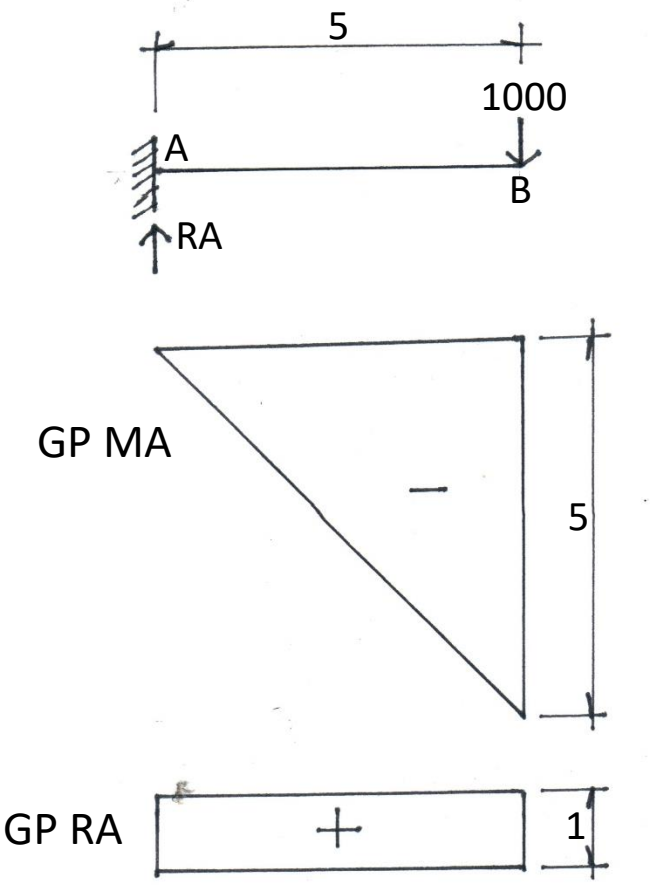
BAB 6 GARIS PENGARUH

6.1 Hitung momen dan gaya lintang dengan metode garis pengaruh, P = 1000 kg



Cara biasa :

$\Sigma V = 0 \rightarrow RA - P = 0 \rightarrow RA - 1000 = 0 \rightarrow$ **RA = 1000 kg**

MA = P. 5 = 1000. 5 = **5000 kgm**

Cara garis pengaruh :

Momen : ordinat Y = L = 5 m

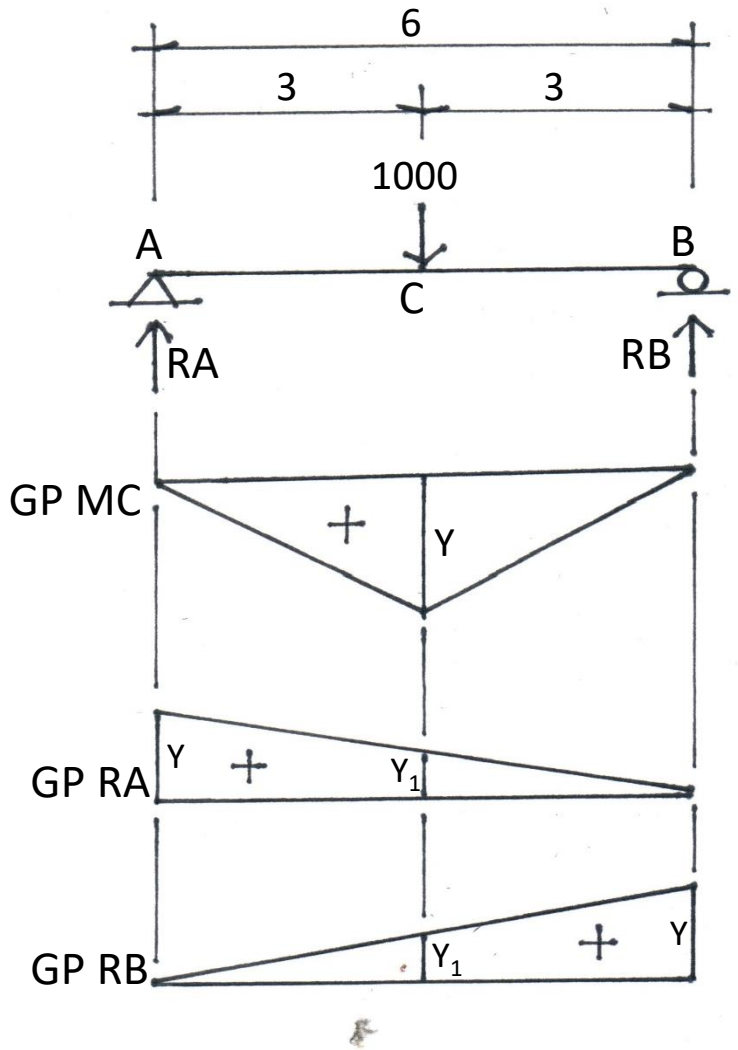
MA = P. Y = 1000. 5 = **5000 kgm**

Gaya lintang : ordinat Y = 1

RA = P. 1 = 1000. 1 = **1000 kg**

6.2 Hitung momen dan gaya lintang dengan metode garis pengaruh,

P = 1000 kg.



Cara biasa : ΣV = 0 → RA + RB = P → RA + RB = 1000

RA = RB = 0,5. 1000 = **500 kg**

MC = 500. 3 = **1500 kg**

Garis pengaruh :

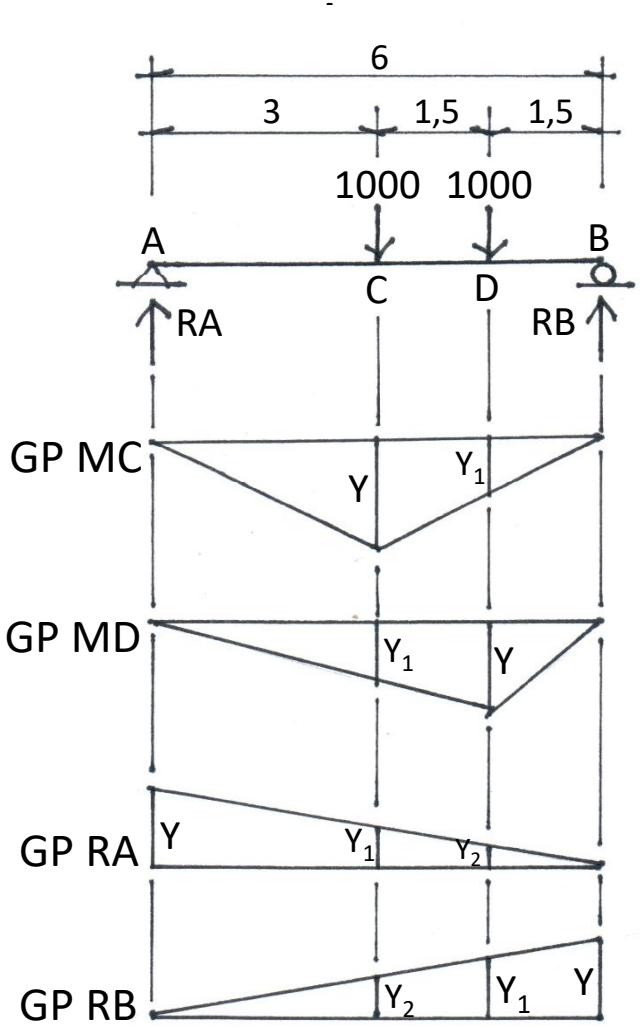
Momen → ordinat : Y = $\frac{3.3}{6}$ = 1,5 →MC = 1000. 1,5 = **1500 kgm**

Gaya lintang : RA → ordinat : Y = 1 ; $\frac{Y_1}{1} = \frac{3}{6}$ → Y_1 = 0,5

RA = 1000. 0,5 = **500 kg**

RB = 1000. 0,5 = **500 kg**

6.3 Hitung momen dan gaya lintang dengan metode garis pengaruh, P = 1000 kg



Cara biasa : ΣMB = 0 → RA. 6 – 1000. 1,5 – 1000. 3 = 0

6 RA – 1500 – 3000 = 0 → 6 RA = 4500 → **RA = 750 kg**

ΣMA = 0 → RB. 6 – 1000. 3 – 1000. 4,5 = 0 → 6 RB – 3000 – 4500 = 0

6 RB = 7500 → **RB = 1250 kg**

MC = 750. 3 = **2250 kgm** ; MD = 1250. 1,5 = **1875 kgm**

Garis pengaruh : MC → ordinat : Y = $\frac{3.3}{6}$ = 1,5 ; $\frac{Y_1}{1,5} = \frac{1,5}{3}$ → Y_1= 0,75

MC = 1000. 1,5 + 1000. 0,75 = 1500 + 750 = **2250 kgm**

MD → ordinat : Y = $\frac{4,5.1,5}{6}$ = 1,125 ; $\frac{Y_1}{1,125} = \frac{3}{4,5}$ → Y_1= 0,75

MD = 1000. 0,75 + 1000. 1,125 = 750 + 1125 = **1875 kgm**

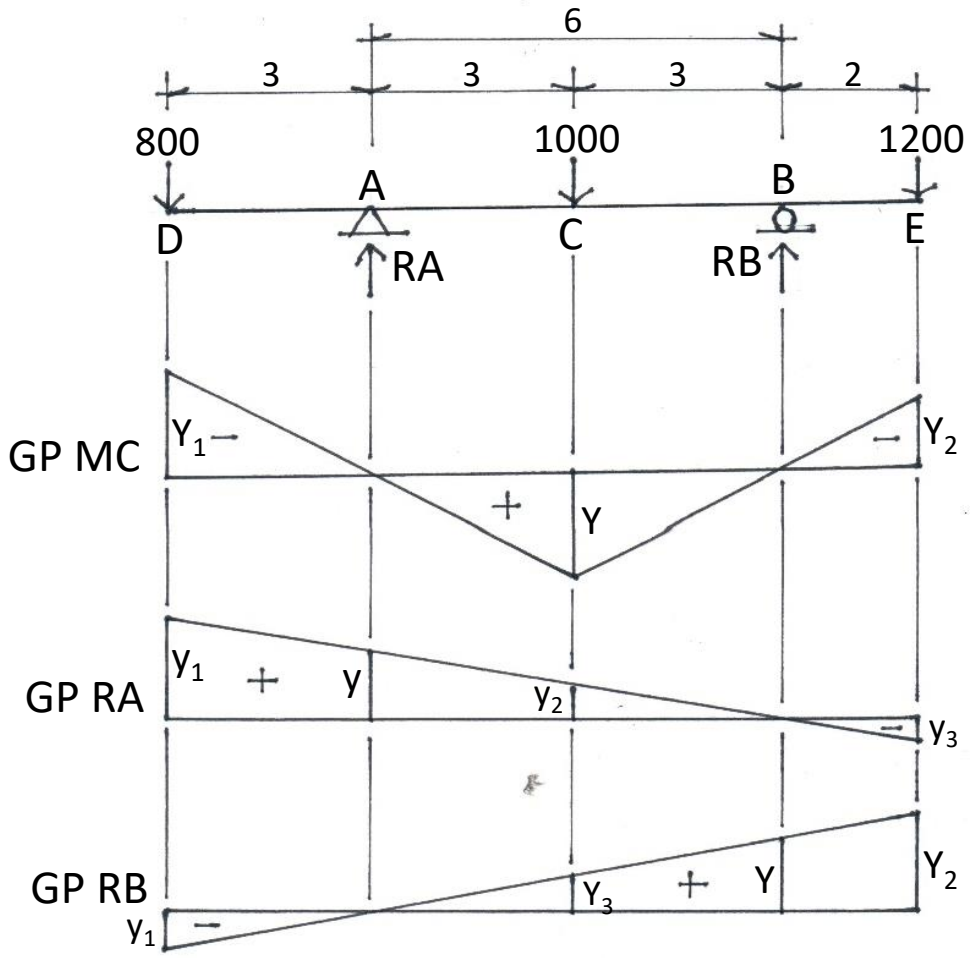
RA → ordinat : Y = 1 ; $\frac{Y_1}{1} = \frac{3}{6}$ → Y_1 = 0,5 ; $\frac{Y_2}{1} = \frac{1,5}{6}$ → Y_2 = 0,25

RA = 1000. 0,5 + 1000. 0,25 = 500 + 250 = **750 kg**

RB → ordinat : Y = 1 ; $\frac{Y_1}{1} = \frac{4,5}{6}$ → Y_1= 0,75 ; $\frac{Y_2}{1} = \frac{3}{6}$ → Y_2 = 0,5

RB = 1000. 0,5 + 1000. 0,75 = 500 + 750 = **1250 kg**

6.4 Hitung momen dan gaya lintang dengan metode garis pengaruh, P_1= 800 kg, P_2= 1000 kg, P_3= 1200 kg



Cara biasa : ΣMB = 0 → RA = **1300 kg**

ΣMA = 0 → RB = **1700 kg**

ΣV = 0 → 1300 + 1700 = 800 + 1000 + 1200

3000 = 3000 → ok

MA = 800. 3 = 2400 kgm ; MB = 1200. 2 = **2400 kgm**

MC = 1300. 3 – 800. 6 = 3900 – 4800 = **- 900 kgm**

Garis pengaruh :

Mom = en di C (MC) → ordinat : Y = $\frac{3.3}{6}$ = 1,5

$\frac{1,5}{Y1+1,5} = \frac{3}{6}$ → Y_1 = 1,5 ; $\frac{1,5}{Y2+1,5} = \frac{3}{5}$ → Y_2 = 1

MC = 1000. 1,5 – 800. 1,5 – 1200. 1 = **- 900 kgm**

GP RA → ordinat : Y = 1 ; $\frac{1}{Y1} = \frac{6}{9}$ → Y_1 = 1,5

$\frac{Y2}{1} = \frac{3}{6}$ → Y_2 = 0,5 ; $\frac{1}{Y3+1} = \frac{6}{8}$ → Y_3 = 0,333

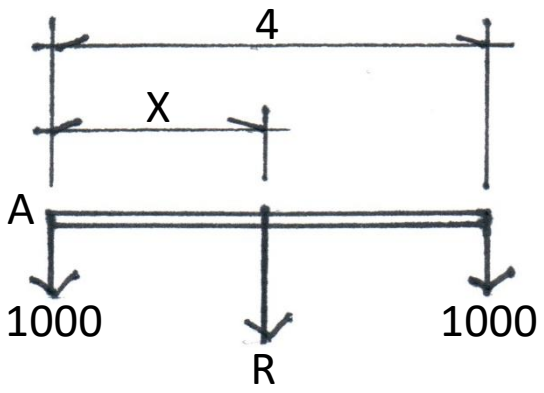
RA = 800. 1,5 + 1000. 0,5 - 1200. 0,333 = **1300 kg**

GP RB → ordinat : Y = 1 ; $\frac{1}{Y2} = \frac{6}{8}$ → Y_2 = 1,333

$\frac{Y3}{1} = \frac{3}{6}$ → Y_3 = 0,5 ; $\frac{1}{Y1+1} = \frac{6}{9}$ → Y_1 = 0,5

RB = 1200. 1,333 + 1000. 0,5 – 800. 0,5 = **1700 kg**

6.5 Hitung besaran R dan letaknya, P = 1000 kg

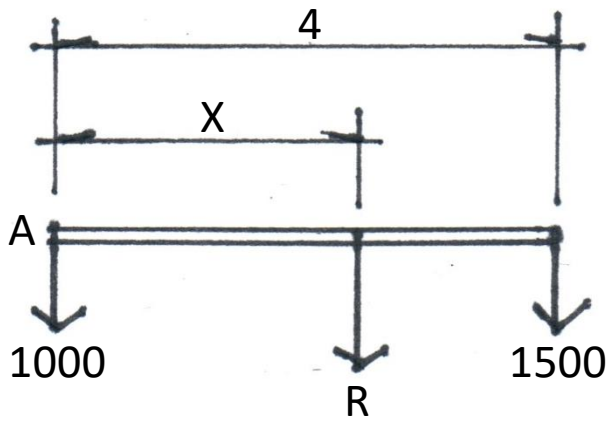


P = 1000 kg

R = ΣP = 2. 1000 = **2000 kg**

R. X = P. 4 → 2000 X = 1000. 4 → 2000 X = 4000 → **X = 2 m dari A**

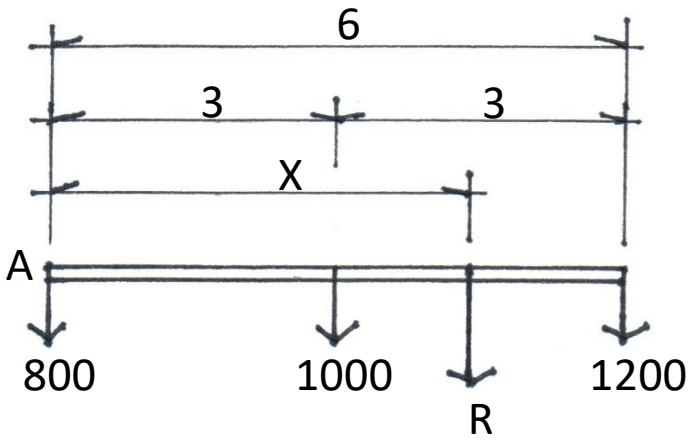
6.6 Hitung besaran R dan letaknya, P_1 = 1000 kg ; P_2 = 1500 kg



$R = \Sigma P = P_1 + P_2 = 1000 + 1500 =$ **2500 kg**

$R.\ X = P_2.\ 4 \rightarrow 2500\ X = 1500.\ 4 \rightarrow 2500\ X = 6000 \rightarrow$ **X = 2,4 m dari A**

6.7 Hitung besaran R dan letaknya, P_1 = 800 kg ; P_2 = 1000 kg ; P_3 = 1200 kg

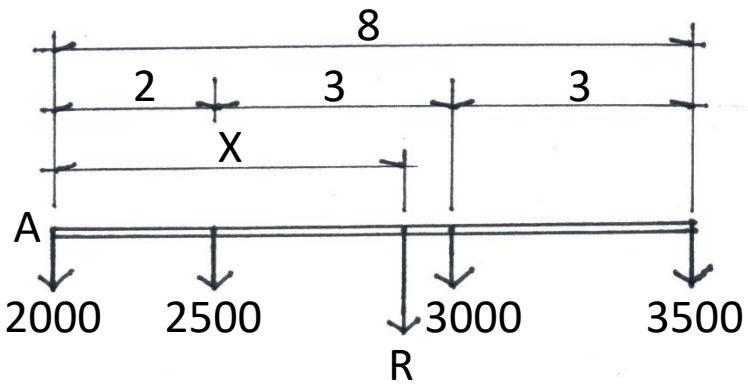


$R = \Sigma P = P_1 + P_2 + P_3 = 800 + 1000 + 1200 =$ **3000 kg**

$R.\ X = P_2.\ 3 + P_3.\ 6 \rightarrow 3000\ X = 1000.\ 3 + 1200.\ 6$

$3000\ X = 3000 + 7200 \rightarrow 3000\ X = 10200 \rightarrow$ **X = 3,4 m dari A**

6.8 Hitung besaran R dan letaknya, P_1 = 2000 kg ; P_2 = 2500 kg ; P_3 = 3000 kg ; P_4 = 3500 kg



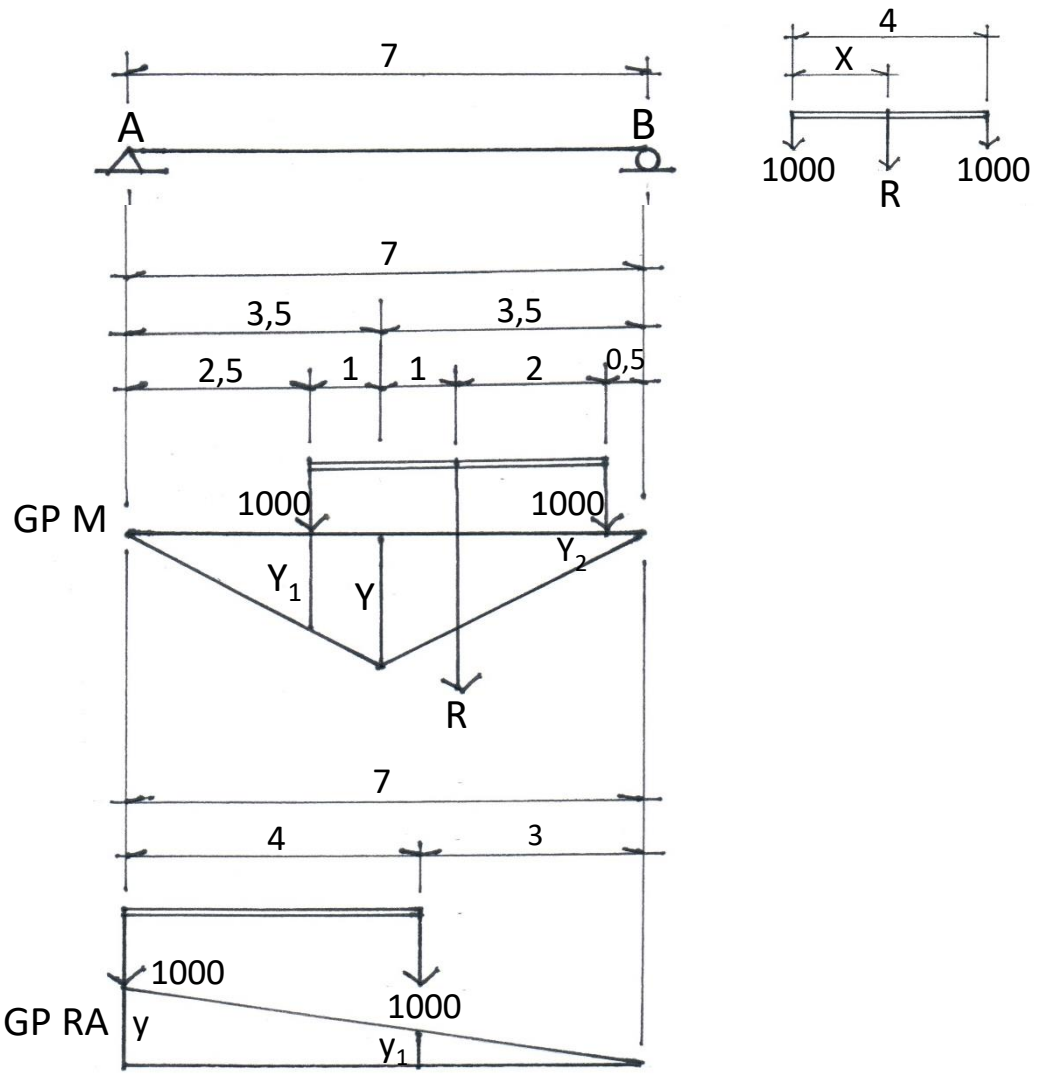
$R = \Sigma P = P_1 + P_2 + P_3 + P_4 = 2000 + 2500 + 3000 + 3500 =$ **11000 kg**

$R.\ X = P_2.\ 2 + P_3.\ 5 + P_4.\ 8 \rightarrow 11000\ X = 2500.\ 2 + 3000.\ 5 + 3500.\ 8$

$11000\ X = 5000 + 15000 + 28000$

$11000\ X = 48000 \rightarrow$ **X = 4,36 m dari A**

6.9 Dengan metode garis pengaruh hitung momen maksimun dan gaya lintang maksimum.



R = 1000 + 1000 = **2000 kg**

2000 X = 1000. 4 → 2000 X = 4000 → **X = 2 m**

Momen → ordinat : Y = $\frac{3,5.3,5}{7}$ = 1,75 m

$\frac{Y_1}{1,75} = \frac{2,5}{3.5}$ → Y_1= 1,25 m ; $\frac{Y_2}{1,75} = \frac{0,5}{3,5}$ → Y_2 = 0,25 m

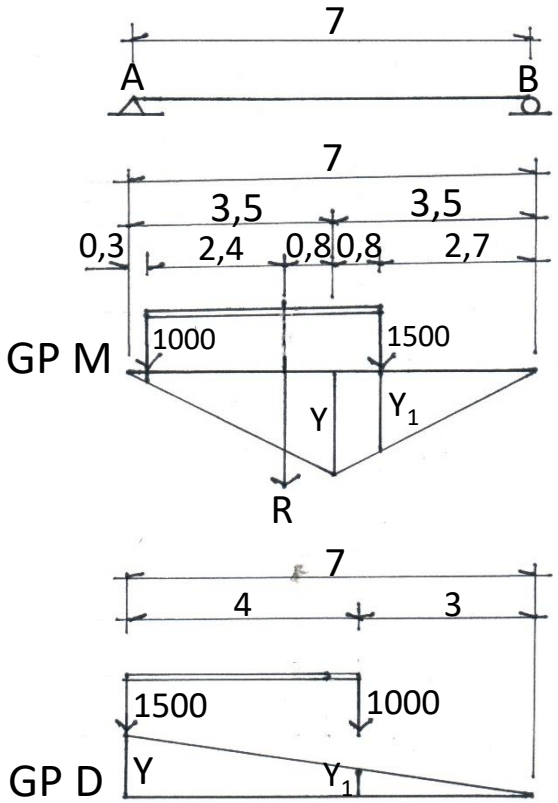
M maks = 1000. 1,25 + 1000. 0,25 = 1250 + 250 = **1500 kgm**

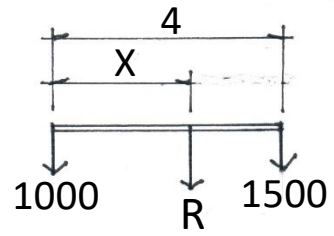
Gaya lintang → ordinat : Y = 1

$Y_1 = \frac{3}{7}$ = 0,429

RA = 1000. 1 + 1000. 0,429 = 1000 + 429 = **1429 kg**

6.10 Dengan metode garis pengaruh hitung momen maksimum dan gaya lintang maksimum, P_1 = 1000 kg ; P_2 = 1500 kg





R = 1000 + 1500 = **2500 kg**

2500 X = 1500. 4 →2500 X = 6000 → **X = 2,4 m**

Momen → ordinat : Y = $\frac{3,5.3,5}{7}$ = 1,75 m ; $\frac{Y_1}{1,75} = \frac{2,7}{3,5}$ →Y_1 = 1,35 m

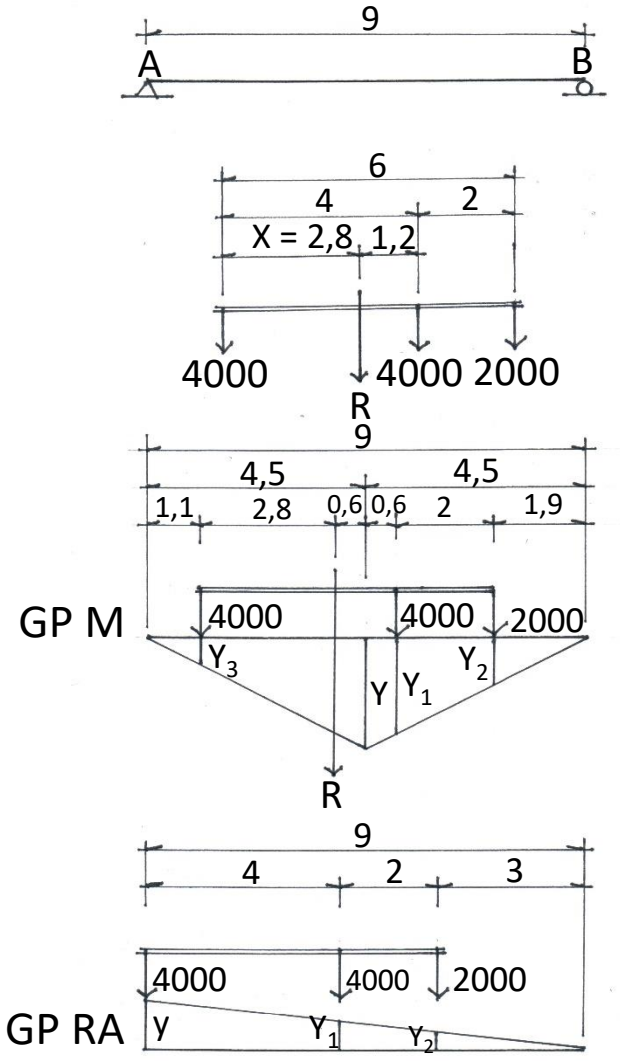
$\frac{Y_2}{1,75} = \frac{2,7}{3,5}$ →Y_2 = 0,15 m ; M maks = 1000. 0,15 + 1500. 1,35 = **2175 kgm**

Gaya lintang (RA maks) → ordinat : Y = 1 ; $\frac{Y_1}{1} = \frac{3}{7}$ → Y_1 = 0,429

RA = 1500. 1 + 1000. 0,429 = 1500 + 429 = **1929 kg**

Catatan : untuk mendapatkan momen yang paling maksimum, Y di tengah-tengah antara R dan beban terdekat.

6.11 Dengan metode garis pengaruh hitung momen maksimum dan gaya lintang maksimum, P_1 = 4000 kg ; P_2 = 4000 kg ; P_3 = 2000 kg



R = 4000 + 4000 + 4000 + 2000 = **10000 kg**

R. X = 4000. 4 + 2000. 6 → 10000 X = 16000 + 12000 →

10000 X = 28000 → **X = 2,8 m**

Momen → ordinat : Y = $\frac{4,5.4,5}{9}$ = 2,25 m ; $\frac{Y_1}{2,25} = \frac{3,9}{4,5}$ → Y_1 = 1,95 m

$\frac{Y_2}{2,25} = \frac{1,9}{4,5}$ → Y_2 = 0,95 m ; $\frac{Y_3}{2,25} = \frac{1,1}{4,5}$ → Y_3 = 0,55 m

M maks = 4000. 0,55 + 4000. 1,95 + 2000. 0,95

= 2200 + 7800 + 1900 = **11900 kgm**

Gaya lintang → ordinat : Y = 1 ; $\frac{Y_1}{1} = \frac{5}{9}$ → Y_1 = 0,56 ; $\frac{Y_2}{1} = \frac{3}{9}$ → Y_2 = 0,33

RA = 4000. 1 + 4000. 0,56 + 2000. 0,33 = 4000 + 2240 + 660 = **6900 kg**