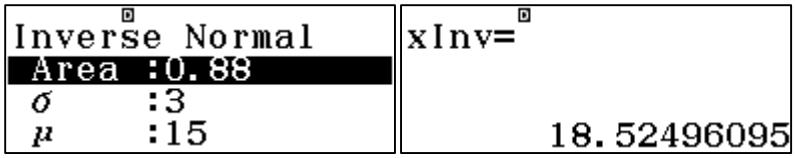


c) Inverse Normal calculation (upper extreme)

As the table and calculator both give answer for lower extreme the area will be entered as 100% - 12% = 88%.

Press MENU and select 7 and then 3 for entering inverse normal calculation mode.

In Area type 0.88 (as 88% = 0.88) and press = and then 3 in σ field and 15 in μ field.



Finding Z table values

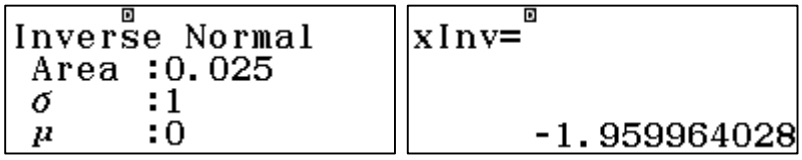
Q#9: Find Z table values for the following.

$Z_{0.025}$, $Z_{0.05}$ and $Z_{0.001}$

Solution

Press MENU and select 7 and then 3 for entering inverse normal calculation mode.

In Area type 0.025 and thrice press = thrice.



Note: The values in Z table are rounded to three significant figures whereas the calculator gives more accurate value.

Hypothesis Testing

Q#10: A certain firm claims that the average mass of their product is 150g with standard deviation of 4g. To test their claim a random sample of 64 units yielded a mean of 152 g. Test the claim of the firm at 5% significance level.

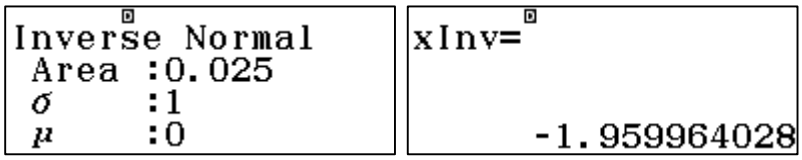
Solution

In hypothesis testing, we calculate critical value and then compare it with table value.

To find table value

Press MENU and select 7 and then 3 for entering inverse normal calculation mode.

In Area type 0.025 (as $\frac{\propto}{2} = 0.025$) and thrice press = thrice.



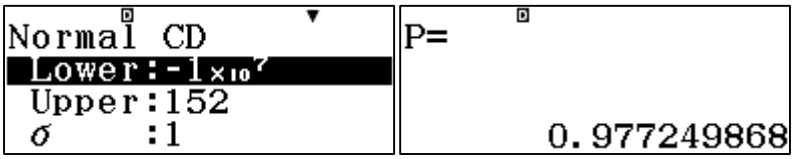
Note: The values in Z table are rounded to three significant figures whereas the calculator gives more accurate value.

To find Critical value

First we need sampling error which is $\frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{64}} = \frac{8}{8} = 1$

Then the p value will be calculated by normal distribution option for this

Press MENU and select 7 and then 2 to enter inverse normal calculation mode. Type lower limit as -1000000000, upper limit 152, mean 150 and SD 1 and press =.

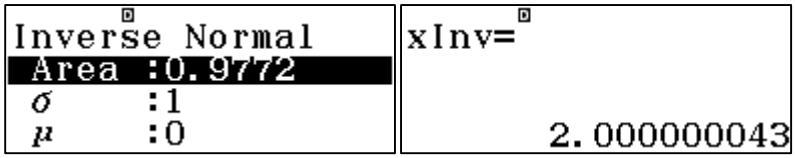


Write the p value somewhere as it will be used in further calculations.

Now we will find the critical value by using the calculated p value in inverse normal menu.

For this, press MENU and select 7 and then 3 for entering inverse normal calculation mode.

In Area type p value i.e. 0.977249868 and, mean as 0, SD as 1press and then press =.



Since the critical value is more than the table value, the null hypothesis will be rejected.