Using TI84 for the IB Exams -Paper 2

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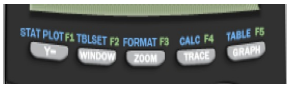
Part 1: Plotting the curve of a function $f(x)$ and solving an equation like $f(x) = 0$

1) Introducing a function
to plot its curve.

– press button $\boxed{y=}$



– introduce your function as $Y_1 = ..$

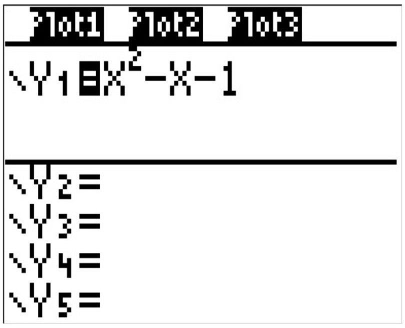


fig.1

Notice: you can introduce many
other functions

2) Parametring the window.

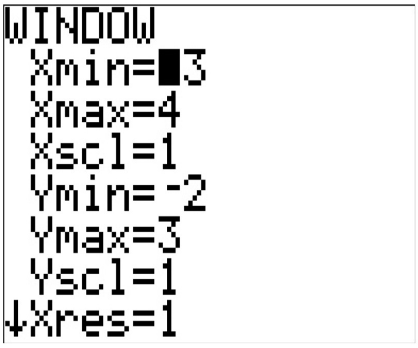


fig.2

– Domain of plotting : $x_{\min} \leqslant x \leqslant x_{\text{msx}}$

– Range of plotting : $y_{\min} \leqslant y \leqslant y_{\text{msx}}$.

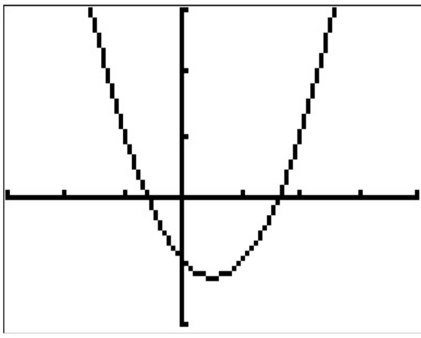


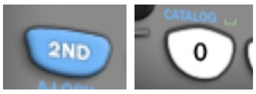
fig.3

3) Plotting the curve of Y_1

press button $\boxed{\text{trace}}$

4) Finding and selecting « solve (»

in the CATALOG.



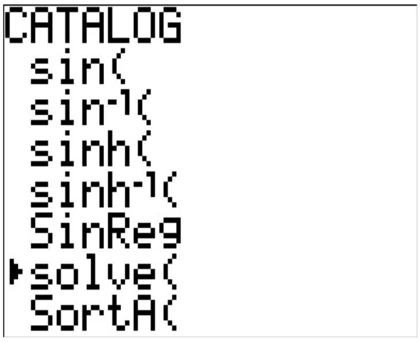


fig.4

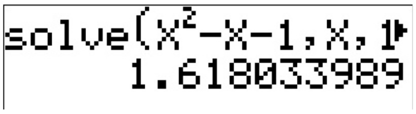


fig.5

5) Using **solve($f(x), x, g$)**

to find an approximate solution of,

for example: equation : $x^2 - x = 1$

The equation has to be introduced

on the form « $f(x) = 0$ ».

(g is a *guess-value*)

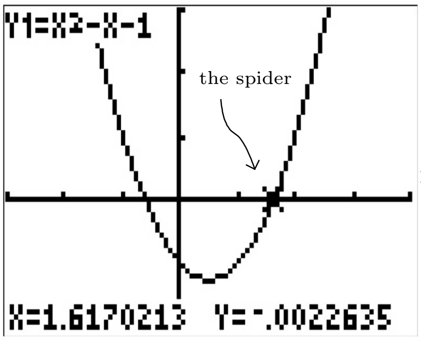


fig.6

6) Using the *spider* to

find (or to confirm) *graphically*

the solution of $f(x) = 0$

by considering the intersection(s)

of the curve with the $x-$axis.

° You can move the *spider* along the curve.

° The coordinates of the spider are given as $x = \ldots$ and $y = \ldots.$

Part 2: Finding the *mean* and the *standard deviation* of a discrete variable

We suppose the discrete variable is

given by a table, for example

x	0	1	2	3	4	5
$n(x)$	10	7	5	3	0	1

What is the *mean* and the *standard-deviation* ?

To find them with the calculators, the steps are:

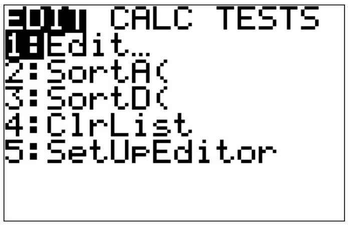


fig.1

1) Press stat (fig.1)

then chose EDIT it the menu.

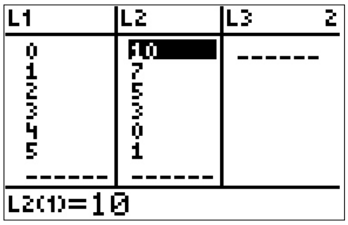


fig.2

2) Introduce the data in a the table (fig.2)

inserting: in L1 the values of x

in L2 the values of $n(x)$

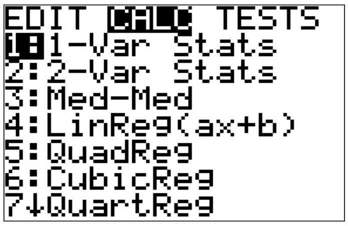


fig.3

3) Press stat again (fig.3)

then chose CALC it the menu.

fig.4

4) Then chose (fig.4)

List : L1 FreqList : L2

or after 1-var starts insert « L1,L2 »

<u>Notice</u>: Don't try introducting « L1 » or « L2 »

with the characters « L » and « 1 »

or « L » and « 2 », that doesn't work !

Use 2nd 1, 2nd 2. (2nd is a *blue* button)

press enter.

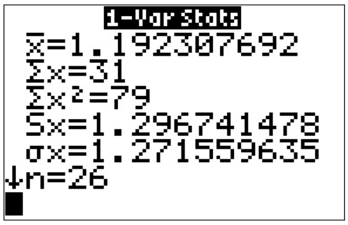


fig.5

<u>Results</u>: (fig.5)

mean: $\bar{x} = 1.192307....$

standard dev : σ_x= 1.271559...

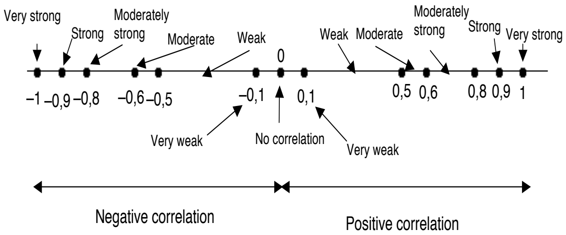
No use to copy so many decimals in your paper!

Part 3 : ***Using you calculator for studying a Linear regression***

Introduction

The r-value from Pearson's correlation indicates the strength of the relationship between two data sets.
A perfect correlation will have a regression coefficient of r = ± 1.0000
No correlation will have a regression coefficient of r = 0

We can conclude, using the following diagram.



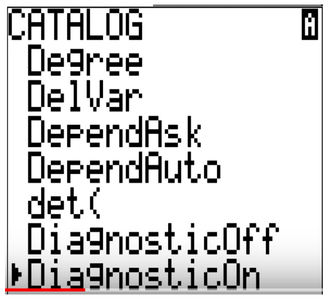


fig.1

fig.2

Step 0 (fig.1 & fig.2)

In order to get the values of r and r^2

you have to activate the mode « Diagnostic » ON

form the CATALOG.

That have to be done once only...

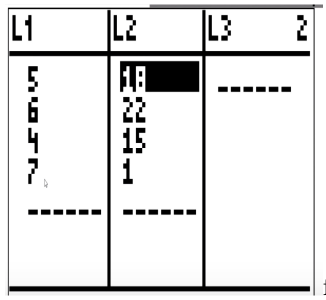


fig.3

Step 1 Press stat (fig.3)

Introduce you datas in L1 and L2 the same way

for finding the mean & standard deviation. (EDIT)

inserting: in L1 the values of x

in L2 the values of y

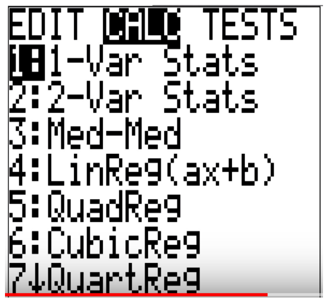


fig.4

Step 2

Press stat again (fig.4)

then chose LinReg it the menu.

that is 4: LingReg($ax + b$)

don't take LinReg($a + bx$) !!!

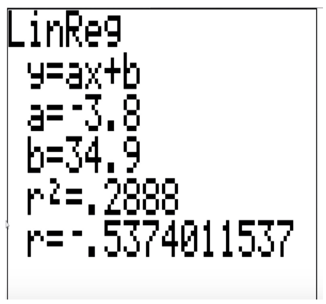


fig.5

step 3

You get the results as shown in fig.5

Notice you can use a and b to draw the line.

For doing that you can transfer the result in a function-variable like Y1, and plot its line. You can even show the like of regression with the data-points (you can expain how it the remaining space below).

i:

ii:

iii:

Part 4 : Using you calculator for a question involving the *Binomial Law*

1) Finding $\mathcal{C}_r^n$

for example $\mathcal{C}_3^8 = \frac{8!}{(8-3)!3!} = 56$

Press 8.
Press MATH 3:nCr.
Press 3 ENTER.

Press ENTER.

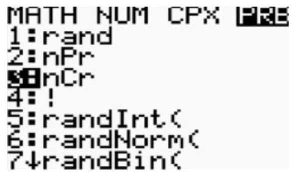


fig.1

2) Finding $P_B(r,n,p)$

for example $P_B\left(5,9,\frac{3}{4}\right) = \mathcal{C}_5^9\left(\frac{3}{4}\right)^5\left(1-\frac{3}{4}\right)^4 = \frac{15309}{131072} \cong 0.116798$

Press 2nd DISTR A:binompdf(.
Enter 9 as trials, 0.75 as p and 5 as x.
Select Paste and press ENTER
Press ENTER again

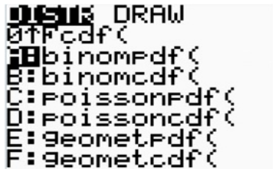


fig.2

3) Finding $\sum_{r=0}^{r_{max}} P_B(r,n,p)$

for example $P_B\left(0,20,\frac{9}{40}\right) + P_B\left(1,20,\frac{9}{40}\right) + \ldots + P_B\left(10,20,\frac{9}{40}\right)$

That gives $\text{Prob}(X \leqslant 10)$ assuming $(X=r) = P_B\left(r,20,\frac{9}{40}\right)$

Press 2nd DISTR B:binomcdf(.

Enter 30 as trials, 0.45 as p and 10 as x.
Select Paste and press ENTER
Press ENTER again

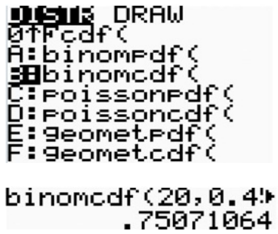


fig.3

Example (IB)

A bag contains four gold balls and six silver balls.

(a) Two balls are drawn at random from the bag, with replacement. Let X be the number of gold balls drawn from the bag.

(i) Find $P(X=0)$.

(ii) Find $P(X=1)$.

(iii) Hence, find $E(X)$. *[8 marks]*

Fourteen balls are drawn from the bag, with replacement.

(b) Find the probability that exactly five of the balls are gold. *[2 marks]*

(c) Find the probability that at most five of the balls are gold. *[2 marks]*

(d) Given that at most five of the balls are gold, find the probability that exactly five of the balls are gold. Give the answer correct to two decimal places. *[3 marks]*

Part 5 : Solving IB problems involving the normal distribution N(μ, σ)

1) Use of a calculator

I] For solving $P(x<a)$ with a Ti 84 use ***NormalCDF***$(-\infty, a, \mu, \sigma)$ More generally for solving $P(\min < x < \max)$ use ***NormalCDF***(**min, max**, μ, σ)

Notice: in place of $\pm\infty$ you can take $\pm$E99

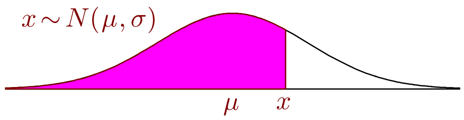
II] For finding a such that $P(x<a)$ has a given value p use ***InverNormal***(p, μ, σ)

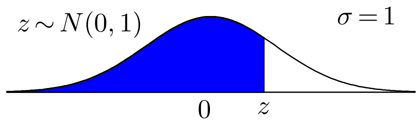
2) $N(\mu, \sigma)$ and $N(0,1)$

Each problem we may have to solve with the variable x has its own values for the *mean* μ and for the *standard deviation* σ.

We name « N(μ, σ) » the *normal distribution* adapted to such a problem.

Hence $N(0,1)$ is the particular case when $\mu = 0$ and $\sigma = 1$.





3) Change of variable

In some situations, it can be useful to change the the variable x of a given problem in order to use the variable z of $N(0,1)$ in place of the x of $N(\mu, \sigma)$.

This change of variable is given by the formula ☼ : $z = \frac{x-\mu}{\sigma}$

4) What is the use of this change of variable ?

It is useful in two situations:

a) When we don't know μ and σ, but two probabilities about x.

b) When we have a calculator unable to work with an other normal distribution than $N(0,1)$.

5) Example of (a) : The two given probabilities are for instance :

$P(x<1) = 23$ % and $P(x<3) = 74\%$ find μ and σ.

Using ☼: $P(\frac{1-\mu}{\sigma}) = 0.23$ and $P(\frac{3-\mu}{\sigma}) = 0.74$

therefore: $\begin{cases} \frac{1-\mu}{\sigma} = \textbf{\textit{InversCDF}}(0.23) = -0.72885 \\ \frac{3-\mu}{\sigma} = \textbf{\textit{InverseCDF}}(0.74) = 0.64335 \end{cases} \Rightarrow \begin{cases} 0.72885\sigma - \mu = -1 \\ 0.64335\sigma + \mu = 3 \end{cases} \Rightarrow \mu = 2.07 \text{ and } \sigma = 1.447$

6) Two examples of using (b):

i) For $x \sim N(2.07, 1.447)$ what is the probability $P(1<x<3)$?

Of course if you calculator has the function ***NormalCDF*** as shown in (1)[I], you just has to use it : ***NormalCDF***(1,3 , 2.07, 1.447) = 0,51 = 51% (that make sens: $0.74 - 0.23 = 0.51$)

If you calculator works *only* with $N(0,1)$, then you have to rewrite the question in terms of z by ☼: $P(1<x<3) = P(\frac{1-2.07}{1.447} < z < \frac{3-2.07}{1.447}) = P(-0.7495 < z < 0.6427) \cong 0.51$.

ii) For $x \sim N(2.07, 1.447)$ find a such that $P(x<a) = 0.74$

If you calculator has the function ***InverseNormal*** as shown above in (1)]2] you just has to use it : ***InversNormal***(0.74, 2.07, 1.447)7= 3 (that make sens, considering (4) above !)

If it has *only* ***InversNormal***(p) for $z \sim N(0,1)$ you find $z = 0.64335$ then by ☼ : $x = \sigma z + \mu = 3$