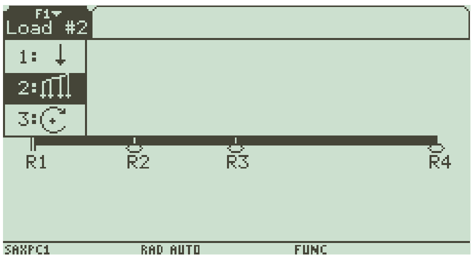
HI WHOEVER YOU ARE, THANKS FOR DOWNLOADING THIS PROGRAM, BELIEVE ME YOU WON'T REGRET IT.

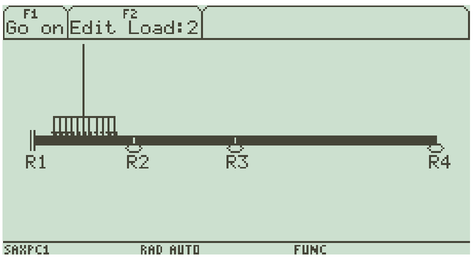
NOT TO GET LOST PLEASE READ VERY WELL ALL THIS.

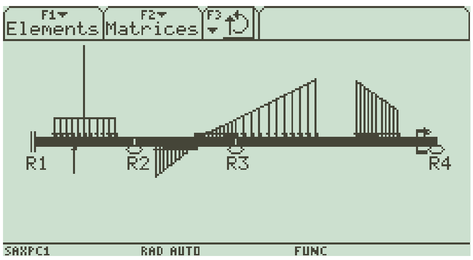
MY NAME IS CARLOS AUGUSTO PEREZ COCA AN EX-STUDENT OF CIVIL ENGINEERING IN NICARAGUA AT UNI. ANY QUESTION, SUGGESTION, DOUBT OR MISTAKE FOUND DON'T EVEN THINK ABOUT IT; EMAIL ME AT COCATHEKILLA@YAHOO.COM.

THIS DOC IS TO MAKE YOU UNDERSTAND HOW SAXPC ULTIMATE (THE PROGRAM YOU'RE DOWNLOADING) WORKS. THIS IS A HP VERSION AND IS VERY BEAUTIFUL (BECAUSE IT DOES EVERYTHING) IN COMPARISON TO THE TI 89, TI 92+ AND THE VOYAGE 200 VERSIONS BECAUSE THOSE VERSIONS ARE LESS BEAUTIFUL, THEY PLOT LIKE THIS AT THE SAME TIME YOUR ENTERING THE DATA.

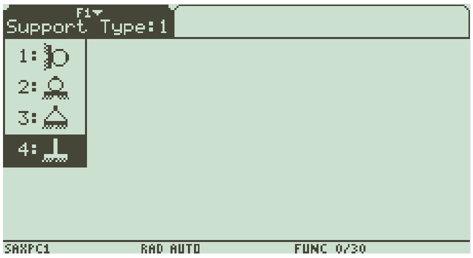
SOME SCREENSHOTS OF BEAMXP FOR TEXAS CALCULATORS.

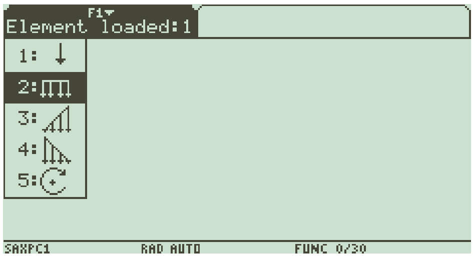


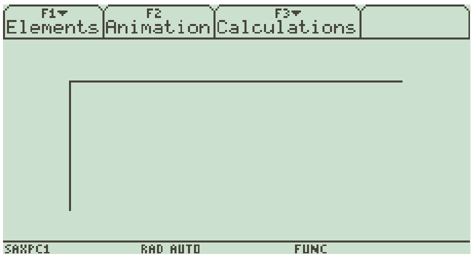




SOME SCREENSHOTS OF FRAMEXP (PORTICOS) FOR TEXAS CALCULATORS.





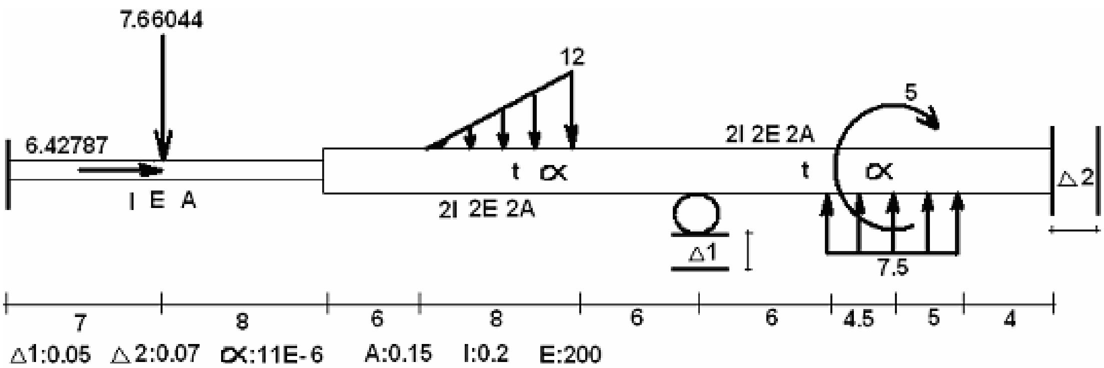


BUT SAXPC HP VERSION IS UNIQUE BECAUSE IT GOT SO MANY TOOLS THAT OTHER STRUCTURAL PROGRAMS DON'T HAVE AND YOU WILL SEE IT.

HISTORY:

THIS PROGRAM HAS A FORMER VERSION CALLED STIFFNESS 1.55 AND IT WAS BIG AND SLOW (so replace it with this one), AND NOT AS HELPFUL AS THIS NEW VERSION. JUST THINK THIS NEW VERSION IS 20000 TIMES MUCH BETTER, ANYWAY LET'S MEET IT.

OK THERE AIN'T BETTER WAY TO KNOW HOW TO USE SOMETHING THAN WITH AN EXAMPLE, LET'S SEE ONE.

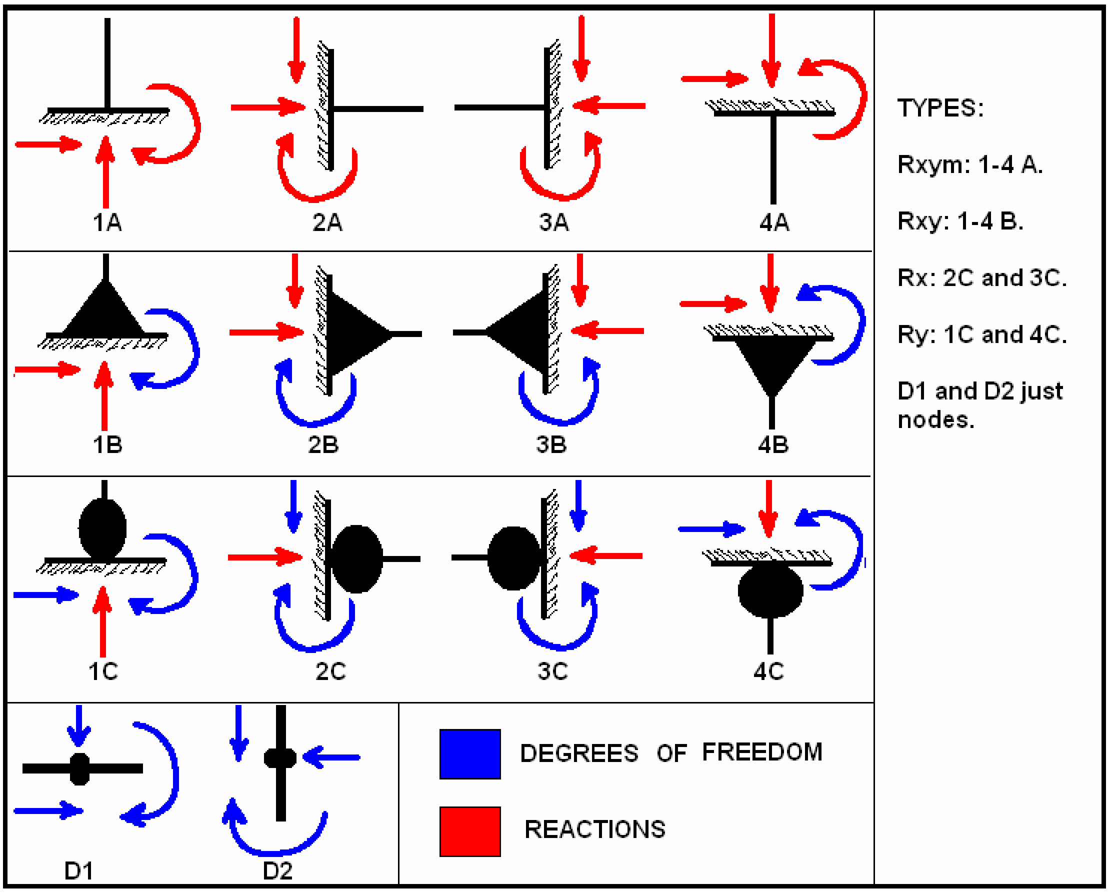


t = 10 FOR ELEMENT ONE AND TWO.
t: TEMPERATURE CHANGE.
α : COEFICIENT OF TEMPERATURE.

TELL ME IF YOU HAVE OTHER PROGRAM IN WHICH YOU CAN ANALYZE THIS TYPE OF BEAM, I'M SURE THERE'S NOT ANY PROGRAM THAT CAN DO IT, BUT MINE.

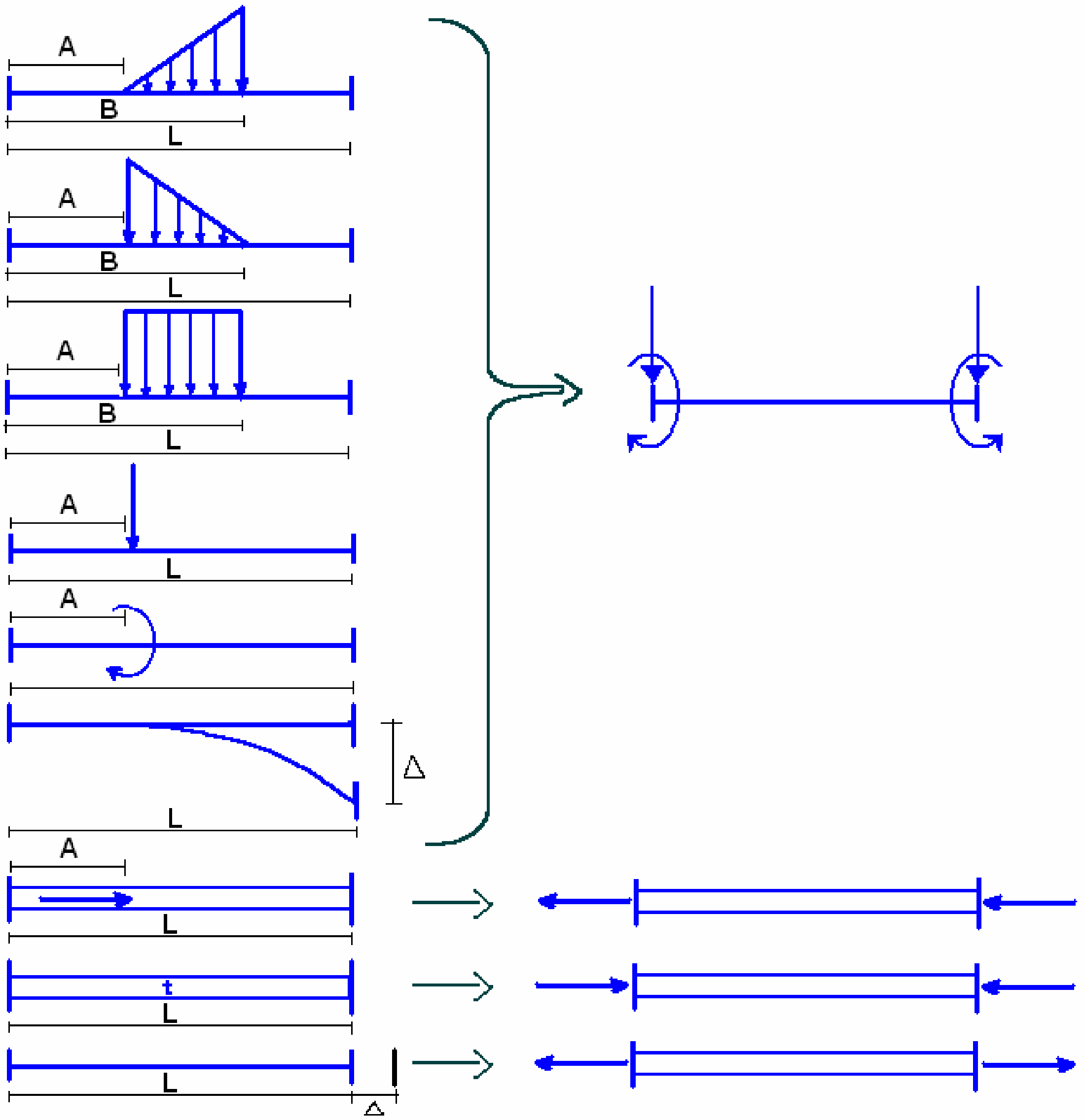
JUST SEE IT, THIS BEAM HAS TEMPERATURE CHANGES ON ITS ELEMENTS, IT HAS A HORIZONTAL LOAD, A TRIANGULAR AND A RECTANGULAR LOAD WITH DISTANCES TO NODES, AND IT HAS TO TYPES OF DISPLACEMENTS.

THE STIFFNESS MATRIX METHOD OR DISPLACEMENTS METHOD WORKS CONCENTRAITING THE ELEMENTS LOADS IN NODAL LOADS USING SOME FORMULAS, ONCE THEY ARE NODAL LOADS YOU MUST KNOW HOW EACH NODE IS WORKING. SO LET'S SEE HOW NODES CAN WORK IN THE FOLLOWING PICTURE:



Rxym: It means Reaction in X, Y direction and a Moment in this node.
Rxy: It means Reaction in X, Y direction in this node.
Rx: It means Reaction in X direction in this node.
Ry: It means Reaction in Y direction in this node.

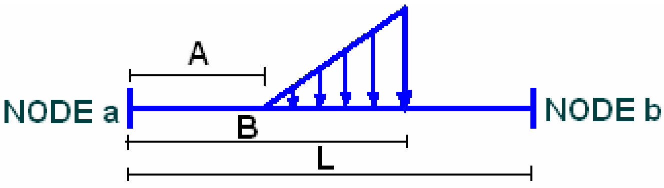
NOW THE LAST THING TO KNOW IS THE TYPES OF LOADS AND HOW THEY ARE CONCENTRATED. LET'S SEE THE FOLLOWING PICTURE.



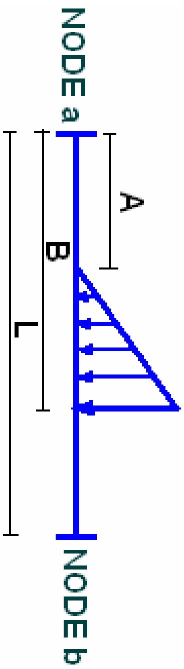
LOAD TYPES (IN ORDER OF APPEARANCE):

1. TRIANGULAR + LOAD (POSITIVE SLOPE).
2. TRIANGULAR - LOAD (NEGATIVE SLOPE).
3. RECTANGULAR LOAD.
4. VERTICAL POINT LOAD (V. POINT).
5. MOMENT LOAD (-) THE MINUS MEANS NEGATIVE WITH CLOCK.
6. VERTICAL DISPLACEMENT.
7. HORIZONTAL POINT LOAD (H. POINT).
8. TEMPERATURE CHANGE (TEMPERATURE).
9. HORIZONTAL DISPLACEMENT.

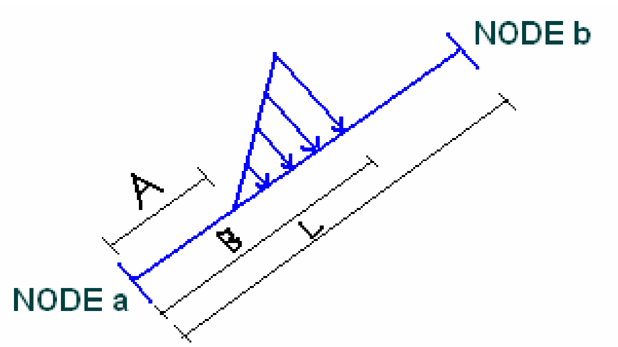
THE PROGRAM WILL DO THIS FOR YOU. NOW THE WAY YOU MUST SEE EVERY ELEMENT MUST BE ALL THE TIME LIKE THIS:



SO YOU DON'T HAVE TO CARE IF IT HAS ANY ANGLE, YOUR NODES WILL BE ALWAYS TWO IN EVERY ELEMENT: THE LEFT AND THE RIGHT ONE.
AND IT WILL BE THE SAME IF YOUR ELEMENT IS LIKE THIS:

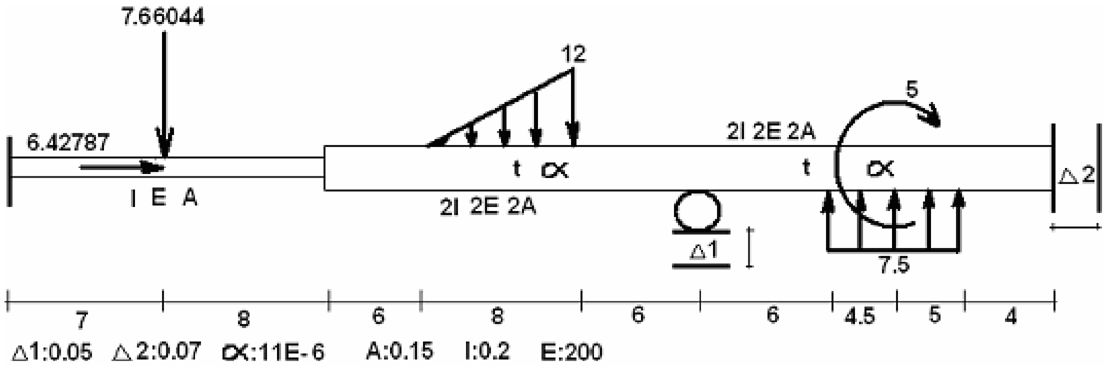


OR LIKE THIS:



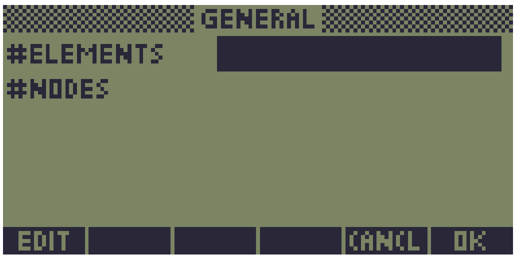
IN THE PROGRAM LOADS MUST BE ALL THE TIME PERPENDICULAR OR PARALLEL TO THE ELEMENT.

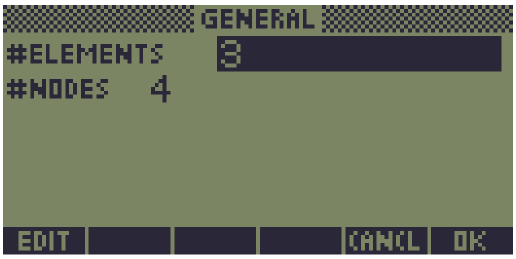
OK. IT'S BEEN ENOUGH LET'S RUN SAXPC AND SOLVE OUR BEAM:



ELEMENTS (SPANS): THE SPACE BETWEEN TWO SUPORTS OR NODES.
NODES: WHERE AN ELEMENT CHANGES ITS DIRECTION (any angle) OR PROPERTIES (A, E, I). HERE WE CHOOSE DATA.

NOW CHOOSE GENERAL AND ENTER 3 ELEMENTS, 4 NODES.

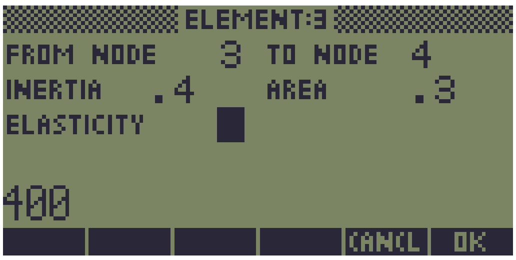




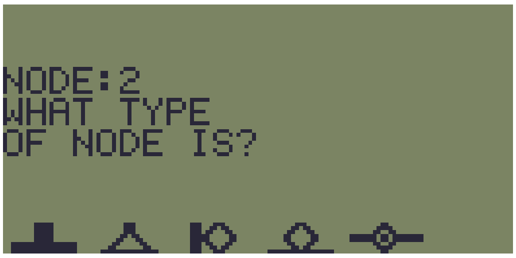
NOW NODES AND HERE WE ENTER THEIR COODENATES.

YOU MUST ALWAYS WORK FROM LEFT TO RIGHT, SO YOUR FIRST NODE ON YOUR LEFT WILL BE THE FIRST ONE AND THIS ONE MUST HAVE THE ZEROS COORDENATES.

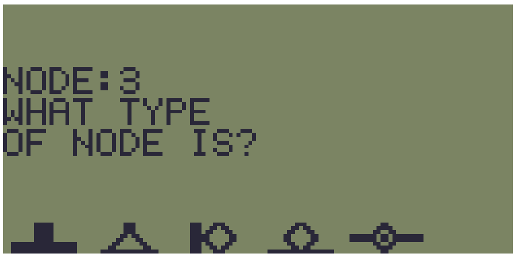
NOW DEFINE THE ELEMENTS.

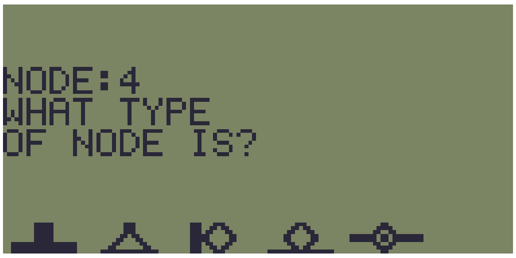


MAYBE YOU'RE NOT SURPRISE UNTIL NOW BUT JUST WAIT. SO CONTINUE WITH SUPPORTS REMEMBERING THE EXPLANATION FOR SUPPORTS TYPES IN THE PICTURE.

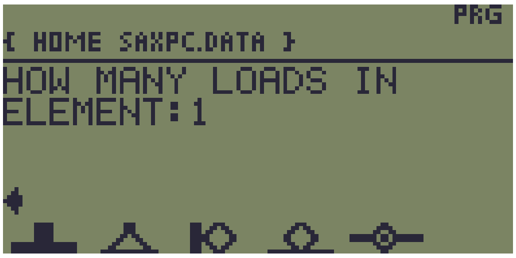


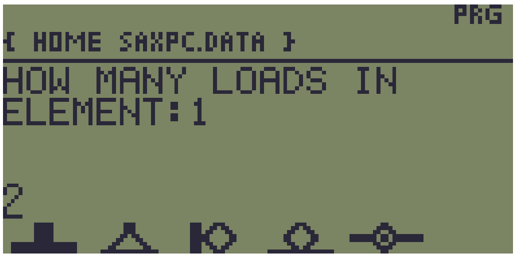
JUST PRESSING THE WHITE KEY BELOW THE SUPPORT TYPE YOU HAVE.

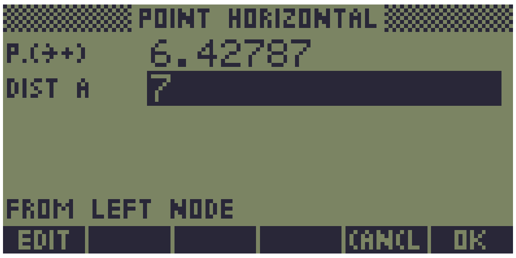


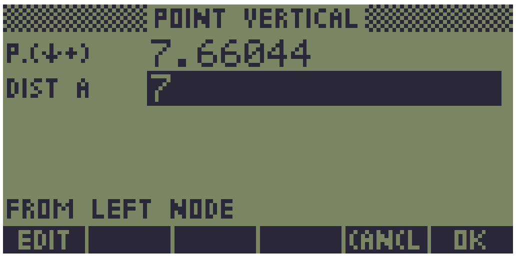


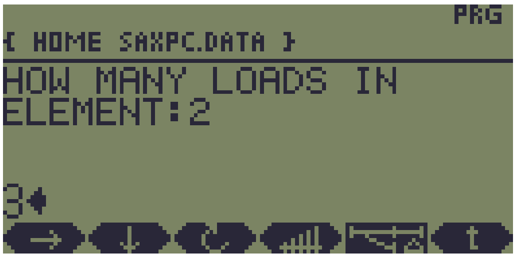
NOW LET'S ENTER THE LOADS.

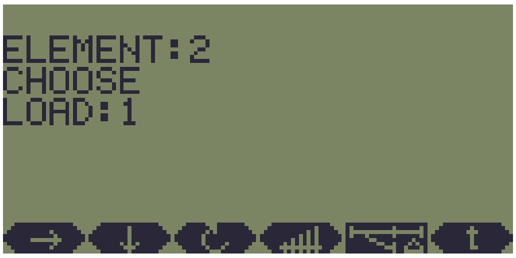


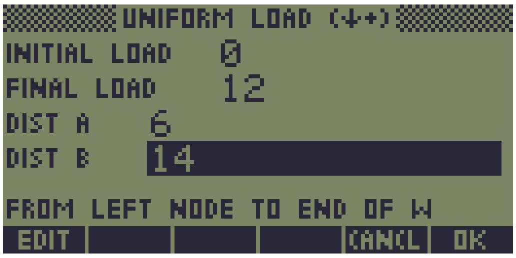


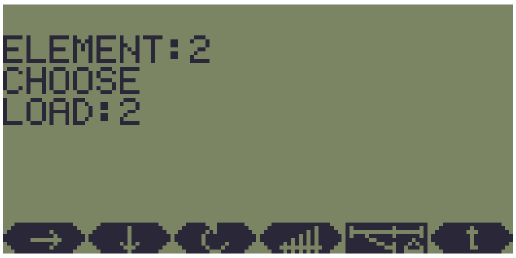


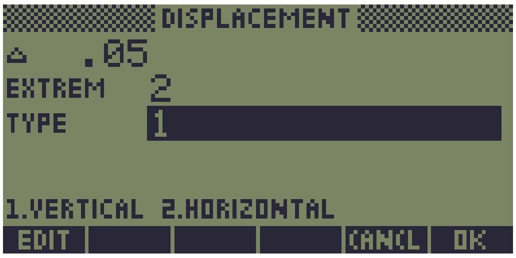

POINT VERTICAL
P.(↓+) 7.66044
DIST A 7
FROM LEFT NODE
EDIT CANCL OK

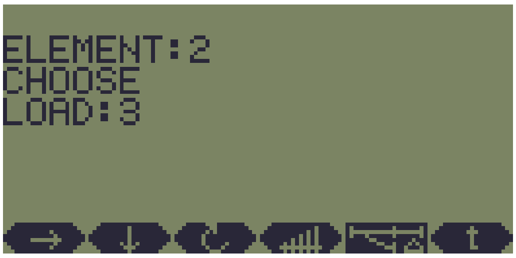

PRG
{ HOME SAXPC.DATA }
HOW MANY LOADS IN
ELEMENT:2
3

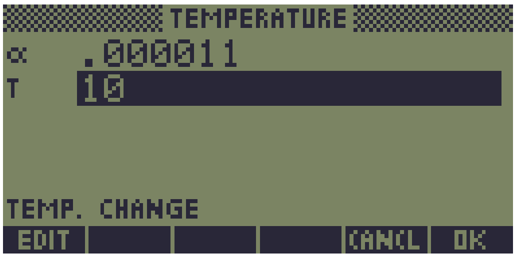

ELEMENT:2
CHOOSE
LOAD:1

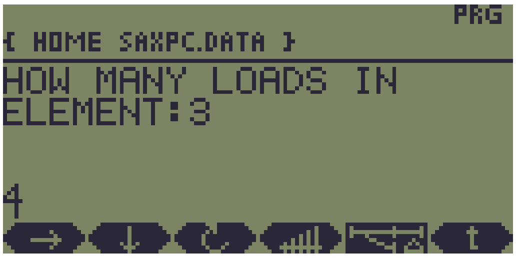

UNIFORM LOAD (↓+)
INITIAL LOAD 0
FINAL LOAD 12
DIST A 6
DIST B 14
FROM LEFT NODE TO END OF W
EDIT CANCL OK

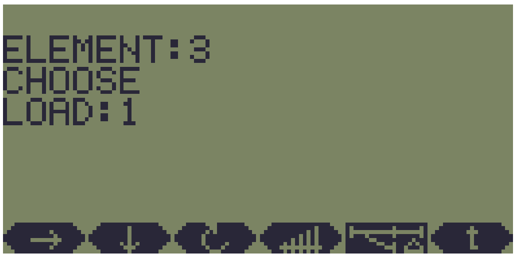

ELEMENT:2
CHOOSE
LOAD:2


DISPLACEMENT
Δ .05
EXTREM 2
TYPE 1
1.VERTICAL 2.HORIZONTAL
EDIT CANCL OK

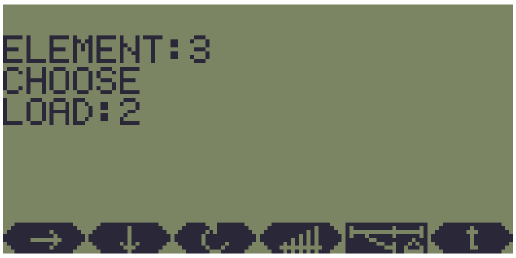

ELEMENT:2
CHOOSE
LOAD:3

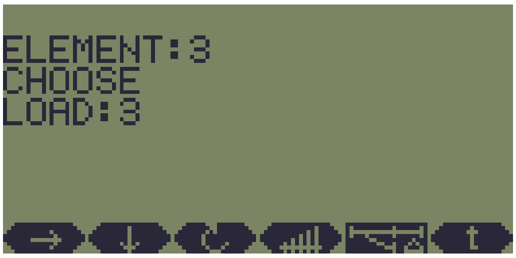

TEMPERATURE
α .000011
T 10
TEMP. CHANGE
EDIT CANCL OK

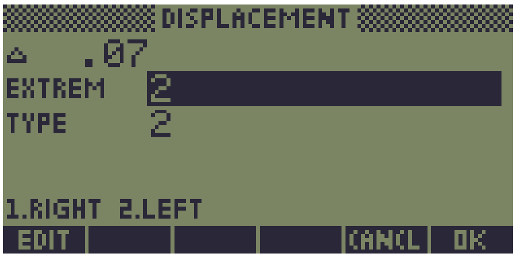

PRG
{ HOME SAXPC.DATA }
HOW MANY LOADS IN
ELEMENT:3
4

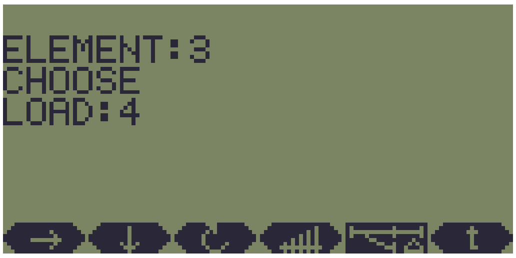

ELEMENT:3
CHOOSE
LOAD:1

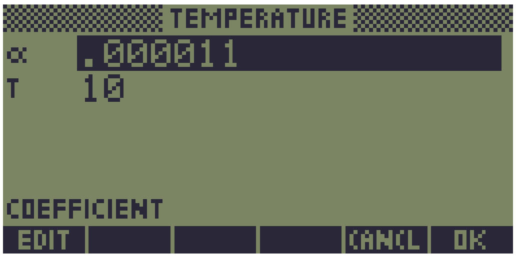

MOMENT
M. 5
DIST A 10.5
CLOCKWISE POSITIVE
EDIT CANCL OK


ELEMENT:3
CHOOSE
LOAD:2

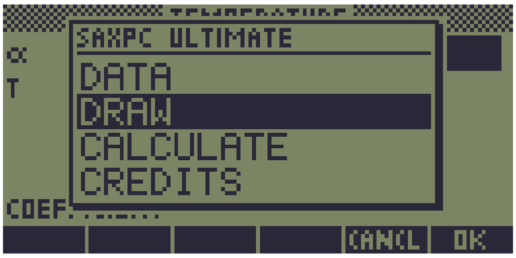




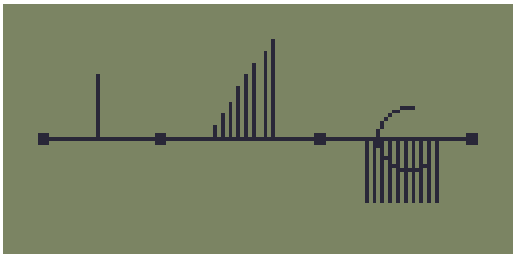




HERE BY PRESSING ON (KEY) OR CANCL (E KEY) WE RETURN TO THE MAIN MENU, WHY LIKE THIS WELL YOU CAN ENTER TO THE SECOND MENU AND CHANGE THE LOADS ONLY. LET'S CHOOSE DRAW.



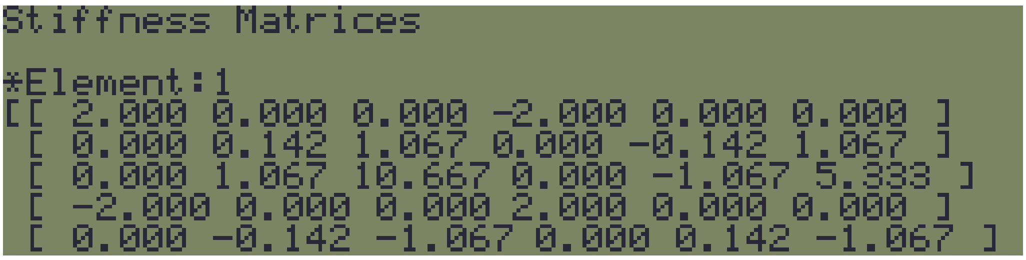
SURPRISE SAXPC CAN DRAW THE BEAM OR FRAME WITH LOADS.

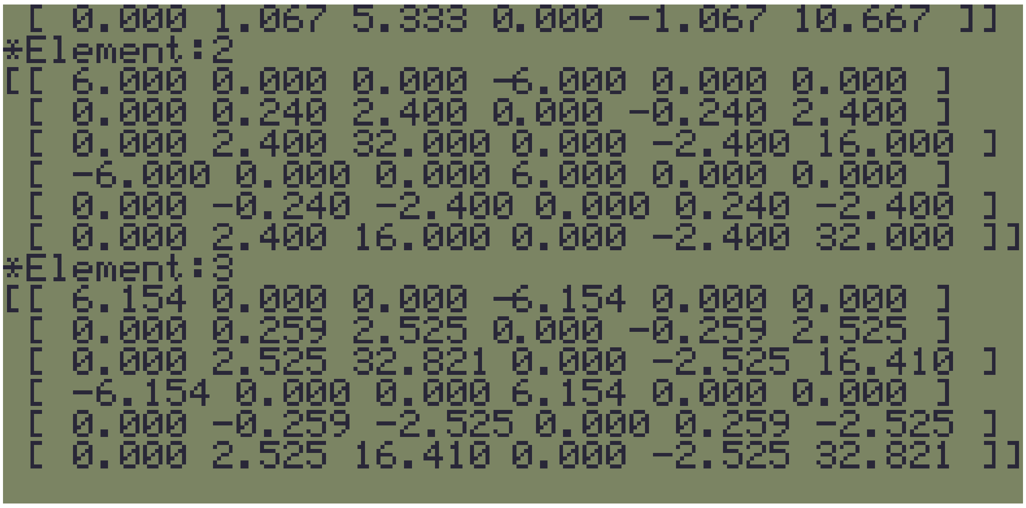


THE FOUR POINTS ARE THE NODES ONLY. NOTICE THAT LOAD SIZES ARE ACCORDING TO THEIR VALUES AND YOU CAN NOT SEE THE HORIZONTAL POINT LOAD BECAUSE IT STARTS AT X=7 BUT IT IS THERE. WHEN YOU DRAW BY FIRST TIME SAXPC DISPLAYS THE MESSAGE AND STARTS DRAWING THE STRUCTURE, BUT IF IT IS THE SECOND TIME IT WILL JUST SHOW IT UNLESS YOU CHANGE LOADS.

WELL LET'S CONTINUE. PRESS THE ON KEY AND LET'S ENTER TO CALCULATE.

THIS IS LIKE THIS DUE TO THE FACT THAT SOME TIMES YOU DON'T NEED ALL JUST SOME PART OF THE SOLUTION, BUT LET'S ENTER TO ALL OF THEM.





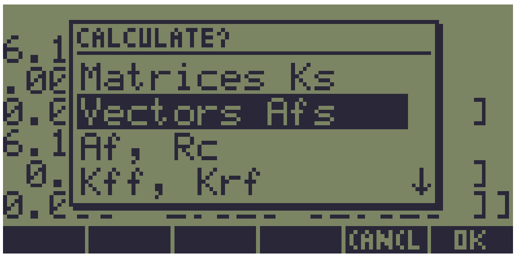
AS YOU SEE THESE MATRICES ARE THE STIFFNESS MATRICES PER ELEMENTS. YOU CAN GET THEM USING THE FOLLOWING INFORMATION:

T (I) [[COS(θ) –SIN(θ) 0 0 0 0]
[-SIN(θ) COS(θ) 0 0 0 0]
[0 0 1 0 0 0]
[0 0 0 0 COS(θ) SIN(θ)]
[0 0 0 0 -SIN(θ) COS(θ)]
[0 0 0 0 0 1]]

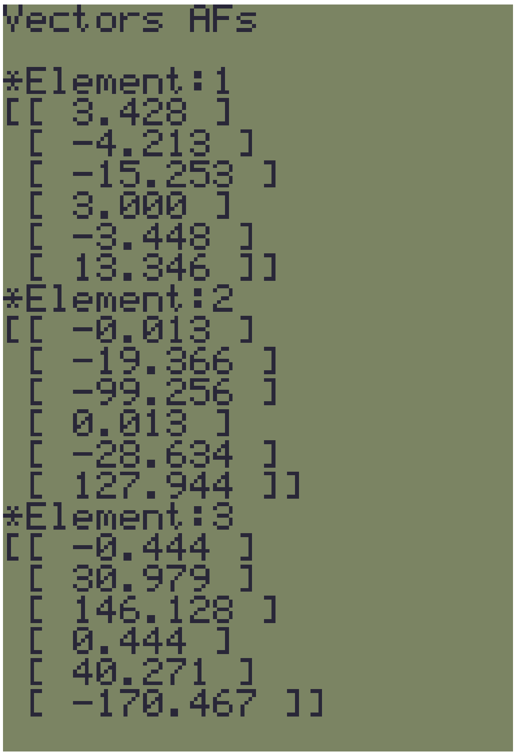
K '(I) [[EA/L 0 0 -EA/L 0 0]
[0 12EI/L3 6EI/L2 0 –12EI/L3 6EI/L2]
[0 6EI/L2 4EI/L 0 –6EI/L2 2EI/L]
[-EA/L 0 0 EA/L 0 0]
[0 -12EI/L3 -6EI/L2 0 12EI/L3 -6EI/L2]
[0 6EI/L2 2EI/L 0 –6EI/L2 4EI/L]]

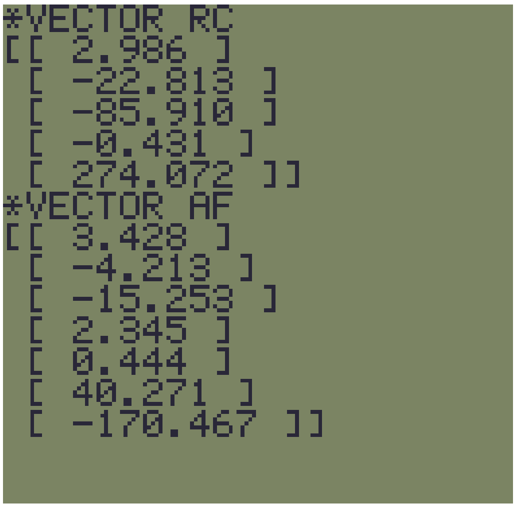
A: Element Area.
L: Element Length (Distance between Node I to Node J).
I: Element Inertia.
(θ): Horizontal Element Angle.

K (i) = T (i) *K ' (i) * T (i)

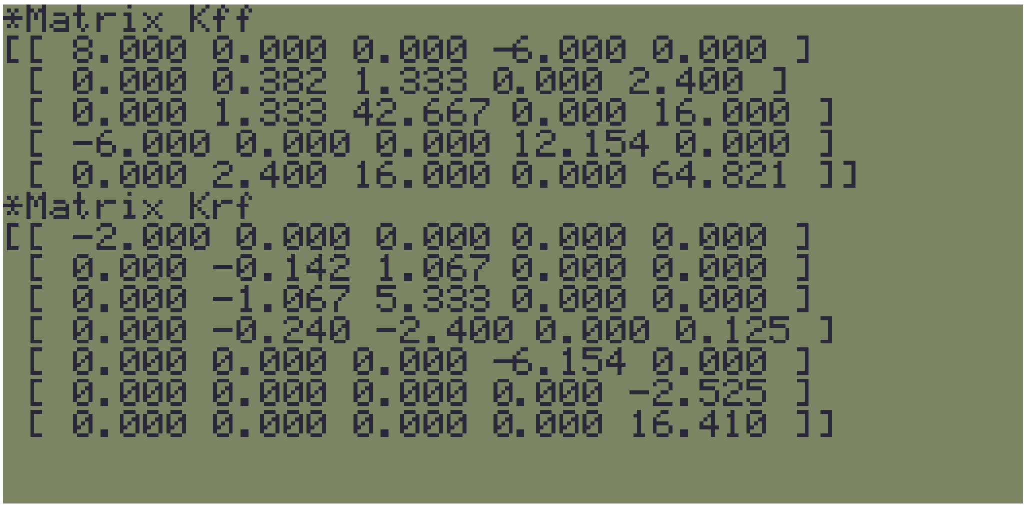


AFS VECTORS ARE VECTORS HAVING THE CONCENTRATED LOADS IN NODES FROM LEFT TO RIGHT ON EACH ELEMENT.





AF: VECTOR FORMED BY THE NODAL LOADS PLACED WHERE THE SUPPORTS ARE. **RC**: VECTOR FORMED BY THE NODAL LOADS PLACED WHERE THE DEGREES OF FREEDOM ARE.



ASSEMBLING THE MATRICES OF THE K (I) WE HAVE THE MATRIX OF RIGIDITY WHERE YOU OBTAIN THE MAIN *KFF* TO FIND THE DISPLACEMENTS AND THE *KRF* FOR THE REACTIONS.

```
*DISPLACEMENTS
 Dd=Kff⁻¹*Rc
 Dd
[[ 0.551 ]
 [ -107.536 ]
 [ -1.908 ]
 [ 0.236 ]
 [ 8.681 ]]
*REACTIONS
 Rd=Krf*Dd
 Rd
[[ -4.529 ]
 [ 17.471 ]
 [ 119.781 ]
 [ 29.126 ]
 [ -1.899 ]
 [ -62.187 ]
 [ 312.920 ]]
```

```
CALCULATE?
Af, Rc
Kff, Krf
Dd, Rd
ALL
CANCL  OK
```

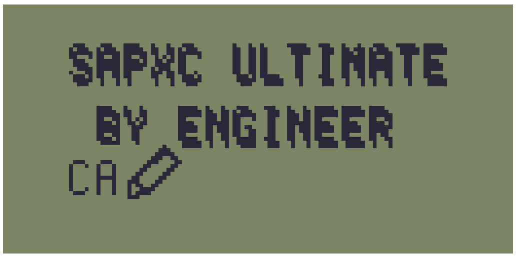
```
RESULTS

*ELEMENT:1
K:
1[[ 2.000 0.000 0.000 -2.000 0.000 0.000 ]
 [ 0.000 0.142 1.067 0.000 -0.142 1.067 ]
 [ 0.000 1.067 10.667 0.000 -1.067 5.333 ]
 [ -2.000 0.000 0.000 2.000 0.000 0.000 ]
 [ 0.000 -0.142 -1.067 0.000 0.142 -1.067 ]
 [ 0.000 1.067 5.333 0.000 -1.067 10.667 ]]
*Af:
1[[ 3.428 ]
 [ -4.213 ]
 [ -15.253 ]
 [ 3.000 ]
 [ -3.448 ]
```

```
 [ 13.346 ]]
*ELEMENT:2
K:
2[[ 6.000 0.000 0.000 -6.000 0.000 0.000 ]
 [ 0.000 0.240 2.400 0.000 -0.240 2.400 ]
 [ 0.000 2.400 32.000 0.000 -2.400 16.000 ]
 [ -6.000 0.000 0.000 6.000 0.000 0.000 ]
 [ 0.000 -0.240 -2.400 0.000 0.240 -2.400 ]
 [ 0.000 2.400 16.000 0.000 -2.400 32.000 ]]
*Af:
2[[ -0.013 ]
 [ -19.366 ]
 [ -99.256 ]
 [ 0.013 ]
 [ -28.634 ]
 [ 127.944 ]]
*ELEMENT:3
K:
3[[ 6.154 0.000 0.000 -6.154 0.000 0.000 ]
 [ 0.000 0.259 2.525 0.000 -0.259 2.525 ]
 [ 0.000 2.525 32.821 0.000 -2.525 16.410 ]
 [ -6.154 0.000 0.000 6.154 0.000 0.000 ]
 [ 0.000 -0.259 -2.525 0.000 0.259 -2.525 ]
 [ 0.000 2.525 16.410 0.000 -2.525 32.821 ]]
*Af:
3[[ -0.444 ]
 [ 30.979 ]
 [ 146.128 ]
 [ 0.444 ]
 [ 40.271 ]
 [ -170.467 ]]
*AF GENERAL:
[[ 3.428 ]
 [ -4.213 ]
 [ -15.253 ]
 [ 2.345 ]
 [ 0.444 ]
 [ 40.271 ]
 [ -170.467 ]]
*RC:
[[ 2.986 ]
 [ -22.813 ]
 [ -85.910 ]
 [ -0.431 ]
 [ 274.072 ]]
*KFF:
[[ 8.000 0.000 0.000 -6.000 0.000 ]
 [ 0.000 0.382 1.333 0.000 2.400 ]
```

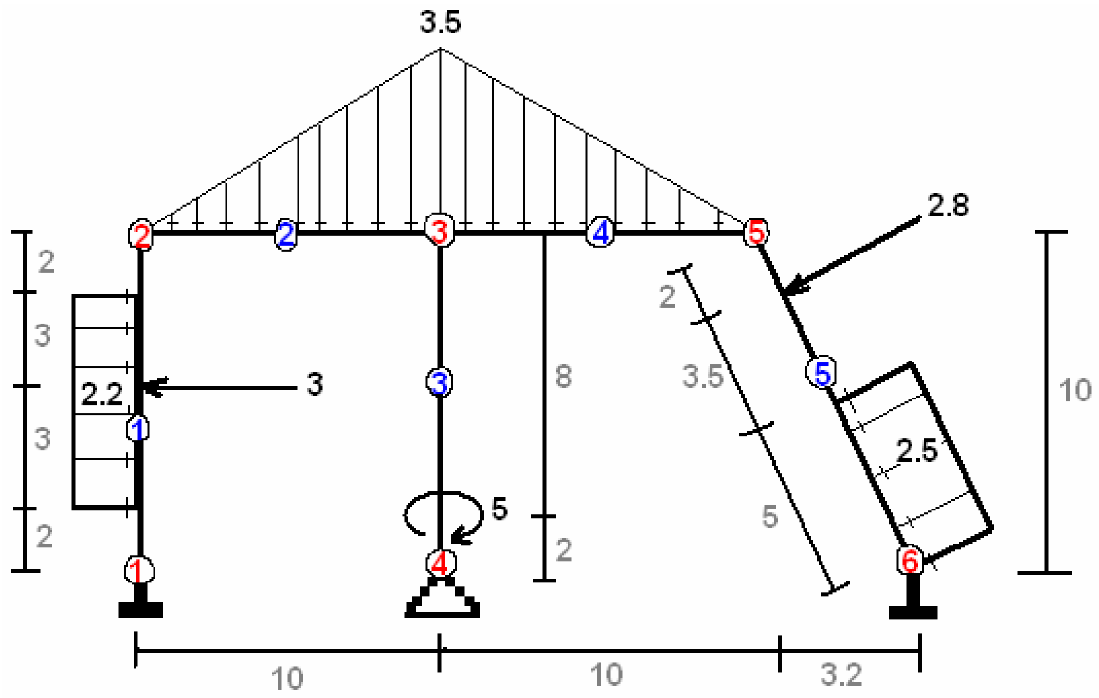
```
 [ 0.000 1.333 42.667 0.000 16.000 ]
 [ -6.000 0.000 0.000 12.154 0.000 ]
 [ 0.000 2.400 16.000 0.000 64.821 ]]
*KRF:
[[ -2.000 0.000 0.000 0.000 0.000 ]
 [ 0.000 -0.142 1.067 0.000 0.000 ]
 [ 0.000 -1.067 5.333 0.000 0.000 ]
 [ 0.000 -0.240 -2.400 0.000 0.125 ]
 [ 0.000 0.000 0.000 -6.154 0.000 ]
 [ 0.000 0.000 0.000 0.000 -2.525 ]
 [ 0.000 0.000 0.000 0.000 16.410 ]]
*Dd=KFF⁻¹*RC
Dd=NODE X,Y,θ
[[ 1.000 0.000 ]
 [ 1.000 0.000 ]
 [ 1.000 0.000 ]
 [ 2.000 0.551 ]
 [ 2.000 -107.536 ]
 [ 2.000 -1.908 ]
 [ 3.000 0.236 ]
 [ 3.000 0.000 ]
 [ 3.000 8.681 ]
 [ 4.000 0.000 ]
 [ 4.000 0.000 ]
 [ 4.000 0.000 ]]
*Rd=KRF*Dd
Rd=NODE X,Y,M
[[ 1.000 -4.529 ]
 [ 1.000 17.471 ]
 [ 1.000 119.781 ]
 [ 2.000 0.000 ]
 [ 2.000 0.000 ]
 [ 2.000 0.000 ]
 [ 3.000 0.000 ]
 [ 3.000 29.126 ]
 [ 3.000 0.000 ]
 [ 4.000 -1.899 ]
 [ 4.000 -62.187 ]
 [ 4.000 312.920 ]]
```

LET’S SEE WHAT IT HAS.

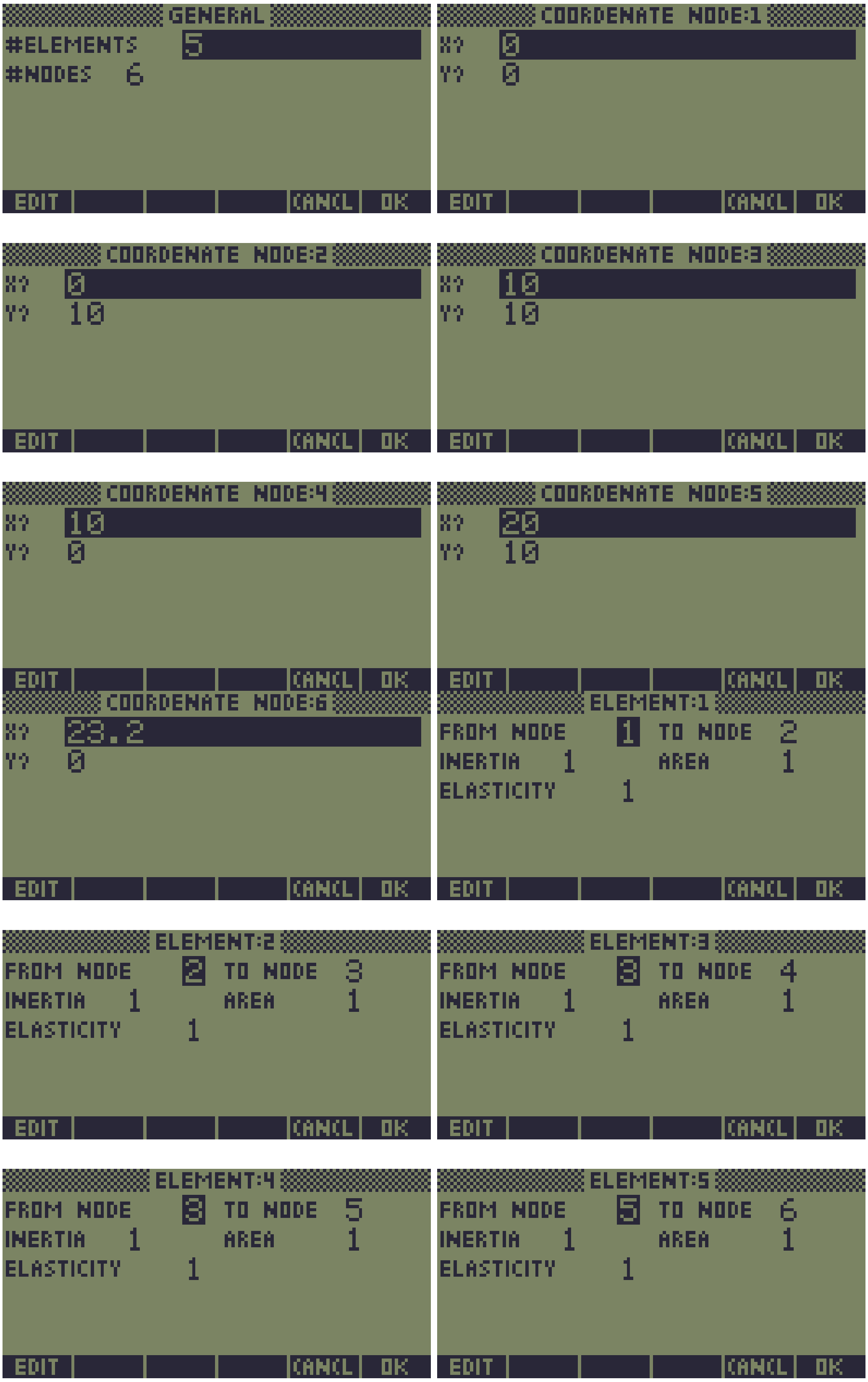


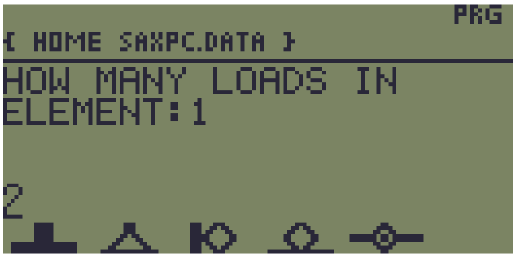
IT IS AN ANIMATION WITH THE PROGRAM NAME AND MY NAME.

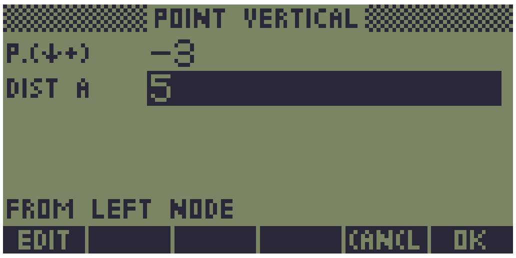
NOW LET'S SOLVE A FRAME BUT I WILL JUST SHOW SOME PARTS WHERE I SUPPOSE YOU CAN HAVE CONFUSION.



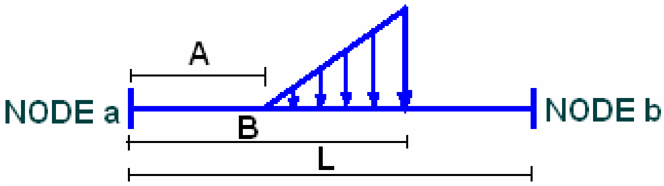
SUPPOSE THAT PROPERTIES ARE THE SAME SO WE ARE GONNA ENTER 1 IN INERTIA, AREA AND ELASTICITY.

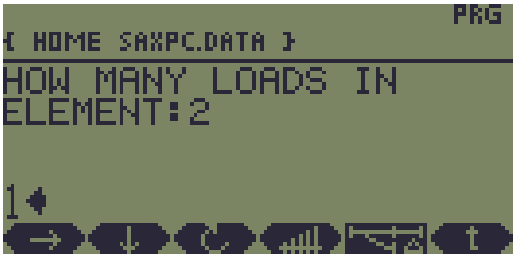

GENERAL
#ELEMENTS 5
#NODES 6
EDIT CANCL OK
COORDENATE NODE:1
X? 0
Y? 0
EDIT CANCL OK
COORDENATE NODE:2
X? 0
Y? 10
EDIT CANCL OK
COORDENATE NODE:3
X? 10
Y? 10
EDIT CANCL OK
COORDENATE NODE:4
X? 10
Y? 0
EDIT CANCL OK
COORDENATE NODE:5
X? 20
Y? 10
EDIT CANCL OK
COORDENATE NODE:6
X? 23.2
Y? 0
EDIT CANCL OK
ELEMENT:1
FROM NODE 1 TO NODE 2
INERTIA 1 AREA 1
ELASTICITY 1
EDIT CANCL OK
ELEMENT:2
FROM NODE 2 TO NODE 3
INERTIA 1 AREA 1
ELASTICITY 1
EDIT CANCL OK
ELEMENT:3
FROM NODE 3 TO NODE 4
INERTIA 1 AREA 1
ELASTICITY 1
EDIT CANCL OK
ELEMENT:4
FROM NODE 3 TO NODE 5
INERTIA 1 AREA 1
ELASTICITY 1
EDIT CANCL OK
ELEMENT:5
FROM NODE 5 TO NODE 6
INERTIA 1 AREA 1
ELASTICITY 1
EDIT CANCL OK

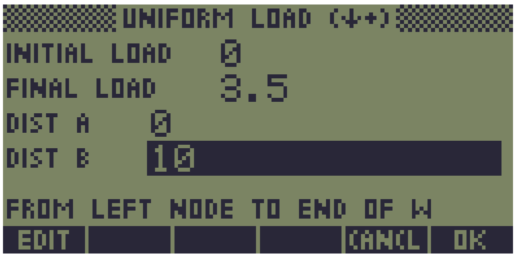


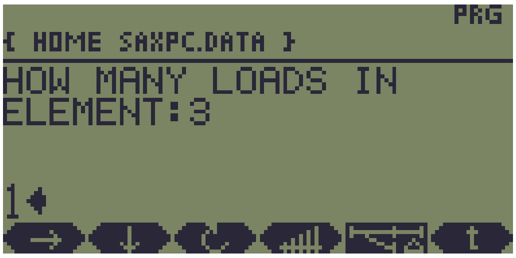


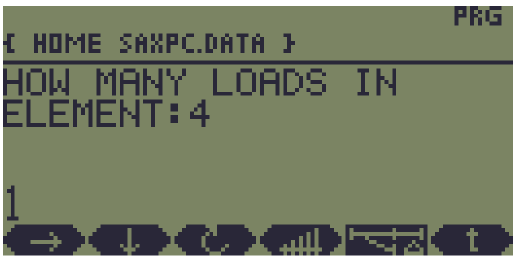
NOTICE THE POINT LOAD IN ELEMENT 1 IS VERTICAL AS I EXPLAINED THIS TO YOU, YOU MUST SEE ELEMENTS **ALLWAYS** LIKE THIS:

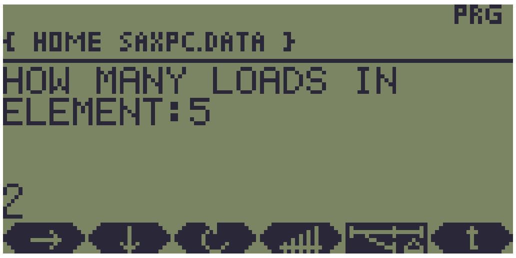


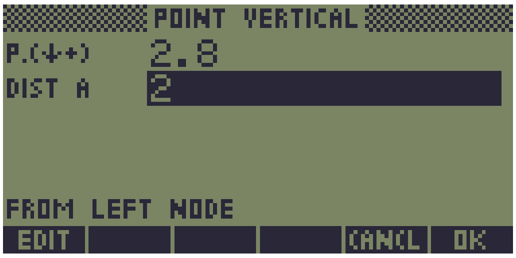




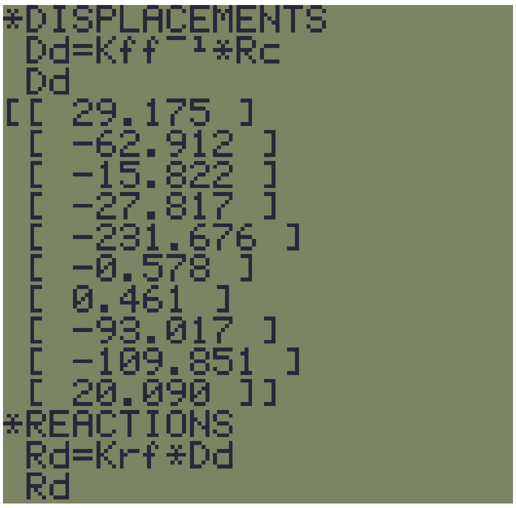








JUST LIKE IN THE PICTURE RIGHT.
WELL LET'S SEE THE ANSWERS AND I GUESS IT WILL BE ALL.



```
[[ -4.501 ]
 [ 6.291 ]
 [ 9.356 ]
 [ 0.821 ]
 [ 23.168 ]
 [ 8.052 ]
 [ 10.204 ]
 [ -18.630 ]]
```

YOU MUST HAVE THE MVIEW LIBRARY (INCLUDED WITHIN THESE FILES.)