



Measure of Center and Dispersion

Q#1: Consider the following data

2, 3, 2, 2, 5, 6, 7, 5, 4, 5, 6, 7, 8, 9, 1, 2, 3, 4, 3, 2, 1, 5, 6, 7

For the data given, find:

1. arithmetic mean (\bar{x})
2. sum of all observations (Σx)
3. Population variance (σ^2)
4. Population Standard Deviation (σ)
5. Sample variace (S^2)
6. Sample Standard deviation (S)
7. lower or First quartile (Q_1)
8. Upper or Third Quartile (Q_3)
9. Median (\tilde{x})
10. Minimum Value
11. Maximum Value
12. Coefficient of variation

Solution:

- Press **MENU** and select **6** and then **1**.
- Enter your data by entering values and **=** after each value.
- After entering the data, press **OPTN** and select **3**

You will have the desired values as follows.

\bar{x} =4.375 Σx =105 Σx^2 =581 $\sigma^2 x$ =5.067708333 σx =2.25115711 $s^2 x$ =5.288043478	sx =2.29957463 n =24 $\min(x)$ =1 Q_1 =2 Med =4.5 Q_3 =6	$\max(x)$ =9
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The calculator doesn't give coefficient of variation directly but can be calculated by dividing mean by standard deviation.

Once you have entered the data press **OPTN** and **4**

- Press **OPTN** and scroll down by \blacktriangledown and select **2** for variables and **3** to enter the answer of standard deviation on the screen.
- Then press \div and repeat the process (**OPTN** \blacktriangledown **2**) and select **1** to enter the answer of mean on the screen.
- Finally press **X** **1** **0** **0** **=** to convert decimal into percentage. The answer will be as follows in (percentage).



$$\sigma x \div \bar{x} \times 100$$

$$51.45501965$$

Note: This option is equally useful for using answers of variables in calculations. You can easily use sums' and variables' answers directly by pressing **OPTN** ∇

Regression and Correlation

Q#2: Consider the following data

x	1	2	3	4	4	5	6	7
y	20	19	18	17	16	15	14	13

For the data given, find:

(a)

1. sum of x values (Σx)
2. sum of y values (Σy)
3. sum of product of values (Σxy)
4. mean of x values (\bar{x})
5. mean of y values (\bar{y})

(b)

1. Regression Constant ' a '
2. Regression Coefficient ' b '
3. Coefficient of correlation ' r '

(c)

1. The estimated value of y if $x = 4.5$
2. The estimated value of x if $y = 16.5$

Solution:

(a)

- Press **MENU** and select **6** and then **2**.
- Enter your x and y values data by entering values and **≡** after each value in their respective columns.
- After entering the data, press **OPTN** and select **3**

You will have the desired values as follows.



\bar{x} =4	s_x =2	σ_y =2.291287847
Σx =32	n =8	s^2_y =6
Σx^2 =156	\bar{y} =16.5	s_y =2.449489743
σ^2_x =3.5	Σy =132	Σxy =494
σ_x =1.870828693	Σy^2 =2220	Σx^3 =848
s^2_x =4	σ^2_y =5.25	Σx^2y =2302

(b)

- Press **MENU** and select **6** and then **2**.
- Enter your x and y values data by entering values and **≡** after each value in their respective columns.
- After entering the data, press **OPTN** and select **4**

You will have the desired values as follows.

$y=a+bx$
$a=21.35714286$
$b=-1.214285714$
$r=-0.991460134$

(c)

- Press **MENU** and select **6** and then **2**.
- Enter your x and y values data by entering values and **≡** after each value in their respective columns.
- After entering the data, press **OPTN** **▼** **1**
- Now select **OPTN** **▼** **4** **5** to enter \hat{y} .
- As the value of x must be entered before \hat{y} , so press **◀** and enter the value i.e. 4.5 and press **≡**

$4.5\hat{y}$	15.89285714
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For estimated value of x repeat the process but select 4th option instead of 5th.

$4.5\hat{y}$	15.89285714
$16.5\hat{x}$	4

Permutation and Combination

Q#3: In how many ways can 4 people be lined up to get on a bus?

Solution:



This question can be solved by just finding 4! For this purpose

in normal calculation mode just write 4 and then press SHIFT x! to write '!' sign. And then press = .

4! 24

Q#4: Find the number of permutations of 7 objects taken 3 at a time.

Solution

To find out 7P_3 input 7 SHIFT x 3 =

7P3 210

Q#5: In how many ways can 3 students be selected out of 7 students?

Solution

To find out 7C_3 input 7 SHIFT C 3 =

7C3 35

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 =



$\begin{array}{l} \text{Binomial PD} \\ x : 3 \\ N : 7 \\ p : 0.3 \end{array}$	$P = 0.2268945$
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(ii) **At most three sales**

Press **MENU** **7** **1** **2**

And enter the data as shown below

$\begin{array}{l} \text{Binomial CD} \\ x : 3 \\ N : 7 \\ p : 0.3 \end{array}$	$P = 0.873964$
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(iii) **At least three sales**

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

c) **Prepare a probability distribution.**

Press **MENU** **7** **4** and select **1**

Enter x values from 0 to 7 and press **=**

$\begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array}$	$\begin{array}{l} x \\ 1 \\ 2 \\ 3 \end{array}$	$P \text{ Binomial PD}$
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Then enter N = 7 and p = 0.3 and press **=**

$\begin{array}{l} \text{Binomial PD} \\ N : 7 \\ p : 0.3 \end{array}$	$\begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{l} x \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{l} P \\ 0.0823 \\ 0.247 \\ 0.3176 \\ 0.2268 \end{array} \text{ Binomial PD}$
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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) **Exactly 4 cars will pass through.**

Press **MENU** **7** **2** to enter Poisson distribution and then select **2**.

Enter **4** in x value and **3** in mean filed then press **=**.



Poisson PD x : 4 λ : 3	P= 0.1680313557
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ii) **At most 4 cars will pass through.**

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

Poisson CD x : 4 λ : 3	P= 0.8152632481
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iii) **More than 4 cars will pass through.**

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 **=**.

Normal CD Lower: -1×10^{10} Upper: 12 σ : 3	P= 0.1586552539
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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 **=**.



Normal CD Lower:12 Upper:1×10 ⁸ σ :3	P= 0.8413447461
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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 **≡**.

Normal CD Lower:12 Upper:16 σ :3	P= 0.4719034059
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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.

Inverse Normal Area :0.1 σ :3 μ :15	xInv= 11.15534508
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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.

Inverse Normal Area :0.88 σ :3 μ :15	xInv= 18.52496095
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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 \square thrice.

Inverse Normal Area :0.025 σ :1 μ :0	xInv= -1.959964028
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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 \square and select \square and then \square for entering inverse normal calculation mode.

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

Inverse Normal Area :0.025 σ :1 μ :0	xInv= -1.959964028
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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 $\frac{\sigma}{\sqrt{n}} = \frac{4}{\sqrt{64}} = \frac{4}{8} = 0.5$

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

Press \square and select \square and then \square to enter inverse normal calculation mode.
Type lower limit as -100000000, upper limit 152, mean 150 and SD 1 and press \square .

Normal CD Lower: -1×10^7 Upper: 152 σ :1	P= 0.977249868
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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 1 press and then press **=**.

Inverse Normal	xInv=
Area :0.9772	
σ :1	
μ :0	2.000000043

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

Using Memory

Q#11: Find geometric mean for the following data.

2, 3, 2, 2, 5, 6, 7, 5, 4, 5

Solution

x	$\log(x)$
2	0.30103
3	0.47712125
2	0.30103
2	0.30103
5	0.69897
6	0.77815125
7	0.84509804
4	0.60205999
5	0.69897
Σ	5.00346053

As we need the sum in the end, we do not need to add all values manually in the calculator. While calculating log of any value press **M+** after every calculation and then in the end press **ALPHA** **M+** **=** to get the sum of all values.

log(4)M+	M
0.6020599913	5.003460532

The same can be used in every calculation where the sum is required in the end e.g. Index number and harmonic mean etc.