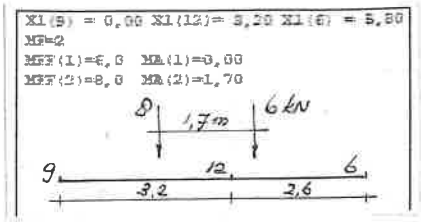
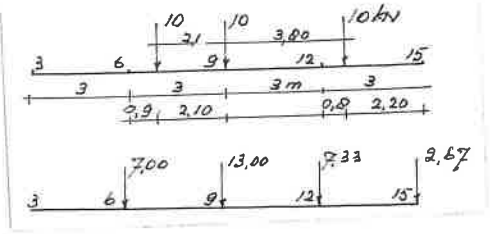
Part 9

Mobile force systems and horizontal beams,

determining the forces on the joints/supports.





FORCEDIVISION1111

```
I4=1   I5=7   V=3   D1=3   I3=7
MF=3
MFF(1)=12,0   MA(1)=0,00
MFF(2)=10,0   MA(2)=2,10
MFF(3)=8,0    MA(3)=2,50
Joint      1        4        7
K1=1    4,27    10,73    15,00
K1=2    0,00     6,67    11,33
K1=3    0,00     0,00     8,00

I4=[1]  I5=[7]  V=[3]  [          ]  OK
D1=[3]  MF=[3]  I3=[7]  Show  Calculate  Cls
        IRO  STORE  NR=?  GET  Again
PrF     EX1  EX2  EX3  EX4  EX5  End
```

FORCEDIVISION2222

```
X1(6) = 0,00 X1(8) = 2,50 X1(5) = 6,00
MF=3
MFF(1)=11,0   MA(1)=0,00
MFF(2)=13,0   MA(2)=1,60
MFF(3)=9,0    MA(3)=2,80
I3=8
Joint      6        8        5
K1=1    8,32    15,68     0,00
K1=2    0,00    18,97     5,03
K1=3    0,00    11,60    10,40

MF=[ ]  I3=[ ]  [          ]  OK  Again
     EX1  EX2  EX3  EX4   Show  Calculate
PrF     IRO  STORE  NR=?  GET  End  Cls
```

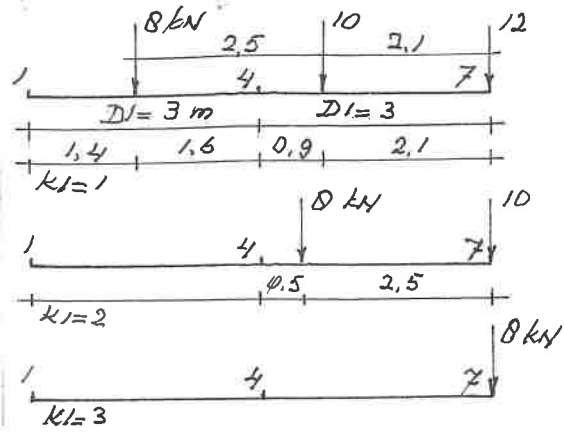
FORCEDIVISION3333

```
X1(6) = 0,00 X1(8) = 2,50 X1(5) = 6,00
MF=3
MFF(1)=11,0   MA(1)=0,00
MFF(2)=13,0   MA(2)=1,60
MFF(3)=9,0    MA(3)=2,80
Joint      6        8        5
I3=6
K1=1  11,00     0,00     0,00
K1=2  16,96     7,04     0,00
K1=3   9,00    16,91     7,09
I3=8
K1=1   8,32    15,68     0,00
K1=2   0,00    18,97     5,03
K1=3   0,00    11,60    10,40
I3=5
K1=1   3,24    11,70    18,06
K1=2   0,00     7,20    14,80
K1=3   0,00     0,00     9,00
```

Mobile force systems moving over supports/ joints. The forces on each support is calculated for each position of the forces.

Application with three programs. Explanetion of input of data on the following pages.

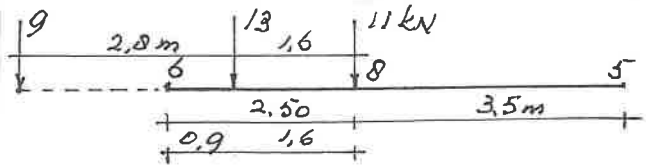
FORCEDIVISION1111 page 2 to 3



Regurly joint numbering from left to right.
I4=1 I5=7 V=3 D1=3 MF=3
Suppose I3=7 then 3 calculations are carried out for support/joint 7.
K1=1 force 12 kN on joint 7
K1=2 force 10 kN on joint 7
K1=3 force 8 kN on joint 7

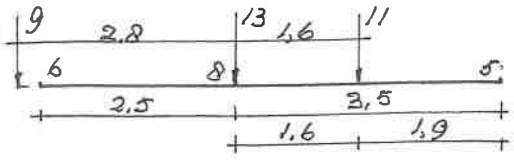
FORCEDIVISION2222 page 4 to 6

Irragular support numbering, distances between the support are different.



Suppose I3=8.
K1=1 11 kN on support 8
(1.6/2.5)*13= 8.32 kN on support 6
(0.9/2.5)*13= 4.68 kN + 11.00 is 15.68 kN on 8
9 kN outside the supports

K1=2 13 kN on support 8



K1=2 13 kN on support 8
(1.9/3.5)*13= 5.97 kN +13.00 kN is 18.97 on 8
(1.6/3.5)*13= 5.03 kN on support 5

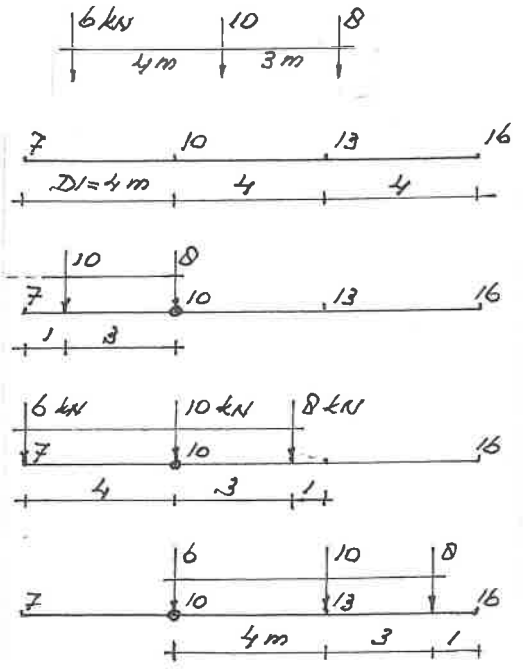
FORCEDIVISION3333 page 7 to 9

Like the example just shown, 3 supports and 3 forces, 3*3=9 calculations are carried out.

/

```
I4=7   I5=16   V=3   D1=4   I3=10
MF=3
MFF(1)=8,0   MA(1)=0,00
MFF(2)=10,0   MA(2)=3,00
MFF(3)=6,0   MA(3)=4,00
Joint      7       10       13       16
K1=1    7,50    10,50     0,00     0,00
K1=2    6,00    12,00     6,00     0,00
K1=3    0,00     6,00    12,00     6,00

I4=[7]  I5=[16]  V=[3]                    OK
D1=[4]  MF=[3]  I3=[10]  Show  Calculate  Cls
        IRO  STORE  NR=?  GET              Again
PrF     EX1  EX2  EX3  EX4  EX5            End
```




```
I4=7   I5=16   V=3   D1=4   I3=10
MF=3
MFF(1)=6,0   MA(1)=0,00
MFF(2)=10,0   MA(2)=4,00
MFF(3)=8,0   MA(3)=8,00
Joint      7       10       13       16
K1=1   10,00     6,00     0,00     0,00
K1=2    6,00    12,00     6,00     0,00
K1=3    0,00    10,50     9,00     4,50

I4=[7]  I5=[16]  V=[3]                    OK
D1=[4]  MF=[3]  I3=[10]  Show  Calculate  Cls
        IRO  STORE  NR=?  GET              Again
PrF     EX1  EX2  EX3  EX4  EX5            End
```

Program **FORCEDIVISION1111**

Fig.1.

Support/joint numbering from left to right with interval V=3, 7 to 16 step 3.

First number I4=7, last number I5=16,
D1=4 m distance between supports/joints.

MF=3 number of forces of the mobile force system numbering from right to left.

I=1 MFF(1)= 8 kN with distance MA(1)= 0 m
I=2 MFF(2)=10 kN with MA(2)= 3 m
I=2 MFF(3)= 6 kN with MA(3)= 4 m

I3 is the arbitrarily chosen support, each of the three forces will be placed on that support and the division of the forces over the supports calculated.

Data to put in,
I4=7 I5=16 V=3 D1=4 MF=3 I3=10

Cursor in text box T14, type 7 and Tab,
cursor in text box T15, type 16 and Tab,
cursor in text box TV, type 3 and Tab,
cursor in text box TD1, type 4 and Tab,

cursor in textbox TMF, type 3 and cursor at same time in the large text box TSTRING in which to type I,MFF(I),MA(I) Enter,

1,8,0, Enter, 2,10,3 Enter, 3,6,4 Enter,

and cursor appears in TI3, type 10.
Click Show to print the data put in on the screen followed by clicking Calculate for the results of the calculation to appear.
See the results on the left.

K1=1 8 kN on support I3=10

(3/4)*10= 7,50 on support 7
(1/4)*10= 2,50 + 8 is 10,50 on support 10

K1=2 10 kN on support I3=10

6,00 kN on support 7
(1/4)*8= 2,00 + 10 is 12,00 on support 10
(3/4)*8= 6,00 on support 13

K1=3 6 kN on support I3=10

6,00 kN on support 10
(1/4)*8= 2,00 + 10 is 12,00 on support 13
(3/4)*8= 6,00 on support16

The second case, forces in reverse order.

Click IRO, then Cls, Show and Calculate to get the second results shown on the left.

That was from 'left to right'. With reversed joint numbering two cases from left to right' with V=-3 same results because same distances D1=4 m. See cases other program page 7A.

```
I4=1  I5=9  V=2  D1=2,5  I3=5
MF=2
MFF(1)=8,0  MA(1)=0,00
MFF(2)=€,0  MA(2)=4,00
Joint     1       3       5       7       9
K1=1  3,€0    2,40    8,00    0,00    0,00
K1=2  0,00    0,00    €,00    3,20    4,80
```

I4=[1] I5=[9] V=[2] [OK]

D1=[2.5] MF=[2] I3=[5] Show Calculate Cls

IRO STORE NR=? GET [Again]

PrF EX1 EX2 EX3 EX4 EX5 [End]

```
I4=3  I5=15  V=3  D1=3  I3=€                    EX2
MF=3
MFF(1)=10,0  MA(1)=0,00
MFF(2)=10,0  MA(2)=3,50
MFF(3)=10,0  MA(3)=2,50
Joint     3       €       9      12      15
K1=1  0,00   10,00    0,00   0,00    0,00
K1=2  8,33   11,€7    8,33   1,€7    0,00
K1=3  0,00   11,€7    8,33  10,00    0,00
```

```
I4=5  I5=9  V=1  D1=3  I3=9                     EX4
MF=3
MFF(1)=€,0  MA(1)=0,00
MFF(2)=7,0  MA(2)=3,00
MFF(3)=3,0  MA(3)=3,00
Joint     5       €       7       8       9
K1=1  0,00    0,00    3,00    7,00    €,00
K1=2  0,00    0,00    0,00    3,00    7,00
K1=3  0,00    0,00    0,00    0,00    3,00
```

```
I4=1  I5=5  V=1  D1=2  I3=4                     EX5
MF=4
MFF(1)=8,0  MA(1)=0,00
MFF(2)=5,0  MA(2)=1,50
MFF(3)=9,0  MA(3)=1,50
MFF(4)=11,0  MA(4)=1,50
Joint     1       2       3       4       5
K1=1  2,75   12,75    8,25    9,25    0,00
K1=2  0,00    5,50   12,25    9,25    €,00
K1=3  0,00    0,00    8,25   13,00    3,75
K1=4  0,00    0,00    0,00   13,25    €,75
```

```
I4=1  I5=5  V=1  D1=2  I3=4                     EX5
MF=4                                            IRO
MFF(1)=11,0  MA(1)=0,00
MFF(2)=9,0  MA(2)=1,50
MFF(3)=5,0  MA(3)=1,50
MFF(4)=8,0  MA(4)=1,50
Joint     1       2       3       4       5
K1=1  2,00    8,50    9,25   13,25    0,00
K1=2  0,00    4,00    7,75   13,00    8,25
K1=3  0,00    0,00    €,00    9,25    €,75
K1=4  0,00    0,00    0,00    9,25    3,75
```

Fig.2. Click EX1 Show and Calculate.

I4=1 I5=9 V=2 D1=2.5 MF=2 I3=5

Cursor in T14, type 1, Tab, type 9 in T15, Tab, type 2 in TV cursor in TD1, type 2.5, Tab, cursor in TMF, type 2 cursor in TSTRING, type

1,8,0 Enter and 2,6,4 Enter,
cursor in T13 and type 5.
Click Show and Calculate for the results.

K=1 8 kN on support I3=5
(1.5/2.5)*6= 3.60 kN on support 1
(1.0/2.5)*8= 2.40 kN on support 3

K=2 6 kN on support I3=5
(1.0/2.5)*8= 3.20 kN on support 7
(1.5/2.5)*8= 4.80 kN on support 9

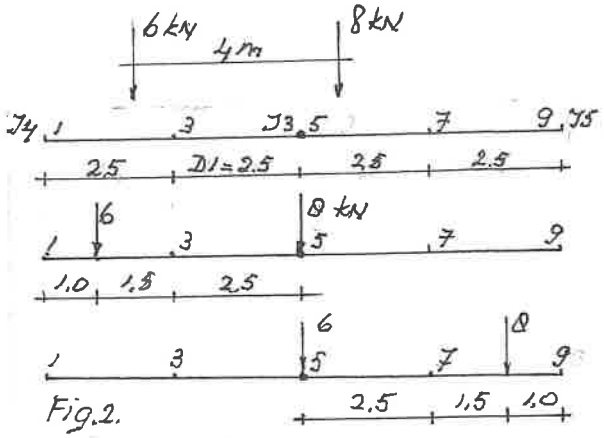


Fig.3. Click EX2 Show and Calculate.

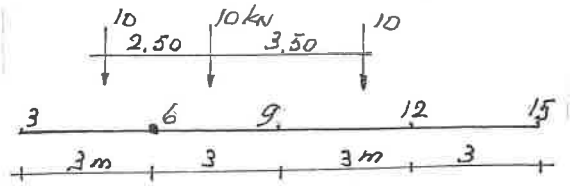


Fig.4. Click EX4 Shoe and Calculate.

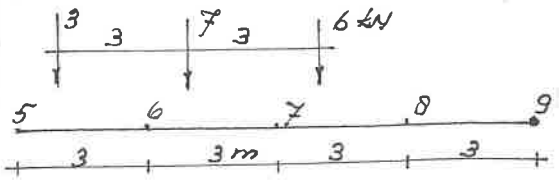
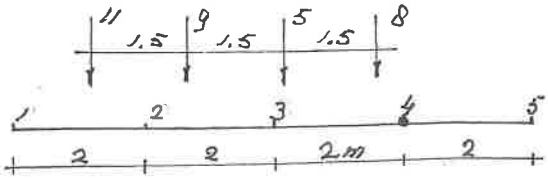


Fig.5 Click EX5 Show and Calculate.



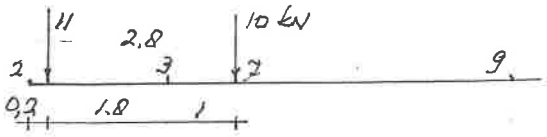
Click IRO to change the order of load forces (not drawn here) of EX5, next Show and Calculate to get the results shown on the left.

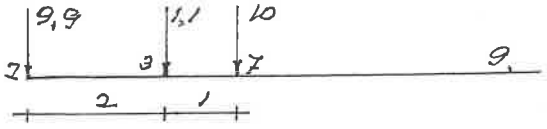
```
X1(2) = 0,00 X1(3) = 2,00 X1(7) = 3,00
X1(5) = 7,00 X1(14)= 5,00
MF=2
MFF(1)=10,0  MA(1)=0,00
MFF(2)=11,0  MA(2)=2,80
Joint:    2       3       7       5       14
I3=7
K1=1   5,50    1,10   10,00    0,00    0,00
K1=2   0,00    0,00   14,00    7,00    0,00
```

MF= 2 I3= 7 OK Again

EX1 EX2 EX3 EX4 Show Calculate

PrF IRO STORE NR= ? GET End Cls





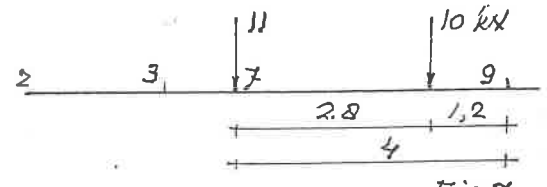


Fig.7

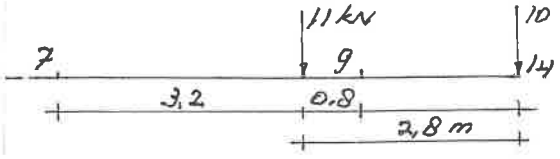


Fig.8

```
X1(2) = 0,00 X1(3) = 2,00 X1(7) = 3,00
X1(5) = 7,00 X1(14)= 5,00
MF=2
MFF(1)=10,0  MA(1)=0,00
MFF(2)=11,0  MA(2)=2,80
Joint:    2       3       7       5       14
I3=14
K1=1   0,00    0,00    2,20    8,80   10,00
K1=2   0,00    0,00    0,00    0,00   11,00
```

MF= 2 I3= 14 v OK Again

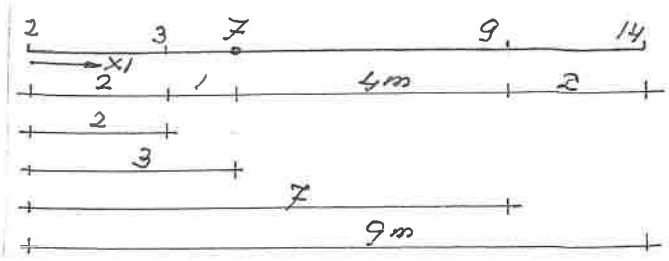
EX1 EX2 EX3 EX4 Show Calculate

PrF IRO STORE NR= ? GET End Cls

Program **FORCEDIVISION2222**

Support/joint numbers can be arbitrarily numbered and distances between the supports can be given arbitrary values.
Number of supports can be NJ=5 or less.

Fig.6.



At the start, or after clicking Again appears the cursor in TSTRING for input of support data with I as counter, JR(I) as support/joint number and support distannces X1(I) measured from the left.

I, JR(I), X1(I).
1,2,0 Enter, 2,3,2 Enter, 3,7,3 Enter,
4,9,7 Enter, 5,14,9 Enter,

after Entér cursor appears in TMF if I is NJ=5. Wanting e.g. I is NJ=3 then Tab to go to TMF.

Type 2 for the number MF of mobile forces, cursor appears in TSTRING and type

I, MFF(I), MA(I) as afollows
1,10,0 Enter and 2,11,2.8 Enter.

Cursor in TI3, suppose I3=7, type 7 (Enter).

Click Show and Calculate to get the first results on the screen print for I3=7.
Click PrF to the printer print on the left.

Fig.7.

K1=1 10 kN on support 7.
(0.2/2)*11= 1.1 kN on support 3
(1.8/2)*11= 9.9 kN on support 2

K=2 11 kN on support 7.
(1.2/4)*10= 3 + 11 is 14 kN on support 7.
(2.8/4)*10= 7 kN on support 9.

Going on with the given results. Suppose I3=14.
Click in TI3 to remove 7 and type 14 (Enter).

Click Cls, Show and Calculate for the second results on the screen.

Fig.8.

K=1 10 kN on support 14.
(o.8/4)*11= 2.2 kN op support7
(3.2/4)*11= 8.8 kN op support 9

K=2 11 kN on support 14.

```
X1(3) = 0,00 X1(4) = 2,00 X1(€) = €,00
X1(2) = 9,00 X1(7) =12,00
MF=2
MFF(1)=9,0  MA(1)=0,00
MFF(2)=5,0  MA(2)=3,00
Joint     3       4       €       2       7
I3=2
K1=1  0,00    0,00    5,00    9,00    0,00
K1=2  0,00    0,00    0,00    5,00    9,00
```

MF= 2 I3= 2 OK Again

EX1 EX2 EX3 EX4 Show Calculate

PrF IRO STORE NR= ? GET End Cls

```
X1(3) = 0,00 X1(4) = 2,00 X1(€) = €,00
X1(2) = 9,00 X1(7) =12,00
MF=2
MFF(1)=5,0  MA(1)=0,00
MFF(2)=9,0  MA(2)=3,00
Joint     3       4       €       2       7
I3=2
K1=1  0,00    0,00    9,00    5,00    0,00
K1=2  0,00    0,00    0,00    9,00    5,00
```

```
X1(3) = 0,00 X1(4) = 2,00 X1(€) = €,00
X1(2) = 9,00 X1(7) =12,00
MF=2
MFF(1)=5,0  MA(1)=0,00
MFF(2)=9,0  MA(2)=3,00
Joint     3       4       €       2       7
I3=€
K1=1  0,00    €,75    7,25    0,00    0,00
K1=2  0,00    0,00    9,00    5,00    0,00
```

```
X1(4) = 0,00 X1(3) = 5,00 X1(2) =10,00
X1(1) =15,00
MF=3
MFF(1)=€,0  MA(1)=0,00
MFF(2)=7,0  MA(2)=3,00
MFF(3)=8,0  MA(3)=3,00
Joint     4       3       2       1
I3=2
K1=1  1,€0   10,€0    8,80    0,00
K1=2  0,00    4,80   12,€0    3,€0
K1=3  0,00    0,00   10,80    4,20
```

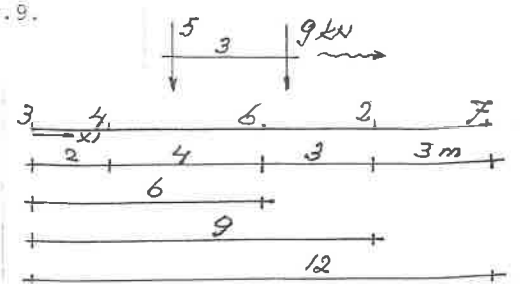
MF= 2 I3= 14 OK Again

EX1 EX2 EX3 EX4 Show Calculate

PrF IRO STORE NR= ? GET End Cls

Example.

Fig.9.



1,3,0 Enter, 2,4,2 Enter, 3,6,6 Enter, 4,2,9 Enter, 5,7,12 Enter.

MF=2 1,9,0 Enter and 2,5,3 Enter.

I3=2 Cls if necessary, Show and Calculate.

Forces in reversed order.

Click IRO, Cls Show, click TI3 gets empty and type again 2, next Calculate for the second results shown on the left.
Because of the distance of 3 m between the two forces and the assumed support I3=2 no division of forces.

Going on with the latest results. Assume I3=6 then click in T3 to remove 2 and type 6, next Cls Show and Calculate for the third results to appear.

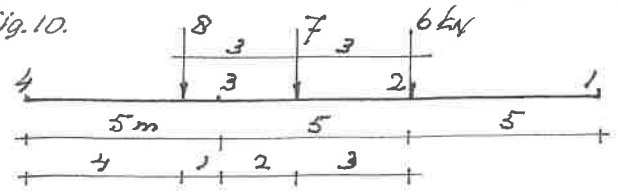
And going on. Click IRO, click TI3 and type 6 again, Show and Calculate for the results shown here below.

```
X1(3) = 0,00 X1(4) = 2,00 X1(€) = €,00
X1(2) = 9,00 X1(7) =12,00
MF=2
MFF(1)=9,0  MA(1)=0,00
MFF(2)=5,0  MA(2)=3,00
Joint     3       4       €       2       7
I3=€
K1=1  0,00    3,75   10,25    0,00    0,00
K1=2  0,00    0,00    5,00    9,00    0,00
```

Example. Click Again.

1,4,0 Enter, 2,3,5 Enter, 3,2,10 Enter and 4,1,15 Enter. After that Tab because NJ<5, cursor in TMF, type 3 for three forces, cursor in TSTRING, type
1,6,0 Enter, 2,7,3 Enter, 3,8,3 Enter, cursor in TI3, type 2 for support/joint 2, next Cls, Show and Calculate, results on the left.

Fig.10.



K1=1 6 kN on support 2.
(2/5)*7= 2.8 + 6 is 8.8 kN on support 2.
(3/5)*7= 4.2 + (4/5)*8= 6.4 is 10.6 kN on 3.
(1/5)*8= 1.6 kN on support 4. Etc.

```
X1(€) = 0,00 X1(12)= 2,€0 X1(9) = 5,80
MF=2                                    EX1
MFF(1)=€,0   MA(1)=0,00
MFF(2)=8,0   MA(2)=1,70
Joint     €       12        9
I3=€
K1=1   €,00     0,00     0,00
K1=2  10,08     3,92     0,00
```

MF= I3= OK Again

EX1 EX2 EX3 EX4 Show Calculate

PrF IRO STORE NR=? GET End Cls

Example EX1

Click EX1, event. Cls, Show and Calculate, see the results on the left. That's for I3=6.

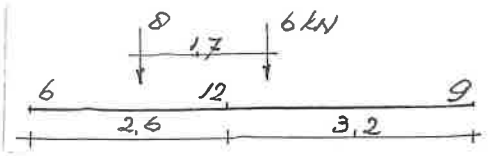


Fig.11.

Type 12 in TI3, not followed by Enter!!, for the second support/joint. Click Cls, Show and Calculate for the second results.
For the third support click in TI3 and type 9, Cls, Show and Calculate, results here below.

```
X1(€) = 0,00 X1(12)= 2,€0 X1(9) = 5,80
MF=2
MFF(1)=€,0   MA(1)=0,00
MFF(2)=8,0   MA(2)=1,70
Joint     €       12        9
I3=12
K1=1   5,23     8,77     0,00
K1=2   0,00    10,81     3,15
```

```
X1(€) = 0,00 X1(12)= 2,€0 X1(9) = 5,80
MF=2
MFF(1)=€,0   MA(1)=0,00
MFF(2)=8,0   MA(2)=1,70
Joint     €       12        9
I3=9
K1=1   0,00     4,25     9,75
K1=2   0,00     0,00     8,00
```

Example EX2 here below.

```
X1(3) = 0,00 X1(€) = 3,00 X1(9) = €,00
X1(12)= 9,00 X1(15)=12,00              EX2
MF=3
MFF(1)=10,0   MA(1)=0,00
MFF(2)=10,0   MA(2)=3,50
MFF(3)=10,0   MA(3)=2,50
Joint     3       €       9      12      15
I3=9
K1=1  11,€7    8,33   10,00    0,00    0,00
K1=2   0,00    8,33   11,€7    8,33    1,€7
K1=3   0,00    0,00   11,€7    8,33   10,00
```

1,3,0 Enter, 2,6,3 Enter, 3,9,6 Enter, 4,12,9 Enter, 5,15,12 Enter.

In TMF type 3, next
1,10,0 Enter, 1,10,3.5 Enter, 3,10,2.5 Enter.

In TI3 type 9, next Cls, Show and Calculate.

```
X1(3) = 0,00 X1(4) = 2,70 X1(7) = 5,40
X1(8) = 8,10 X1(1) =10,80              EX3
MF=3
MFF(1)=12,0   MA(1)=0,00
MFF(2)=8,0   MA(2)=2,90
MFF(3)=8,0   MA(3)=1,50
Joint     3       4       7       8       1
I3=1
K1=1   0,00    0,00    5,€3   10,37   12,00
K1=2   0,00    0,00    0,00    4,44   11,5€
K1=3   0,00    0,00    0,00    0,00    8,00
```

MF= I3= OK Again

EX1 EX2 EX3 EX4 Show Calculate

PrF IRO STORE NR=? GET End Cls

Example EX4 with two supports and three forces.

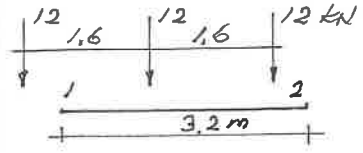


Fig.12.

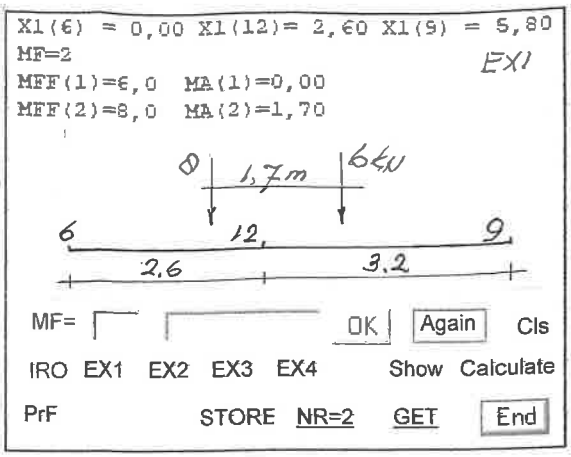
1,1,0 Enter and 2,2,3.2 Enter. Tab, in TMF type 3 for the mobile forces,
1,12,0 Enter, 2,12,1.6 Enter, 3,12,1.6 Enter.

In TI3 type 1, next Cls, Show and Calculate.

```
X1(1) = 0,00 X1(2) = 3,20              EX4
MF=3
MFF(1)=12,0   MA(1)=0,00
MFF(2)=12,0   MA(2)=1,€0
MFF(3)=12,0   MA(3)=1,€0
Joint     1       2
I3=1
K1=1  12,00    0,00
K1=2  18,00    €,00
K1=3  18,00   18,00
```

MF= I3= OK Again

EX1 EX2 EX3 EX4 Show Calculate



Form print with PrF, when invisible click the form somewhere with right mouse button.

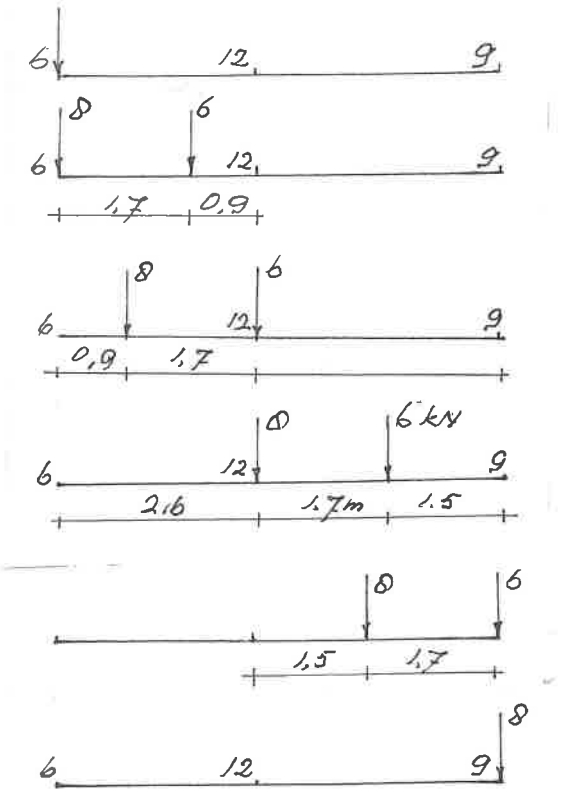


Fig.13.

X1(€) = 0,00 X1(12)= 2,€0 X1(9) = 5,80			
MF=2			
MFF(1)=€,0	MA(1)=0,00		
MFF(2)=8,0	MA(2)=1,70		
Joint	€	12	9
I3=€			
K1=1	€,00	0,00	0,00
K1=2	10,08	3,92	0,00
I3=12			
K1=1	5,23	8,77	0,00
K1=2	0,00	10,81	3,19
I3=9			
K1=1	0,00	4,25	9,75
K1=2	0,00	0,00	8,00

A1

Program **FORCEDIVISION3333**

Support/joint numbers can be arbitrarily numbered, with different distances between the supports/joints.
All NJ supports/joints will be loaded with all MF mobile forces,
calcualations are carried out for all possible positions of the force system.

Example, figure on the print on the left.

1,6,0 Enter, 2,12,2.6 Enter, 3,9,5.8 Enter.
The cursor does not jump to TMF, that happens only if NJ=5, the largest value assumed.

Click Tab, cursor in TMF, type 2, cursor in TSTRING, type for I, MFF(I), MA(I)
1,6,0 Enter and 2,8,1.7 Enter.

Click Show to get the first print. Whole start picture with controls still visible.
Click Calculate for the second print, controls disappear, see the print bottom left.

Fig.13.

K=1 6 kN on support 6

K=2 8 kN on support 6
(0.9/2.6)*6= 2.08 + 8 is 10.08 kN on support 6
(1.7/2.6)*6= 3.92 kN on support 12

K=1 6 kN on support 12
(0.9/2.6)*8= 2.77 + 6 is 8.77 kN on support 12
(1.7/2.6)*8= 5.23 kN on support 6

K=2 8 kN on support 12
(1.5/3.2)*6= 2.81 + 6 is 10.81 kN on support 12
(1.7/3.2)*6= 3.19 kN on joint 9

K=1 6 kN op support 9
(1.5/3.2)*8= 3.75 + 6 is 9.75 kN op support 9
(1.7/3.2)*8= 4.25 kN on support 12

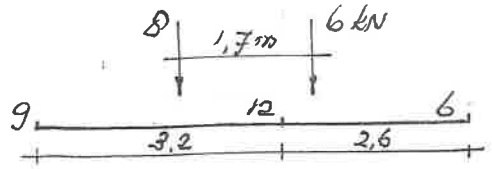
K=2 8 kN op support 9

Click somewhere on the form, results disappear and controls appear again.
Click IRO for the forces in reversed order, 8-6 i.s.o. 6-8. Click Show, and Calculate to get the print here below with new results.

X1(€) = 0,00 X1(12)= 2,€0 X1(9) = 5,80			
MF=2			
MFF(1)=8,0	MA(1)=0,00		
MFF(2)=€,0	MA(2)=1,70		
Joint	€	12	9
I3=€			
K1=1	8,00	0,00	0,00
K1=2	8,77	5,23	0,00
I3=12			
K1=1	3,92	10,08	0,00
K1=2	0,00	9,75	4,25
I3=9			
K1=1	0,00	3,19	10,81
K1=2	0,00	0,00	€,00

B1

```
X1(9) = 0,00 X1(12)= 3,20 X1(6) = 5,80
MF=2
MFF(1)=6,0  MA(1)=0,00
MFF(2)=8,0  MA(2)=1,70
```



MF= 2 OK Again Cls

IRO EX1 EX2 EX3 EX4 Show Calculate

PrF STORE NR= ? GET End

```
X1(9) = 0,00 X1(12)= 3,20 X1(6) = 5,80
MF=2
MFF(1)=6,0  MA(1)=0,00
MFF(2)=8,0  MA(2)=1,70
Joint:     9       12        6
I3=5
K1=1   6,00    0,00    0,00
K1=2  10,81    3,15    0,00
I3=12
K1=1   4,25    5,75    0,00
K1=2   0,00   10,08    3,52
I3=6
K1=1   0,00    5,23    8,77
K1=2   0,00    0,00    8,00
```

B2

Same example, two more cases.

Joint numbering 9-12-6 instead of 6-12-9.

1,9,0 Enter, 2,12,3.2 Enter, 3,6,5.8 Enter.

Tab, type 2 in TMF and in TSTRING
1,6,0 Enter and 2,8,1.7 Enter.

Click Show for the first print on the left, and Calculate for the second print.

Second case with forces in reversed order.
1,8,0 Enter and 2,6,1.7 Enter.

Click the form, next IRO, Show and Calculate to get the results here below.

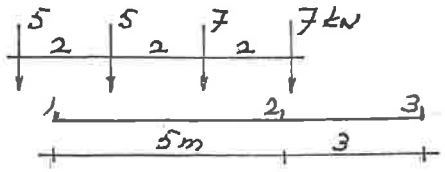
```
X1(9) = 0,00 X1(12)= 3,20 X1(6) = 5,80
MF=2
MFF(1)=8,0  MA(1)=0,00
MFF(2)=6,0  MA(2)=1,70
Joint:     9       12        6
I3=5
K1=1   8,00    0,00    0,00
K1=2   5,75    4,25    0,00
I3=12
K1=1   3,15   10,81    0,00
K1=2   0,00    8,77    5,23
I3=6
K1=1   0,00    3,52   10,08
K1=2   0,00    0,00    6,00
```

A2

Comparing with preceding page, same results, see I3=9, A1 and A2, B1 and B2.

Example.

After input of data, click Show and Calculate for first results, click form, IRO for forces in reversed order, again Show and Calculate. Next case, joint numbering 3-2-1 instead of 1-2-3, 1,3,0 Enter, 2,2,5 Enter, 3,1,8 Enter. Etc. And compare the results.




```
X1(1) = 0,00 X1(2) = 5,00 X1(3) = 8,00
MF=4
MFF(1)=7,0  MA(1)=0,00
MFF(2)=7,0  MA(2)=2,00
MFF(3)=5,0  MA(3)=4,00
MFF(4)=5,0  MA(4)=6,00
Joint:     1       2       3
I3=1
K1=1   7,00    0,00    0,00
K1=2  11,20    2,80    0,00
K1=3   6,40   10,27    2,33
K1=4   5,00    3,33    1,67
I3=2
K1=1   2,80   11,20    0,00
K1=2   4,00   10,33    4,67
K1=3   0,00    5,00    0,00
K1=4   0,00    5,00    0,00
I3=3
K1=1   3,00    6,67    5,33
K1=2   1,00    4,00    7,00
K1=3   3,00    3,00    5,00
K1=4   0,00    0,00    5,00
```

```
X1(1) = 0,00 X1(2) = 5,00 X1(3) = 8,00
MF=4
MFF(1)=5,0  MA(1)=0,00
MFF(2)=5,0  MA(2)=6,00
MFF(3)=7,0  MA(3)=4,00
MFF(4)=7,0  MA(4)=2,00
Joint:     1       2       3
I3=1
K1=1   5,00    0,00    0,00
K1=2   5,00    3,33    1,67
K1=3   8,00    4,00    0,00
K1=4  11,20    6,13    1,67
I3=2
K1=1   0,00    5,00    0,00
K1=2   5,60    6,40    0,00
K1=3   2,80   11,20    0,00
K1=4   0,00    5,33    4,67
I3=3
K1=1   3,00    2,00    5,00
K1=2   5,60    8,40    5,00
K1=3   0,00    4,67    9,33
K1=4   0,00    0,00    7,00
```

```
X1(2) = 0,00 X1(4) = 3,00 X1(€) = €,00
X1(8) = 9,00
MF=3
MFF(1)=12,0  MA(1)=0,00
MFF(2)=10,0  MA(2)=1,00
MFF(3)=8,0   MA(3)=1,00
```

MF= 3 | OK | Again | Cls

IRO EX1 EX2 EX3 EX4 Show Calculate

PrF STORE NR=? GET End

```
X1(2) = 0,00 X1(4) = 3,00 X1(€) = €,00
X1(8) = 9,00
MF=3
MFF(1)=12,0  MA(1)=0,00
MFF(2)=10,0  MA(2)=2,00
MFF(3)=8,0   MA(3)=2,00
Joint     2       4       €       8
I3=2
K1=1 12,00    0,00    0,00    0,00
K1=2 14,00    8,00    0,00    0,00
K1=3 11,33   14,€7    4,00    0,00
I3=4
K1=1  €,€7   15,33    0,00    0,00
K1=2  5,33   1€,€7    8,00    0,00
K1=3  0,00   11,33   14,€7    4,00
I3=€
K1=1  2,€7   12,00   15,33    0,00
K1=2  0,00    5,33   1€,€7    8,00
K1=3  0,00    0,00   11,33    €,€7
I3=8
K1=1  0,00    2,€7   12,00   15,33
K1=2  0,00    0,00    5,33   12,€7
K1=3  0,00    0,00    0,00    8,00
```

```
X1(2) = 0,00 X1(4) = 3,00 X1(€) = €,00
X1(8) = 9,00
MF=3
MFF(1)=8,0   MA(1)=0,00
MFF(2)=10,0  MA(2)=2,00
MFF(3)=12,0  MA(3)=2,00
Joint     2       4       €       8
I3=2
K1=1  8,00    0,00    0,00    0,00
K1=2 12,€7    5,33    0,00    0,00
K1=3 15,33   12,00    2,€7    0,00
I3=4
K1=1  €,€7   11,33    0,00    0,00
K1=2  8,00   1€,€7    5,33    0,00
K1=3  0,00   15,33   12,00    2,€7
I3=€
K1=1  4,00   14,€7   11,33    0,00
K1=2  0,00    8,00   1€,€7    5,33
K1=3  0,00    0,00   15,33    €,€7
I3=8
K1=1  0,00    4,00   14,€7   11,33
K1=2  0,00    0,00    8,00   14,00
K1=3  0,00    0,00    0,00   12,00
```

Example.

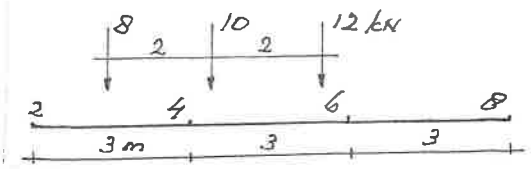


Fig.14.

1,2,0 Enter, 2,4,3 Enter, 3,6,6 Enter and 4,8,9 Enter. Tab to go to TMF, type 3,

1,12,0 Enter, 2,10,2 Enter, 3,8,2 Enter.

Click Show for the print with the data put in, which can be printed by the printer by clicking PrF.
and click Calculate for the total print without the form controls which can be printed by clicking the form at an arbitrary place with the right mouse button.

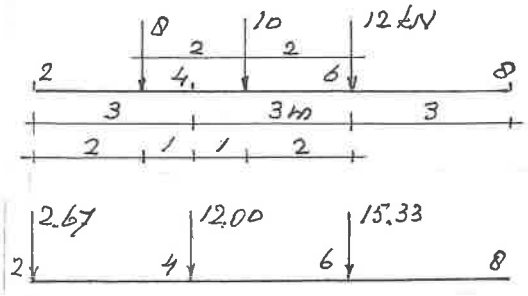


Fig.15.

K=1 I3=6 12 kN on support 6
(1/3)*8= 2.67 kN on support 2
(2/3)*8= 5.33 + (2/3)*10= 5.67 is 12 kN on 4
(1/3)*10= 3.33 + 12 is 15.33 on support 6

Forces in reversed order.

Click on the form, start picture appears, click IRO and Show, see the forces in reversed order and click Calculate to get the second print with again NJ*MF is 4*3=12 load cases.

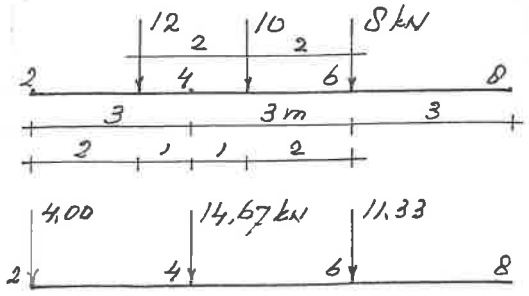


Fig.16.

K=1 I3=6 8 kN on support 6
(1/3)*12= 4.00 kN on support 2
(2/3)*12= 8.00 +(2/3)*10= 6.67 is 14.67 kN on 4
(1/3)*10= 3.33 + 8 is 11.33 on support 6

```
X1(5) = 0,00 X1(11)= 2,60 X1(7) = 5,80
MF=3
MFF(1)=6,0  MA(1)=0,00
MFF(2)=8,0  MA(2)=2,10
MFF(3)=10,0  MA(3)=4,20
```

MF= [ ] [ ] OK Again Cls

IRO EX1 EX2 EX3 EX4 Show Calculate

PrF STORE NR= ? GET End

```
X1(5) = 0,00 X1(11)= 2,60 X1(7) = 5,80
MF=3
MFF(1)=6,0  MA(1)=0,00
MFF(2)=8,0  MA(2)=2,10
MFF(3)=10,0  MA(3)=4,20
Joint     5      11      7
I3=5
K1=1  6,00   0,00   0,00
K1=2  9,15   4,85   0,00
K1=3 10,00   4,00   4,00
I3=11
K1=1  6,46   7,54   0,00
K1=2  0,00  10,06   3,94
K1=3  0,00  10,00   0,00
I3=7
K1=1  0,00   5,25   8,75
K1=2  3,85   6,15   8,00
K1=3  0,00   0,00  10,00
```

```
X1(5) = 0,00 X1(11)= 2,60 X1(7) = 5,80
MF=3
MFF(1)=10,0  MA(1)=0,00
MFF(2)=8,0  MA(2)=4,20
MFF(3)=6,0  MA(3)=2,10
```

MF= [ ] [ ] OK Again Cls

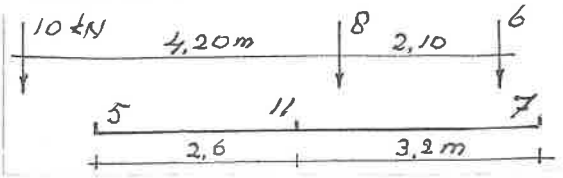
IRO EX1 EX2 EX3 EX4 Show Calculate

PrF STORE NR= ? GET End

```
X1(5) = 0,00 X1(11)= 2,60 X1(7) = 5,80
MF=3
MFF(1)=10,0  MA(1)=0,00
MFF(2)=8,0  MA(2)=4,20
MFF(3)=6,0  MA(3)=2,10
Joint     5      11      7
I3=5
K1=1 10,00   0,00   0,00
K1=2  8,00   5,00   5,00
K1=3  7,54   6,46   0,00
I3=11
K1=1  0,00  10,00   0,00
K1=2  4,85   5,15   0,00
K1=3  0,00   2,75   5,25
I3=7
K1=1  3,00   4,92  10,00
K1=2  0,00   3,94  10,06
K1=3  0,00   0,00   6,00
```

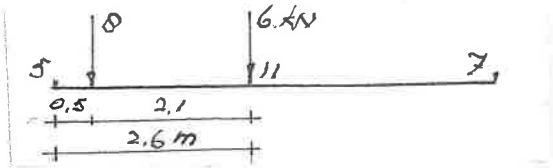
Example EX1.

Click EX1, gets underlined, and Show.
Click PrF to get the print printed by the printer shown on the left with the data of the figure here below.
The forces move from left to right.



Click Calculate for the second print where the controls have disappeared. Click the form somewhere on the form with the right mouse button to get it printed by the printer.

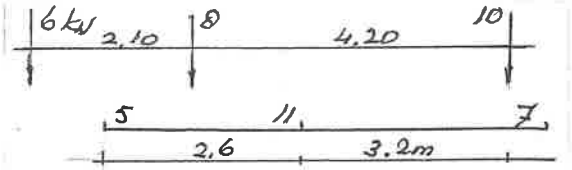
Suppose joint I3=11 with K1=1, first force of 6 kN on joint 11. Division of 8 kN.



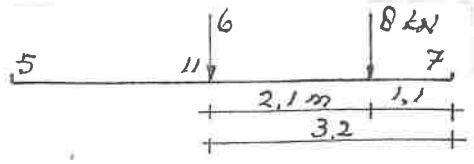
(2,1/2,6)*8= 6,46 kN on joint 5
(0,5/2,6)*8= 1,54 kN on joint 11
So 6,00+1,54= 7,54 kN on joint 11.

Forces in reversed order.

Click IRO and Show, the three forces appear in reversed order.
The forces move from left to right as if the forces with order here above move from right to left.



Click Calculate to get the results.
Suppose joint I3=11 with K1=3, the last force of 6 kN on joint 11.Division of 8 kN on the right of joint 11.



(2,1/3,2)*8= 5,25 kN on joit 7
(1,1/3,2)*8= 2,75 kN on joint 11
So 6,00+2,75= 8,75 kN on joint 11.

Suppose joint 5 and 7 are supports of this beam with length 5,8 m the the largest possible reactions can be found.
On support 5 10 kN,
on support 7 10,06 kN K1=2 8 kN on joint 7 and 6 kN between joint 11 and 7, 8+2,06= 10,06.

```
X1(3) = 0,00 X1(6) = 3,00 X1(9) = 6,00
X1(12)= 9,00 X1(15)=12,00          EX2
MF=3
MFF(1)=10,0  MA(1)=0,00
MFF(2)=10,0  MA(2)=3,80
MFF(3)=10,0  MA(3)=2,10
Joint     3       6       9      12      15
I3=3
K1=1 10,00    0,00    0,00    0,00    0,00
K1=2 10,00    7,33    2,67    0,00    0,00
K1=3 13,00    7,33    9,67    0,00    0,00
I3=6
K1=1  0,00   10,00    0,00    0,00    0,00
K1=2  7,00   13,00    7,33    2,67    0,00
K1=3  0,00   13,00    7,33    9,67    0,00
I3=9
K1=1 12,33    7,67   10,00    0,00    0,00
K1=2  0,00    7,00   13,00    7,33    2,67
K1=3  0,00    0,00   13,00    7,33    9,67
I3=12
K1=1  0,00   12,33    7,67   10,00    0,00
K1=2  0,00    0,00    7,00   13,00    0,00
K1=3  0,00    0,00    0,00   13,00    7,00
I3=15
K1=1  0,00    0,00   12,33    7,67   10,00
K1=2  0,00    0,00    0,00    7,00   13,00
K1=3  0,00    0,00    0,00    0,00   10,00
```

Example EX2.

Click Cls if necessary, EX2, Show, Calculate to get the results shown on the left.
Suppose I3=9, 2nd force of 10 kN on support 9

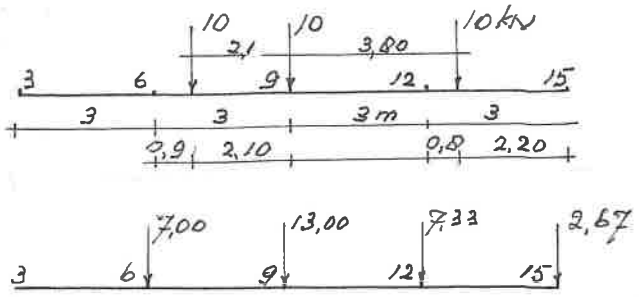


Fig.17.

K1=2 2nd 10 kN on support 9.
(2.1/3)*10= 7.00 kN on support 6
(0.9/3)*10= 3 + 10 is 13.00 kN on support 9
(2.2/3)*10= 7.33 kN on support 12
(0.8/3)*10= 2.67 kN on support 15

Example EX3.

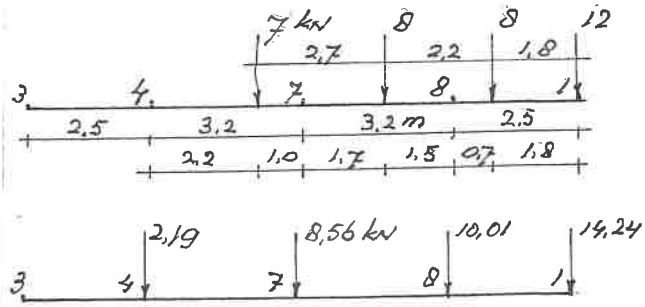


Fig.18.

K1=1 I3=1, 12 kN on support 1.
(1.0/3.2)*7= 2.19 kN on support 4
(2.2/3.2)*7= 4.81 kN + (1.5/3.2)= 5.76 kN is 8.56 kN on support 7
(1.7/3.2)*8= 4.25 kN + (1.8/2.5)= 5.76 kN is 10.01 kN on support 8
(0.7/2.5)*8= 2.24 + 12.00 is 14.24 kN on 1

Going on with the given case.
Click on the form to go to start position and click IRO for the forces in reversed order, Cls and Show. Click Calculate, results appear, shown for last for last support I3=1.

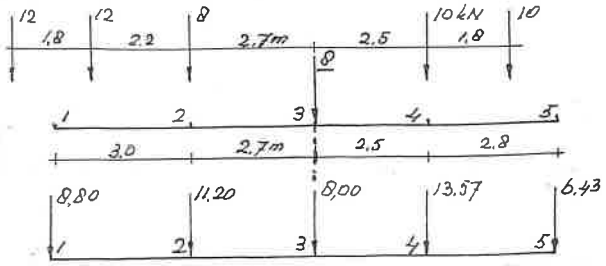
```
X1(3) = 0,00 X1(4) = 2,50 X1(7) = 5,70
X1(8) = 8,90 X1(1) =11,40          EX3
MF=4
MFF(1)=12,0  MA(1)=0,00
MFF(2)=8,0   MA(2)=1,80
MFF(3)=8,0   MA(3)=2,20
MFF(4)=7,0   MA(4)=2,70
Joint     3       4       7       8       1
I3=3
K1=1 12,00    0,00    0,00    0,00    0,00
K1=2 11,36    8,64    0,00    0,00    0,00
K1=3  8,96   13,42    5,63    0,00    0,00
K1=4  7,00    9,50   14,75    3,75    0,00
I3=4
K1=1  5,76   14,24    0,00    0,00    0,00
K1=2  7,04   14,21    6,75    0,00    0,00
K1=3  0,00   10,50   14,50    3,00    0,00
K1=4  0,00    8,25   10,50   14,81    1,44
I3=7
K1=1  2,56    9,94   15,50    0,00    0,00
K1=2  4,76    7,74   15,75    6,75    0,00
K1=3  0,00    5,91   11,59   13,66    3,84
K1=4  0,00    0,00    8,25    9,31    5,44
I3=8
K1=1  0,84    8,16   10,50   15,50    0,00
K1=2  0,00    3,72    8,78   13,86    8,64
K1=3  0,00    0,00    5,91   10,05    7,04
K1=4  0,00    0,00    0,00    7,00    0,00
I3=1
K1=1  0,00    2,19    8,56   10,01   14,24
K1=2  0,00    0,00    5,25    8,79    8,96
K1=3  0,00    0,00    0,44    6,56    8,00
K1=4  0,00    0,00    0,00    0,00    7,00
```

```
X1(3) = 0,00 X1(4) = 2,50 X1(7) = 5,70
X1(8) = 8,90 X1(1) =11,40
MF=4
MFF(1)=7,0   MA(1)=0,00
MFF(2)=8,0   MA(2)=2,70
MFF(3)=8,0   MA(3)=2,20
MFF(4)=12,0  MA(4)=1,80
```

```
I3=1
K1=1  0,00    3,75   14,75    9,50    7,00
K1=2  0,00    0,00    5,63   13,42    8,96
K1=3  0,00    0,00    0,00    8,64   11,36
K1=4  0,00    0,00    0,00    0,00   12,00
```

After case a click IRO to get the forces in reverse order, case b.
Click Cls, Show and Calculate.
Results for support I3=3 and load case K1=3, the third force 8 kN on I3=3.

Support data like case a.
In TMF 6 and in TSTRING
1,10,0 Enter, 2,10,1.8 Enter,
3,8,2.5 Enter, 4,8,2.7 Enter,
5,12,2.2 Enter, 6,12,1.8 Enter.



X1(1) = 0,00 X1(2) = 3,00 X1(3) = 5,70
X1(4) = 8,20 X1(5) =11,00
MF=€
MFF(1)=10,0 MA(1)=0,00
MFF(2)=10,0 MA(2)=1,80
MFF(3)=8,0 MA(3)=2,50
MFF(4)=8,0 MA(4)=2,70
MFF(5)=12,0 MA(5)=2,20
MFF(€)=12,0 MA(€)=1,80

Fig.19.

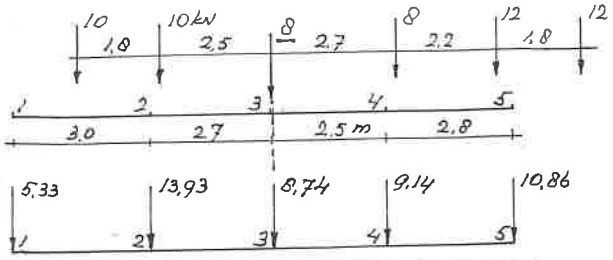
Joint	1	2	3	4	5
I3=1					
K1=1	10,00	0,00	0,00	0,00	0,00
K1=2	14,00	€,00	0,00	0,00	0,00
K1=3	9,€7	13,52	4,81	0,00	0,00
K1=4	8,80	9,05	12,95	5,20	0,00
K1=5	14,13	8,24	8,83	13,23	3,57
K1=€	1€,80	12,24	7,7€	9,€3	13,57
I3=2					
K1=1	€,00	14,00	0,00	0,00	0,00
K1=2	€,€7	14,€7	€,€7	0,00	0,00
K1=3	7,20	9,54	12,8€	€,40	0,00
K1=4	8,80	11,20	8,00	13,57	€,43
K1=5	7,20	18,28	7,48	9,18	7,8€
K1=€	0,00	1€,00	11,84	7,87	4,29
I3=3					
K1=1	4,27	10,40	13,33	0,00	0,00
K1=2	€,€7	8,74	13,39	7,20	0,00
K1=3	8,80	11,20	8,00	13,57	€,43
K1=4	5,20	1€,58	10,22	7,79	10,21
K1=5	0,00	8,00	1€,9€	8,18	€,8€
K1=€	0,00	0,00	15,3€	12,35	4,29
I3=4					
K1=1	4,80	8,53	9,87	12,80	0,00
K1=2	8,80	11,20	8,00	13,57	€,43
K1=3	€,00	17,2€	8,74	9,07	8,93
K1=4	0,00	€,€7	15,89	9,73	7,71
K1=5	0,00	0,00	8,€4	17,07	€,29
K1=€	0,00	0,00	0,00	1€,29	7,71
I3=5					
K1=1	1€,80	12,24	7,7€	9,€3	13,57
K1=2	4,80	1€,53	10,35	7,4€	10,8€
K1=3	0,00	€,22	15,8€	9,€3	8,29
K1=4	0,00	0,00	5,7€	15,€7	10,57
K1=5	0,00	0,00	0,00	7,71	1€,29
K1=€	0,00	0,00	0,00	0,00	12,00

Example EX4 case a here below.

Click EX4, Cls, Show and Calculate.
Results for support I3=3 and load cae K1=4 is the fourth force 8 kN on support 3, underlined.

Or 1,1,0 Enter, 2,2,3 Enter, 3,3,5.7 Enter,
4,4,8.2 Enter, 5,5,11 Enter. For MF=6 forces

1,12,0 Enter, 2,12,1.8 Enter, 3,8,2.2 Enter,
4,8,2.7 Enter, 5,10,2.5 Enter, 6,10,1.8 Enter.



X1(1) = 0,00 X1(2) = 3,00 X1(3) = 5,70
X1(4) = 8,20 X1(5) =11,00
MF=€
MFF(1)=12,0 MA(1)=0,00
MFF(2)=12,0 MA(2)=1,80
MFF(3)=8,0 MA(3)=2,20
MFF(4)=8,0 MA(4)=2,70
MFF(5)=10,0 MA(5)=2,50
MFF(€)=10,0 MA(€)=1,80

Fig.20.

Joint	1	2	3	4	5
I3=1					
K1=1	12,00	0,00	0,00	0,00	0,00
K1=2	1€,80	7,20	0,00	0,00	0,00
K1=3	11,20	1€,3€	4,44	0,00	0,00
K1=4	8,80	10,7€	15,€4	4,80	0,00
K1=5	11,33	8,15	10,3€	15,87	4,29
K1=€	14,00	10,15	7,€9	11,87	1€,29
I3=2					
K1=1	7,20	1€,80	0,00	0,00	0,00
K1=2	5,87	18,13	8,00	0,00	0,00
K1=3	7,20	11,02	15,54	€,24	0,00
K1=4	8,33	9,€7	9,44	1€,13	€,43
K1=5	€,00	14,59	7,41	10,57	9,43
K1=€	0,00	13,33	9,55	7,98	5,14
I3=3					
K1=1	3,47	12,53	1€,00	0,00	0,00
K1=2	5,87	8,€5	1€,84	8,€4	0,00
K1=3	8,33	9,€7	9,44	1€,13	€,43
K1=4	5,33	13,93	8,74	9,14	10,8€
K1=5	0,00	€,€7	13,33	8,29	7,71
K1=€	0,00	0,00	12,80	10,0€	5,14
I3=4					
K1=1	4,00	8,44	12,20	15,3€	0,00
K1=2	7,33	9,78	7,93	17,25	7,71
K1=3	€,00	14,59	7,41	10,57	9,43
K1=4	0,00	€,€7	13,33	8,29	7,71
K1=5	0,00	0,00	7,20	13,€€	7,14
K1=€	0,00	0,00	0,00	13,57	€,43
I3=5					
K1=1	14,00	10,15	7,€9	11,87	1€,29
K1=2	4,00	13,78	8,94	7,57	13,71
K1=3	0,00	€,30	13,30	8,11	8,29
K1=4	0,00	0,00	€,00	12,93	9,07
K1=5	0,00	0,00	0,00	€,43	13,57
K1=€	0,00	0,00	0,00	0,00	10,00

```
   MF(1)= 7,0 kN     MA(1)= 0,00 m
   MF(2)= 8,0 kN     MA(2)= 2,50 m
      L1=6,00 m

K= 1   I= 1   F2=  7,0 kN     L2= 0,00 m
K= 2   I= 1   F2=  8,0 kN     L2= 0,00 m
       I= 2   F2=  7,0 kN     L2= 2,50 m

K=1    R1=   7,00 kN     R2=   0,00 kN
K=2    R1=  12,08 kN     R2=   2,92 kN
    LLR1=  12,08 kN  LLR2=   2,92 kN

   MF(1)= 8,0 kN     MA(1)= 0,00 m
   MF(2)= 7,0 kN     MA(2)= 2,50 m
      L1=6,00 m

K= 1   I= 1   F2=  8,0 kN     L2= 0,00 m
K= 2   I= 1   F2=  7,0 kN     L2= 0,00 m
       I= 2   F2=  8,0 kN     L2= 2,50 m

K=1    R1=   8,00 kN     R2=   0,00 kN
K=2    R1=  11,67 kN     R2=   3,33 kN
    LLR1=  12,08 kN  LLR2=   3,33 kN
```

NMF= [ ] [ ] OK Cls

L1= [ ] X= [ ] Show Again

Load cases R1 | F2-L2 | Calculate R1

Load cases X | IRO | Calc. LT5LT7LM5

STORE NR=1 GET Calc. MAXLM5

PrF EX1 EX2 EX3 EX4 EX5 End

```
K= 1   I= 1   F2= 10,0 kN     L2= 0,00 m
K= 2   I= 1   F2=  7,0 kN     L2= 0,00 m
       I= 2   F2= 10,0 kN     L2= 3,00 m
K= 3   I= 1   F2=  5,0 kN     L2= 0,00 m
       I= 2   F2=  7,0 kN     L2= 2,00 m
       I= 3   F2= 10,0 kN     L2= 5,00 m

K=1    R1=  10,00 kN     R2=   0,00 kN
K=2    R1=  12,00 kN     R2=   5,00 kN
K=3    R1=  11,33 kN     R2=  10,67 kN
    LLR1=  12,00 kN  LLR2=  10,67 kN

K= 1   I= 1   F2=  5,0 kN     L2= 0,00 m
K= 2   I= 1   F2=  7,0 kN     L2= 0,00 m
       I= 2   F2=  5,0 kN     L2= 2,00 m
K= 3   I= 1   F2= 10,0 kN     L2= 0,00 m
       I= 2   F2=  7,0 kN     L2= 3,00 m
       I= 3   F2=  5,0 kN     L2= 5,00 m

K=1    R1=   5,00 kN     R2=   0,00 kN
K=2    R1=  10,33 kN     R2=   1,67 kN
K=3    R1=  14,33 kN     R2=   7,67 kN
    LLR1=  14,33 kN  LLR2=  10,67 kN
```

Program **BEAMPROGRAM2222**

Calculation of the largest support reactions R1 and R2 of a simple beam with a moving load force system.

For each force on support 1 the calculation is carried out.

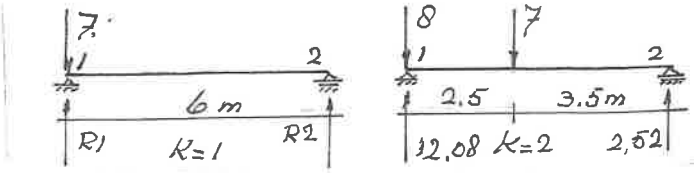


Fig.21.

I=1 MF(1)= 7 kN MA(1)= 0 m
I=2 MF(2)= 8 kN MA(2)= 2,5 m L1= 6 m

Type 2 in TNMF, Tab and in TSTRING
1,7,0, Enter and 2,8,2.5 Enter.
In TL1 type 6.
Click Show to see the data just put in.
Click Load cases R1 and F2-L2 for the cases

K=1 with 7 kN at beam end 1 with L2= 0 m and

K=2 with 8 kN at beam end 1 with L2= 0 m and
with 7 kN with L2= 2.5 m from beam end 1.

Click Calculate R1 to calculate the reactions R1 and R2 for both cases K=1 and K=2.

K=1 R1= 7,00 kN R2= 0 kN and
K=2 R1= 12,08 kN R2= 2,92 kN.
Support 1, largest reaction LLR1= 12,08 kN and
support 2, largest reaction LLR2= 3,33 kN.

Click IRO to put the load forces in reversed order, next click Show and again
Load cases R1, F2-L2 and Calculate R1.

Final results LLR1= 12,08 kN and LLR2= 3,33 kN.

If the calculation would have been carried out for each force on support 2 then LLR1= 3,33 kN and LLR2= 12,08 kN. So for both supports the largest support reaction is 12,08 kN.

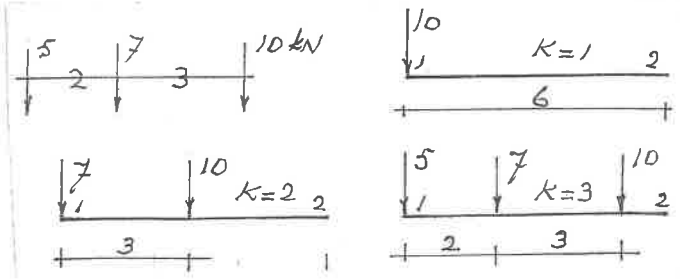


Fig.22.

I=1 MF(1)= 10 kN MA(1)= 0 m
I=2 MF(2)= 7 kN MA(2)= 3 m
I=3 MF(3)= 5 kN MA(3)= 2 m

After input click Show to see the data put in, next click Cls to delete them. Then go on with Load cases R1, F2-L2, Calculate R1, then IRO, Load cases R1, F2-L2, Calculate R1, results shown on the left.

```
   MF(1)= 8,0 kN     MA(1)= 0,00 m
   MF(2)= 7,0 kN     MA(2)= 3,50 m
   MF(3)= 6,0 kN     MA(3)= 1,50 m
      L1=5,00 m

K= 1  I= 1  F2=  8,0 kN     L2= 0,00 m
K= 2  I= 1  F2=  7,0 kN     L2= 0,00 m
      I= 2  F2=  8,0 kN     L2= 3,50 m
K= 3  I= 1  F2=  6,0 kN     L2= 0,00 m
      I= 2  F2=  7,0 kN     L2= 1,50 m

K=1   R1=   8,00 kN    R2=   0,00 kN
K=2   R1=   9,40 kN    R2=   5,60 kN
K=3   R1=  10,90 kN    R2=   2,10 kN
    LLR1=  10,90 kN  LLR2=   5,60 kN

   MF(1)= 6,0 kN     MA(1)= 0,00 m
   MF(2)= 7,0 kN     MA(2)= 1,50 m
   MF(3)= 8,0 kN     MA(3)= 3,50 m
      L1=5,00 m

K= 1  I= 1  F2=  6,0 kN     L2= 0,00 m
K= 2  I= 1  F2=  7,0 kN     L2= 0,00 m
      I= 2  F2=  6,0 kN     L2= 1,50 m
K= 3  I= 1  F2=  8,0 kN     L2= 0,00 m
      I= 2  F2=  7,0 kN     L2= 3,50 m

K=1   R1=   6,00 kN    R2=   0,00 kN
K=2   R1=  11,20 kN    R2=   1,80 kN
K=3   R1=  10,10 kN    R2=   4,90 kN
    LLR1=  11,20 kN  LLR2=   5,60 kN
```

Example. EX1

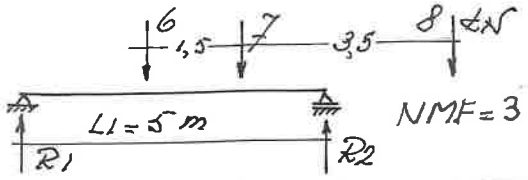


Fig.23.

I=1 MF(1)= 8 kN MA(1)= 0 m
I=2 MF(2)= 7 kN MA(2)= 3,5 m
I=3 MF(3)= 6 kN MA(3)= 1.5 m L1= 5 m

Click EX1 and Show etc. Or as follows.

Type 3 in TNMF, Tab and in TSTRING
1,8,0, Enter, 2,7,3.5 Enter, 3,6,1.5 Enter.
Type 5 in TL1.
Click Show, Load cases R1, F3-L2, Calculate R1, and for load cases in reversed order, click IRO and then again
Load cases R1, Show, F2-R2 and Calculate R1.

(If part of text not visible then make it visible with a form click at arbitrairy place and click PrF to print the form if wanted.)

Fig.24.
The first three load csases, 8 kN on support 1, 7 kN on 1 and 6 kN on 1. For case K=3 see the underlined values.
The largest reactions for this first case are LLR1= 10,90 kN and LLR2= 5,60 kN.

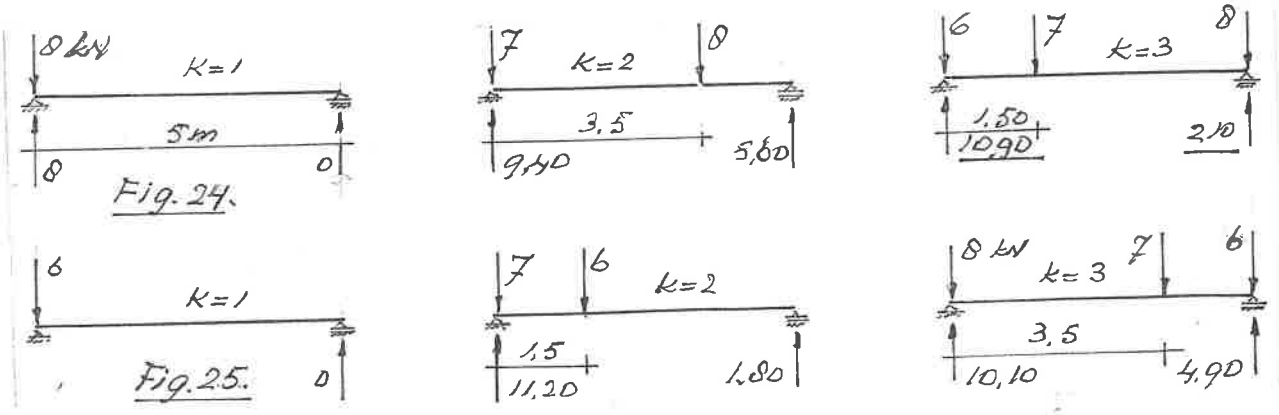
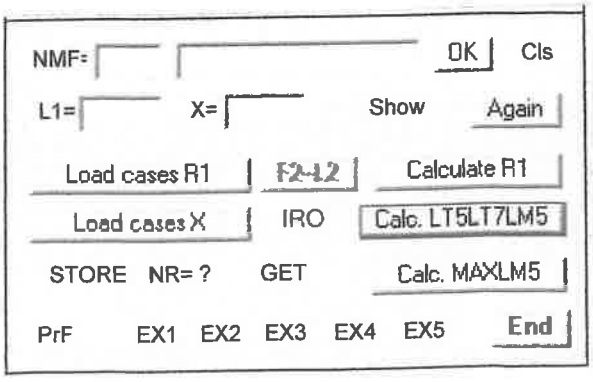


Fig.25.
The second three load cases with forces in reversed order, 6 kN on support 1, 7 kN on 1 and 8 kN on 1.
The largest reactions for both cases together, LLR1= 11,20 kN and LLR2= 5,60 kN.

To be clear, see the calculated reactions R1 and R2 of both cases,

1st case
K=3 R1= 10,90 kN and K=2 R2= 5,60 kN
2nd csee
K=2 R1= 11,20 kN and K=3 R2= 4,90 kN

The largest possible reaction for both supports is 11,20 kN.



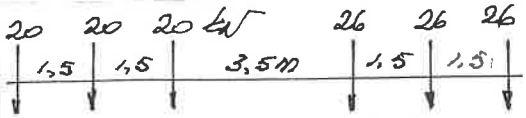
```
K= 1   I= 1   F2= 25,0 kN     L2= 0,00 m
K= 2   I= 1   F2= 25,0 kN     L2= 0,00 m
       I= 2   F2= 25,0 kN     L2= 2,00 m
K= 3   I= 1   F2= 30,0 kN     L2= 0,00 m
       I= 2   F2= 25,0 kN     L2= 2,80 m
       I= 3   F2= 25,0 kN     L2= 4,80 m
K= 4   I= 1   F2= 30,0 kN     L2= 0,00 m
       I= 2   F2= 30,0 kN     L2= 2,40 m
       I= 3   F2= 25,0 kN     L2= 5,20 m

K=1    R1=  25,00 kN    R2=   0,00 kN
K=2    R1=  41,38 kN    R2=   8,62 kN
K=3    R1=  47,24 kN    R2=  32,76 kN
K=4    R1=  50,17 kN    R2=  34,83 kN
     LLR1=  50,17 kN  LLR2=  34,83 kN

K= 1   I= 1   F2= 30,0 kN     L2= 0,00 m
K= 2   I= 1   F2= 30,0 kN     L2= 0,00 m
       I= 2   F2= 30,0 kN     L2= 2,40 m
K= 3   I= 1   F2= 25,0 kN     L2= 0,00 m
       I= 2   F2= 30,0 kN     L2= 2,80 m
       I= 3   F2= 30,0 kN     L2= 5,20 m
K= 4   I= 1   F2= 25,0 kN     L2= 0,00 m
       I= 2   F2= 25,0 kN     L2= 2,00 m
       I= 3   F2= 30,0 kN     L2= 4,80 m

K=1    R1=  30,00 kN    R2=   0,00 kN
K=2    R1=  47,59 kN    R2=  12,41 kN
K=3    R1=  43,62 kN    R2=  41,38 kN
K=4    R1=  46,55 kN    R2=  33,45 kN
     LLR1=  50,17 kN  LLR2=  41,38 kN
```

Another example. The calculated reactions are printed.



NMF=6 load forces

With beam length L1=6 m.

```
K=1    R1=  26,00 kN    R2=   0,00 kN
K=2    R1=  45,50 kN    R2=   6,50 kN
K=3    R1=  58,50 kN    R2=  15,50 kN
K=4    R1=  35,17 kN    R2=  36,83 kN
K=5    R1=  39,33 kN    R2=  26,67 kN
K=6    R1=  45,00 kN    R2=  15,00 kN
     LLR1=  58,50 kN  LLR2=  36,83 kN

K=1    R1=  20,00 kN    R2=   0,00 kN
K=2    R1=  35,00 kN    R2=   5,00 kN
K=3    R1=  45,00 kN    R2=  15,00 kN
K=4    R1=  37,67 kN    R2=  28,33 kN
K=5    R1=  48,83 kN    R2=  23,17 kN
K=6    R1=  58,50 kN    R2=  15,50 kN
     LLR1=  58,50 kN  LLR2=  36,83 kN
```

The third load case K=3 of the first set of calculations appears to be the same as the sixth K=6 load case of the second set of calculations.

Example. EX2

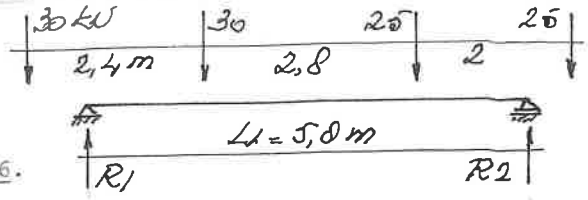


Fig.26.

NMF=4

```
I=1  MF(1)= 25 kN  MA(1)=   0 m
I=2  MF(2)= 25 kN  MA(2)=   2 m
I=3  MF(3)= 30 kN  MA(3)= 2.8 m
I=4  MF(4)= 30 kN  MA(4)= 2.4 m
```

For the first set of calculations load case K=4 gives the largest reaction R1= 50,47 kN, stored with LLR1.

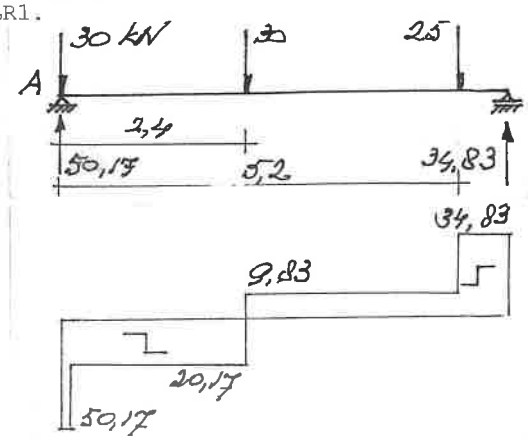


Fig.27.

$\sum$ mom. A=0 30*2,4 +25*5,2 -R2*5,8=0
72,0 +130,0 -R2*5,8=0
R2=202,0/5,8=34,83 kN

$\sum$ vert.=0 30+30+25-R1-R2=0
85-R1-34,83=0 R1=50,17 kN

And for the second set of calculations the largest reaction R1=47,59 kN for load case K=2.

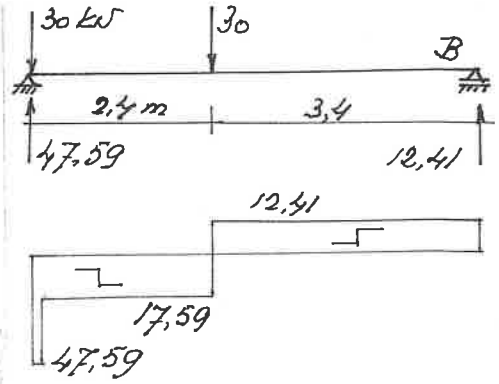


Fig.28.

$\sum$ mom. B=0 R1*5,8-30*5,8-30*3,4=0
R1*5,8-174,0-102,0=0
R1=276,0/5,8=47,59 kN.

$\sum$ vert.=0 30+30-R1-R2=0
60-47,59-R2=0 R2=12,41 kN

The largest of all possible reactions is LLR1=50,47 kN. This final result applies ofcourse to the right support as well when the load force system moves in the two possible direcions.

Order of clicks after input of data to get the two results shown on the left, Loadcases R1, Calculate R1, IEO, Loadcases R1, Calculate R1.

K= 1	I= 1	F2= 15,0 kN	L2= 1,70 m
K= 2	I= 1	F2= 9,0 kN	L2= 1,70 m
K= 3	I= 1	F2= 18,0 kN	L2= 1,70 m
	I= 2	F2= 9,0 kN	L2= 3,70 m

	T5 kN	T7 kN	M5 kNm
K= 1	10,75	-4,25	18,28
K= 2	6,45	-2,55	10,97
K= 3	16,35	-1,65	27,80
X=1,70	LT5 kN	LT7 kN	LM5 kNm
	16,35	-4,25	27,80

K= 1	I= 1	F2= 18,0 kN	L2= 1,70 m
K= 2	I= 1	F2= 9,0 kN	L2= 1,70 m
	I= 2	F2= 18,0 kN	L2= 3,70 m
K= 3	I= 1	F2= 15,0 kN	L2= 1,70 m

	T5 kN	T7 kN	M5 kNm
K= 1	12,90	-5,10	21,93
K= 2	13,35	4,35	22,70
K= 3	10,75	-4,25	18,28
X=1,70	LT5 kN	LT7 kN	LM5 kNm
	13,35	-5,10	22,70
	LLT5 kN	LLT7 kN	LLM5 kNm
	16,35	-5,10	27,80

Second case.
Click IRO to put the forces in reversed Order, 15-9-18.
And done for the first case click Load cses X, F2-L2, Calc.LT5LT7LM5 with Results plus final results

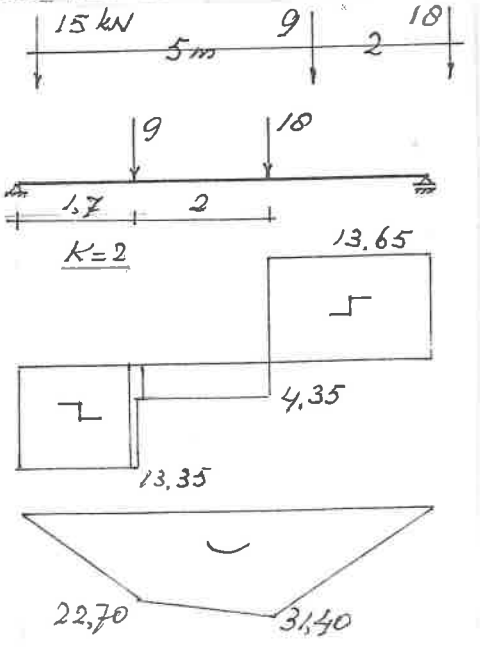


Fig.31.

Second case with largest of K=1 to 3, LT5= 13,35 kN LT7= -5,10 kN and LM5= 22,70 kNm.
Finally largest of six calculations, LLT5= 16,35 kN, LLT5= -5,10 kN and LLM5= 27,80 kNm.

Calculation of the largest shear forces T5 and T7, and bending moment M5 at X meter.

Example. EX3

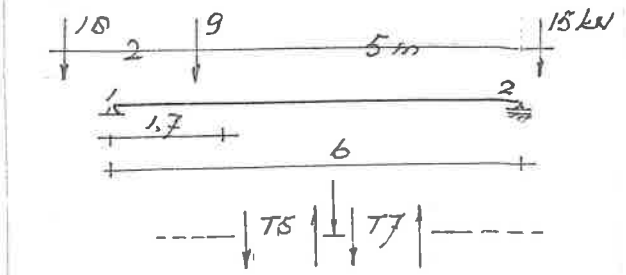


Fig.28.

NMF=3 load forces.
I=1 MF(1)= 15 kN MA(1)= 0 m
I=2 MF(2)= 9 kN MA(2)= 5 m
I=3 MF(3)= 18 kN MA(3)= 2 m
After input of load forces type 6 in TL1 and 1.7 in TX.

First case.
Click Show to check input, and Cls to delete.
Click Load cases X, F2-L2 and Calc.LT5LT7LM5.

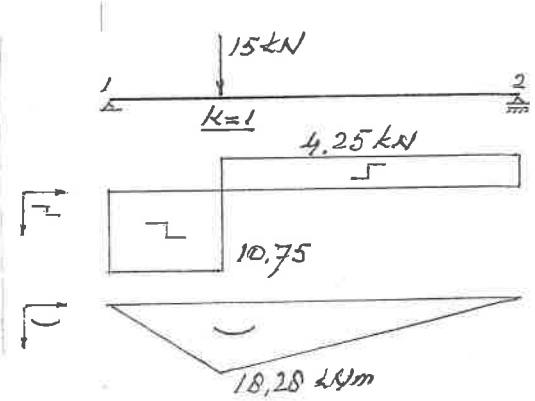


Fig.29.

Shearforce and bending moment diagram for K=1.
T5= 10,75 kN pos. answer, as assumed.
T7= -4,25 kN neg. answer, not as assumed, but .
M5= 18,28 kNm, pos. answer, as assumed.

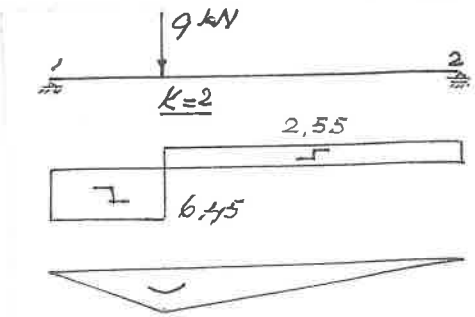


Fig 30

Shear force and bending moment diagram for K=2.

For K=1, K=2 and K=3 are the largest values LT5= 16,35 kN, LT7= -4,25 kN, LM5= 27,80 kNm.

```
MF(1)=40,0 kN     MA(1)= 0,00 m
MF(2)=40,0 kN     MA(2)= 1,50 m
MF(3)=30,0 kN     MA(3)= 2,00 m
MF(4)=30,0 kN     MA(4)= 1,50 m
MF(5)=30,0 kN     MA(5)= 1,50 m
   L1= 8,00 m          X= 4,00 m

K= 1  I= 1  F2= 40,0 kN    L2= 4,00 m
      I= 2  F2= 40,0 kN    L2= 2,50 m
      I= 3  F2= 30,0 kN    L2= 0,50 m
K= 2  I= 1  F2= 40,0 kN    L2= 4,00 m
      I= 2  F2= 40,0 kN    L2= 5,50 m
      I= 3  F2= 30,0 kN    L2= 2,00 m
      I= 4  F2= 30,0 kN    L2= 0,50 m
K= 3  I= 1  F2= 30,0 kN    L2= 4,00 m
      I= 2  F2= 40,0 kN    L2= 6,00 m
      I= 3  F2= 40,0 kN    L2= 7,50 m
      I= 4  F2= 30,0 kN    L2= 2,50 m
      I= 5  F2= 30,0 kN    L2= 1,00 m
K= 4  I= 1  F2= 30,0 kN    L2= 4,00 m
      I= 2  F2= 30,0 kN    L2= 5,50 m
      I= 3  F2= 40,0 kN    L2= 7,50 m
      I= 4  F2= 30,0 kN    L2= 2,50 m
K= 5  I= 1  F2= 30,0 kN    L2= 4,00 m
      I= 2  F2= 30,0 kN    L2= 5,50 m
      I= 3  F2= 30,0 kN    L2= 7,00 m

        T5 kN       T7 kN       M5 kNm
K= 1     5,63      -34,38      137,50
K= 2    23,13      -16,88      167,50
K= 3    14,38      -15,63      162,50
K= 4    17,50      -12,50      145,00
K= 5    28,13       -1,88      112,50
X=4,00  LT5 kN      LT7 kN      LM5 kNm
        28,13      -34,38      167,50
```

```
MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 1,50 m
MF(3)=30,0 kN     MA(3)= 1,50 m
MF(4)=40,0 kN     MA(4)= 2,00 m
MF(5)=40,0 kN     MA(5)= 1,50 m
   L1= 8,00 m          X= 4,00 m

K= 1  I= 1  F2= 30,0 kN    L2= 4,00 m
      I= 2  F2= 30,0 kN    L2= 2,50 m
      I= 3  F2= 30,0 kN    L2= 1,00 m
K= 2  I= 1  F2= 30,0 kN    L2= 4,00 m
      I= 2  F2= 30,0 kN    L2= 5,50 m
      I= 3  F2= 30,0 kN    L2= 2,50 m
      I= 4  F2= 40,0 kN    L2= 0,50 m
K= 3  I= 1  F2= 30,0 kN    L2= 4,00 m
      I= 2  F2= 30,0 kN    L2= 5,50 m
      I= 3  F2= 30,0 kN    L2= 7,00 m
      I= 4  F2= 40,0 kN    L2= 2,00 m
      I= 5  F2= 40,0 kN    L2= 0,50 m
K= 4  I= 1  F2= 40,0 kN    L2= 4,00 m
      I= 2  F2= 30,0 kN    L2= 6,00 m
      I= 3  F2= 30,0 kN    L2= 7,50 m
      I= 4  F2= 40,0 kN    L2= 2,50 m
K= 5  I= 1  F2= 40,0 kN    L2= 4,00 m
      I= 2  F2= 40,0 kN    L2= 5,50 m
      I= 3  F2= 30,0 kN    L2= 7,50 m
```

Example. EX4

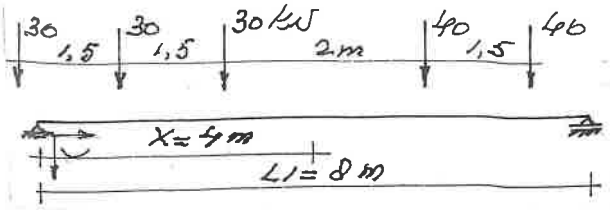


Fig.32.

NMF=5 load forces.
I=1 MF(1)= 40 kN MA(1)= 0 m
I=2 MF(2)= 40 kN MA(2)= 1.5 m
I=3 MF(3)= 30 kN MA(3)= 2 m
I=4 MF(4)= 30 kN MA(4)= 1.5 m
I=5 MF(5)= 30 kN MA(5)= 1.5 m L1=8 m X=4 m

First case.
After input of data (or click EX4) click Show, Load cases X, F2-L2 and Calc.LT5LT7LM5. A part of the results became covered by controls, Click somewhere on the form so that the form print appears like shown on the left.
LT5= 28,13 kN, LT7= -34,38 kN, LM5= 167,50 kNm,

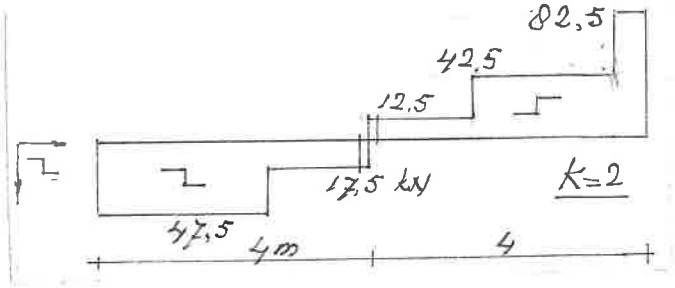


Fig.33.
Case K=4 with the 4th load force 30 kN at X=4 m from the left support.
With equations of equilibrium the reactions can be calculated,
Support 1 with 47,5 kN, support 2 with 82,5 kN.

The bending moment at X m is
LM5 = 47,5*4 -30*1.5= 190-45= 145 kNm.
Bending moment diagram not drawn here.

Second case.
Click the form to get the controls back and click Cls. Click IRO to put the forces in reversed order and click Show, Load cases X and Calc.LT5LT7LM5. See the results of the 2nd case

LT5= 34,38 kN, LT7= -28,13 kN, LM5= 167,50 kNm.

and the final reslts,
LLT5=34,38 kN, LLT7=-34,38 kN, LLM5=167,50 kNm.

```
        T5 kN       T7 kN       M5 kNm
K= 1     1,88      -28,13      112,50
K= 2    12,50      -17,50      145,00
K= 3    15,63      -14,38      162,50
K= 4    16,88      -28,13      167,50
K= 5    34,38       -5,63      137,50
X=4,00  LT5 kN      LT7 kN      LM5 kNm
        34,38      -28,13      167,50

       LLT5 kN     LLT7 kN     LLM5 kNm
        34,38      -34,38      167,50
```

```
    MF(1)=24,0 kN     MA(1)= 0,00 m
    MF(2)=24,0 kN     MA(2)= 3,00 m
    MF(3)=28,0 kN     MA(3)= 3,00 m
    MF(4)=28,0 kN     MA(4)= 2,00 m
       L1= 6,50 m        X= 3,50 m

          T5  kN      T7  kN      M5  kNm
K= 1       9,23      -14,77       44,31
K= 2       8,92      -15,08       45,23
K= 3       6,46      -21,54       64,62
K= 4      17,23      -10,77       60,31
X=3,50   LT5 kN      LT7 kN     LM5 kNm
          17,23      -21,54       64,62

    MF(1)=28,0 kN     MA(1)= 0,00 m
    MF(2)=28,0 kN     MA(2)= 2,00 m
    MF(3)=24,0 kN     MA(3)= 3,00 m
    MF(4)=24,0 kN     MA(4)= 3,00 m
       L1= 6,50 m        X= 3,50 m

          T5  kN      T7  kN      M5  kNm
K= 1       6,46      -21,54       64,62
K= 2      15,38      -12,62       65,85
K= 3       9,23      -14,77       44,31
K= 4      11,08      -12,92       38,77
X=3,50   LT5 kN      LT7 kN     LM5 kNm
          15,38      -21,54       65,85

         LLT5 kN    LLT7 kN    LLM5 kNm
          17,23      -21,54       65,85
```

```
    MF(1)=28,0 kN     MA(1)= 0,00 m
    MF(2)=28,0 kN     MA(2)= 2,00 m
    MF(3)=24,0 kN     MA(3)= 3,00 m
    MF(4)=24,0 kN     MA(4)= 3,00 m
       L1= 6,50 m        X= 3,00 m

          T5  kN      T7  kN      M5  kNm
K= 1      12,92      -11,08       38,77
K= 2      14,77       -9,23       44,31
K= 3      12,62      -15,38       65,85
K= 4      21,54       -6,46       64,62
X=3,00   LT5 kN      LT7 kN     LM5 kNm
          21,54      -15,38       65,85

    MF(1)=28,0 kN     MA(1)= 0,00 m
    MF(2)=28,0 kN     MA(2)= 2,00 m
    MF(3)=24,0 kN     MA(3)= 3,00 m
    MF(4)=24,0 kN     MA(4)= 3,00 m
       L1= 6,50 m        X= 3,00 m

          T5  kN      T7  kN      M5  kNm
K= 1      10,77      -17,23       60,31
K= 2      21,54       -6,46       64,62
K= 3      15,08       -8,92       45,23
K= 4      14,77       -9,23       44,31
X=3,00   LT5 kN      LT7 kN     LM5 kNm
          21,54      -17,23       64,62

         LLT5 kN    LLT7 kN    LLM5 kNm
          21,54      -17,23       65,85
```

Example. EX5

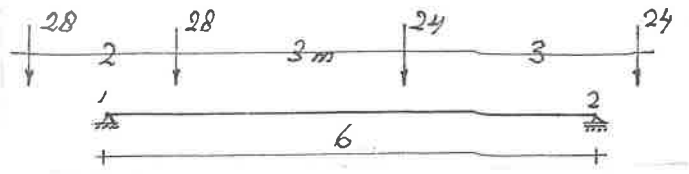


Fig.34.

NMF=4 load forces.

I=1	MF(1)= 24 kN	MA(1)= 0 m	
I=2	MF(2)= 24 kN	MA(2)= 3 m	
I=3	MF(3)= 28 kN	MA(3)= 3 m	L1= 6.5 m
I=4	MF(4)= 28 kN	MA(4)= 2 m	X= 3.5 m

First case.
After input of data (or click EX4) click Show, Load cases X and Calc.LT5LT7LM5.
Second case with forces in reversed order.
Click IRO, Load cases X and Calc.LT5LT7LM5.

Largest values after both cases,

LLT5= 17,23 kN	K=4	first case
LLT7= -21,54 kN	K=3	first case
	K=1	second case
LLM5= 65,85 kNm	K=2	second case

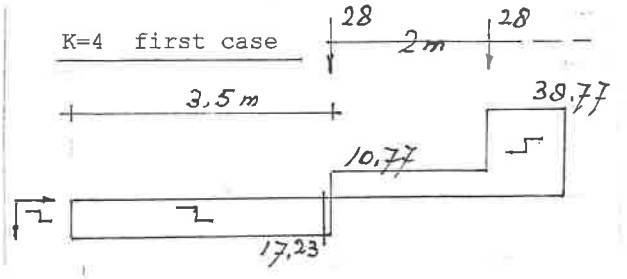


Fig.35.

Next with X= 6.50-3.5= 3 m, same cross-section.

First case.
Click Again to start all over again. After input of data type 3 in TX and click Show.
Or, click EX5 and type 3 in TX to replace 3.5 m and click Show, next
Load cases X and Calc.LT5LT7LM5.
Second case with forces in reversed order.
Click IRO, Load cases X and Calc.LT5LT7LM5.

Largest values after both cases,

LLT5= 21,54 kN	K=4	first case
	K=2	second case
LLT7= -17,23 kN	K=1	second case
LLM5= 65,85 kNm	K=3	first case

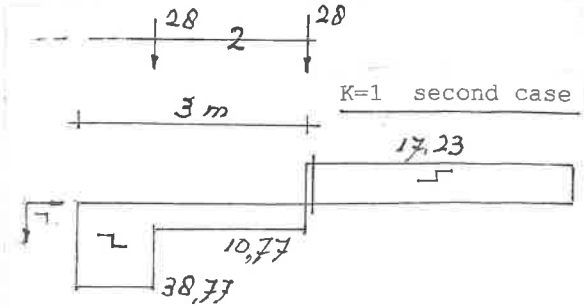


Fig.36.

For both cases with X= 3,50 m and X= 3,00 m the same maiximal values are found. (3.5+3.0=6.5)

```
MF(1)= 7,0 kN     MA(1)= 0,00 m
MF(2)= 6,0 kN     MA(2)= 3,00 m
MF(3)= 5,0 kN     MA(3)= 2,50 m
   L1=6,00 m

Largest possible bending moment
MAXLM5=  11,54 kNm   X= 3,69 m
MF(1)=  7,00 kN

MF(1)= 5,0 kN     MA(1)= 0,00 m
MF(2)= 6,0 kN     MA(2)= 2,50 m
MF(3)= 7,0 kN     MA(3)= 3,00 m
   L1=6,00 m

Largest possible bending moment
MAXLM5=  11,54 kNm   X= 2,31 m
MF(3)=  7,00 kN
```

```
MF(1)= 7,0 kN     MA(1)= 0,00 m
MF(2)= 6,0 kN     MA(2)= 3,00 m
MF(3)= 5,0 kN     MA(3)= 2,50 m
   L1=6,00 m          X= 3,69 m

        T5  kN      T7  kN      M5  kNm
K= 1      2,01       -5,00       11,54
K= 2      1,32       -4,68       10,81
K= 3      1,93       -3,08        7,10
X=3,69  LT5 kN     LT7 kN     LM5 kNm
          2,01       -5,00       11,54

        T5  kN      T7  kN      M5  kNm
K= 1      0,74       -4,27        9,85
K= 2      1,51       -4,50       10,38
K= 3      2,70       -4,31        9,94
X=3,69  LT5 kN     LT7 kN     LM5 kNm
          2,70       -4,50       10,38

       LLT5 kN    LLT7 kN    LLM5 kNm
          2,70       -5,00       11,54
```

```
MF(1)=25,0 kN     MA(1)= 0,00 m
MF(2)=25,0 kN     MA(2)= 2,00 m
MF(3)=30,0 kN     MA(3)= 2,80 m
MF(4)=30,0 kN     MA(4)= 2,40 m
   L1=5,80 m

Largest possible bending moment
MAXLM5=  54,72 kNm   X= 2,30 m
MF(4)= 30,00 kN

MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 2,40 m
MF(3)=25,0 kN     MA(3)= 2,80 m
MF(4)=25,0 kN     MA(4)= 2,00 m
   L1=5,80 m

Largest possible bending moment
MAXLM5=  54,72 kNm   X= 2,30 m
MF(2)= 30,00 kN
```

Calculation of the largest possible bending moment MAXLM5 when a mobile load force system moves from left to right or from right to left.

Example. EX1

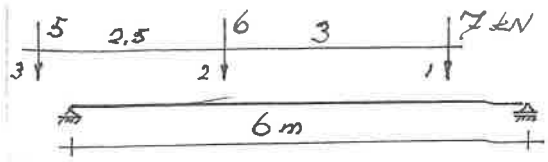


Fig.37.

NMF=3 load forces.
I=1 MF(1)= 7 kN MA(1)= 0 m
I=2 MF(2)= 6 kN MA(2)= 3.0 m
I=3 MF(3)= 5 kN MA(3)= 2.5 m L1= 6 m

Type 3 in TNMF, Tab, cursor in TSTRING, type 1,7,0 Enter, 2,6,3 Enter, 3,5,2.5 Enter.
Type 6 in TL1, click Show to see the data.

First case. MF(1)= 7 kN
Click Calc.MAXLM5. MAXLM5= 11,54 kNm **X=3,69 m**

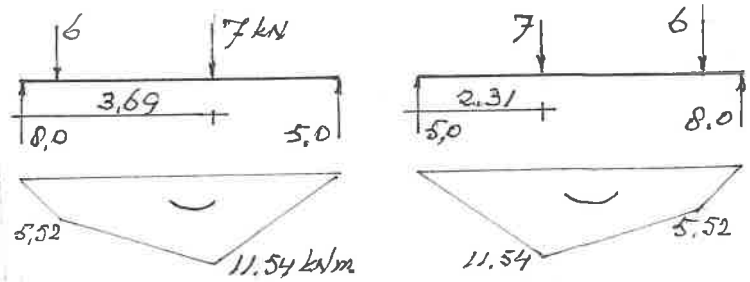


Fig.38.

Second case. MF(3)= 7 kN
Click IRO to put the forces in reversed order,
They are again moving from left to right.
Click Show and see the forces 7-6-5.
Click Calc.MAXLM5. MAXLM5= 11,54 kNm **X=2,31 m**

Example. EX2

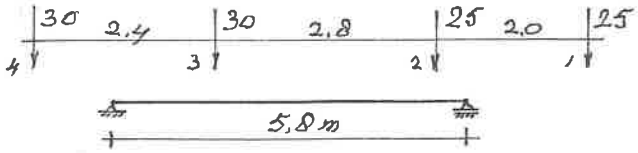


Fig.39.

NMF=4
I=1 MF(1)= 25 kN MA(1)= 0 m
I=2 MF(2)= 25 kN MA(2)= 2,0 m
I=3 MF(3)= 30 kN MA(3)= 2,8 m
I=4 MF(4)= 30 kN MA(4)= 2,4 m L1= 5,80 m

First case. MF(4)= 30 kN
Click Calc.MAXLM5. MAXLM5= 54,72 kNm **X=2,30 m**

Second case. MF(2)=30 kN
Click Calc.MAXLM5. MAXLM5= 54,72 kNm **X=2,30 m**

Both cases, 25-25-30-30 and 30-30-25-25 with a maximum bending moement at 2,30 m from the left support.

```
MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 2,00 m
MF(3)=30,0 kN     MA(3)= 2,80 m
MF(4)=30,0 kN     MA(4)= 2,40 m
   L1=5,80 m

Largest possible bending moment
MAXLM5=  59,59 kNm    X= 3,40 m
MF(1)= 30,00 kN

MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 2,40 m
MF(3)=30,0 kN     MA(3)= 2,80 m
MF(4)=30,0 kN     MA(4)= 2,00 m
   L1=5,80 m

Largest possible bending moment
MAXLM5=  59,59 kNm    X= 3,40 m
MF(3)= 30,00 kN
```

Going on with the example of the preceding page. Click IRO and Show to get the start position of the data.
Type in TSTRING
1,30,0 Enter and 2,30,2 Enter, click Cls and Show, next Calc.MAXLM5. And IRO, Show and Calc.MAXLM5.

Both cases MAXLM5= 59,59 kNm **X= 3,40 m**

```
MF(1)=11,0 kN     MA(1)= 0,00 m
MF(2)=11,0 kN     MA(2)= 2,00 m
   L1=5,40 m

Largest possible bending moment
MAXLM5=  19,72 kNm    X= 2,20 m
MF(2)= 11,00 kN
```

```
MF(1)=40,0 kN     MA(1)= 0,00 m
MF(2)=40,0 kN     MA(2)= 1,50 m
MF(3)=30,0 kN     MA(3)= 2,00 m
MF(4)=30,0 kN     MA(4)= 1,50 m
MF(5)=30,0 kN     MA(5)= 1,50 m
   L1=8,00 m          X= 4,00 m

Largest possible bending moment
MAXLM5= 169,96 kNm    X= 4,38 m
MF(2)= 40,00 kN

MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 1,50 m
MF(3)=30,0 kN     MA(3)= 1,50 m
MF(4)=40,0 kN     MA(4)= 2,00 m
MF(5)=40,0 kN     MA(5)= 1,50 m
   L1=8,00 m

Largest possible bending moment
MAXLM5= 169,96 kNm    X= 3,62 m
MF(4)= 40,00 kN
```

```
MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 3,00 m
MF(3)=30,0 kN     MA(3)= 2,80 m
MF(4)=30,0 kN     MA(4)= 2,00 m
   L1=6,50 m

Largest possible bending moment
MAXLM5=  74,50 kNm    X= 3,12 m
MF(3)= 30,00 kN

MF(1)=30,0 kN     MA(1)= 0,00 m
MF(2)=30,0 kN     MA(2)= 2,00 m
MF(3)=30,0 kN     MA(3)= 2,80 m
MF(4)=30,0 kN     MA(4)= 3,00 m
   L1=6,50 m

Largest possible bending moment
MAXLM5=  74,50 kNm    X= 3,38 m
MF(2)= 30,00 kN
```

Going on with the example on the left. Click IRO and Show and change length L1, type 6.5 in TL1, click Cls and Show and Calc.MAXLM5. And IRO and Show followed by Calc.MAXLM5.

MAXLM5= 74,50 kNm, **X= 3,12 m** and **X= 3,38 m**.

Example.

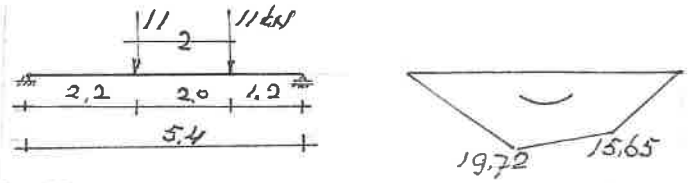


Fig.40.

Example. EX4

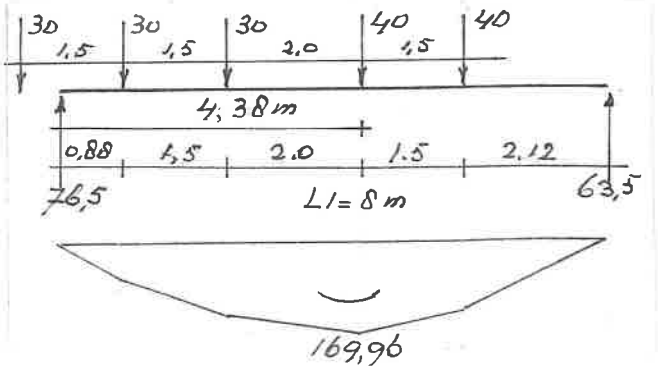


Fig.41.

When clicking EX4 and Show x= 4 m appears, no prblem when clicking Calc.MAXLM5, but remove it by typing a zero 0 in TX. Then Cls and Show. Etc. See the results.

First case.
MF(2)= 40 kN MAXLM5= 169,96 kNm **X= 4,38 m**

Second case.
MF(4)= 40 kN MAXML%= 169,96 kNm **X= 3,62 m**

(Sometimes remarkeble results....)