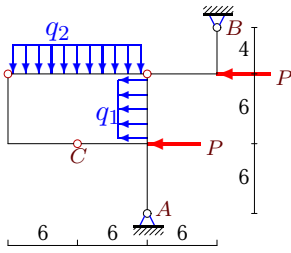


Статически определимая рама

Построить эпюры M , Q , N в раме. Найти горизонтальное (Δx_C) или вертикальное (Δy_C) смещение шарнира C . Все стержни имеют одинаковую жесткость EJ .

Задача 21.1.

3

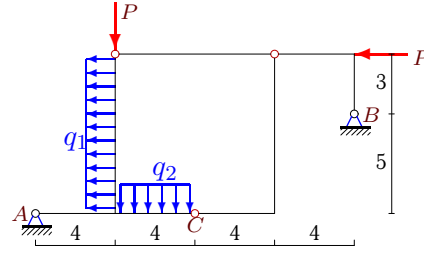


$$\begin{aligned} q_1 &= 12 \text{ кН/м}, \\ q_2 &= 6 \text{ кН/м}, \\ P &= 5 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.2.

3

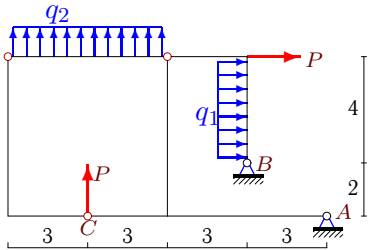


$$\begin{aligned} q_1 &= 2 \text{ кН/м}, \\ q_2 &= 4 \text{ кН/м}, \\ P &= 30 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.3.

3

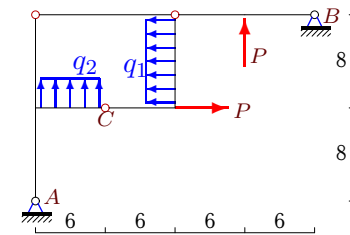


$$\begin{aligned} q_1 &= 1 \text{ кН/м}, \\ q_2 &= 4 \text{ кН/м}, \\ P &= 35 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.4.

3

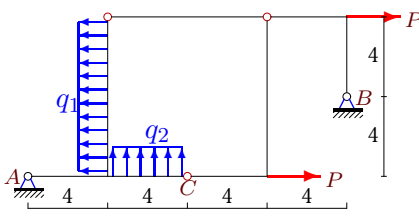


$$\begin{aligned} q_1 &= 5 \text{ кН/м}, \\ q_2 &= 13 \text{ кН/м}, \\ P &= 45 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.5.

3

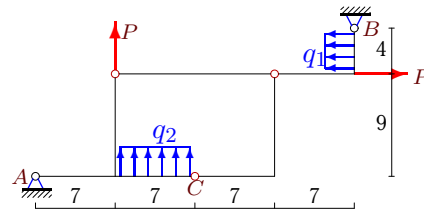


$$\begin{aligned} q_1 &= 4 \text{ кН/м}, \\ q_2 &= 2 \text{ кН/м}, \\ P &= 15 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.6.

3

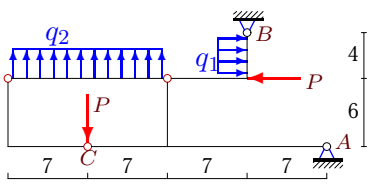


$$\begin{aligned} q_1 &= 1 \text{ кН/м}, \\ q_2 &= 13 \text{ кН/м}, \\ P &= 15 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.7.

3

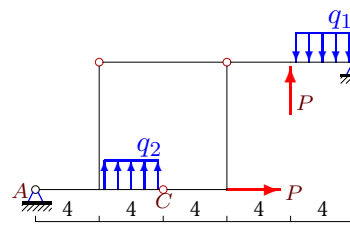


$$\begin{aligned} q_1 &= 1 \text{ кН/м}, \\ q_2 &= 7 \text{ кН/м}, \\ P &= 5 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.8.

3

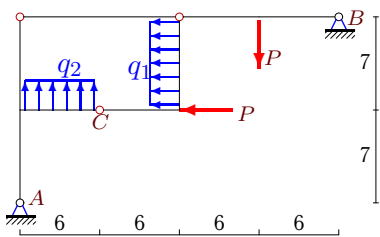


$$\begin{aligned} q_1 &= 4 \text{ кН/м}, \\ q_2 &= 7 \text{ кН/м}, \\ P &= 45 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.9.

3

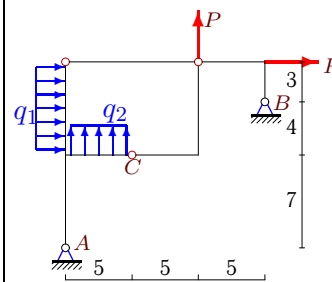


$$\begin{aligned} q_1 &= 6 \text{ кН/м}, \\ q_2 &= 11 \text{ кН/м}, \\ P &= 5 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.10.

3

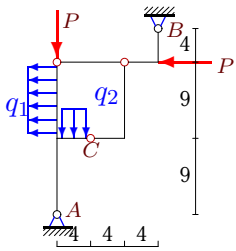


$$\begin{aligned} q_1 &= 3 \text{ кН/м}, \\ q_2 &= 2 \text{ кН/м}, \\ P &= 10 \text{ кН}. \end{aligned}$$

$\Delta y_C = ?$

Задача 21.11.

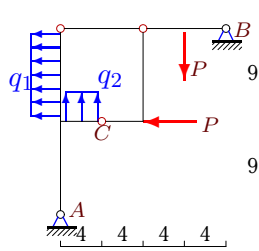
3



$q_1 = 1 \text{ кН/м},$
 $q_2 = 5 \text{ кН/м},$
 $P = 15 \text{ кН}.$
 $\Delta x_C = ?$

Задача 21.12.

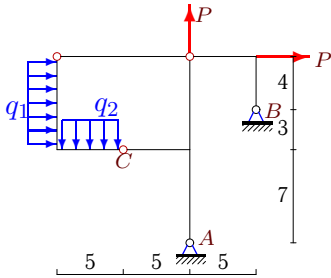
3



$q_1 = 5 \text{ кН/м},$
 $q_2 = 2 \text{ кН/м},$
 $P = 20 \text{ кН}.$
 $\Delta x_C = ?$

Задача 21.13.

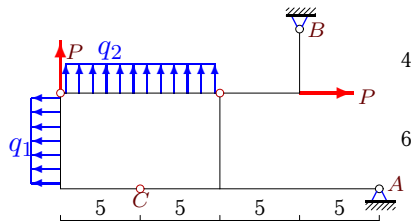
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 3 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.14.

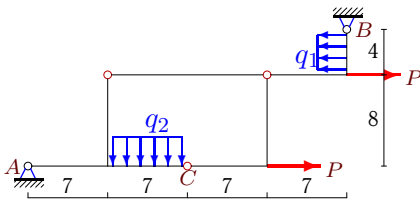
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 3 \text{ кН/м},$
 $P = 50 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.15.

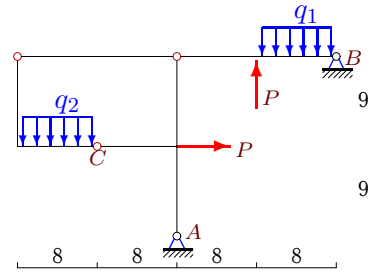
3



$q_1 = 10 \text{ кН/м},$
 $q_2 = 5 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.16.

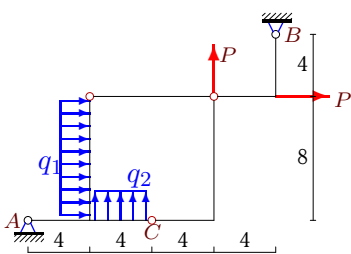
3



$q_1 = 5 \text{ кН/м},$
 $q_2 = 6 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.17.

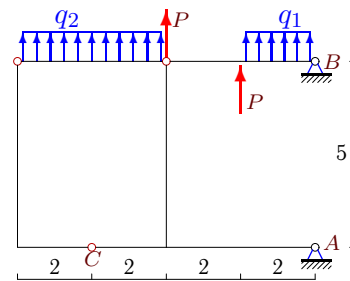
3



$q_1 = 3 \text{ кН/м},$
 $q_2 = 12 \text{ кН/м},$
 $P = 40 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.18.

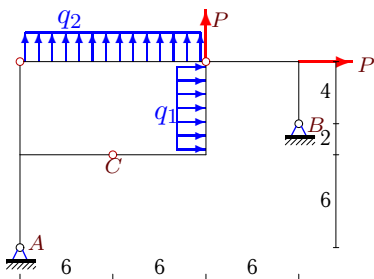
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 3 \text{ кН/м},$
 $P = 50 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.19.

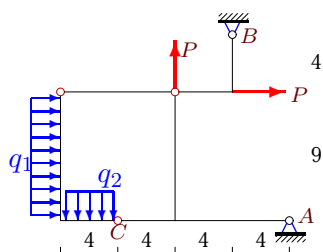
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 9 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.20.

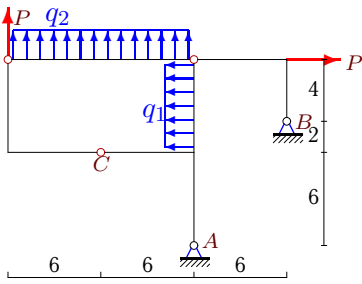
3



$q_1 = 3 \text{ кН/м},$
 $q_2 = 6 \text{ кН/м},$
 $P = 55 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.21.

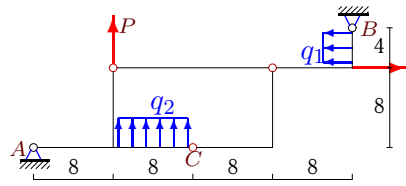
3



$q_1 = 1 \text{ кН/м},$
 $q_2 = 13 \text{ кН/м},$
 $P = 30 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.22.

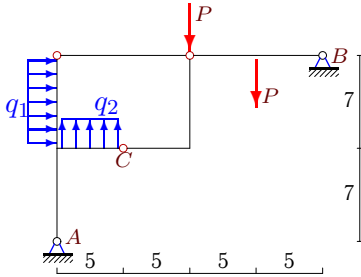
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 7 \text{ кН/м},$
 $P = 45 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.23.

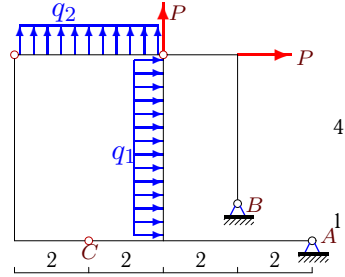
3



$q_1 = 10 \text{ кН/м},$
 $q_2 = 5 \text{ кН/м},$
 $P = 30 \text{ кН}.$
 $\Delta x_C = ?$

Задача 21.24.

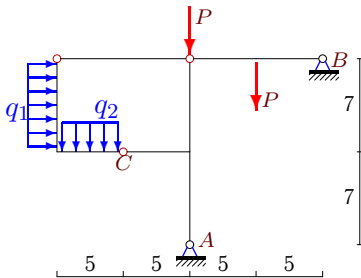
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 7 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.25.

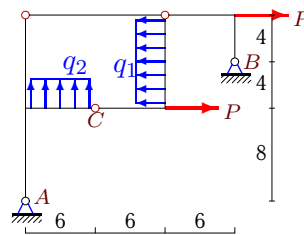
3



$q_1 = 3 \text{ кН/м},$
 $q_2 = 5 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta x_C = ?$

Задача 21.26.

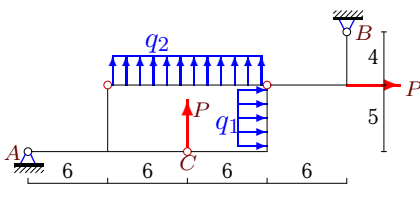
3



$q_1 = 5 \text{ кН/м},$
 $q_2 = 9 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.27.

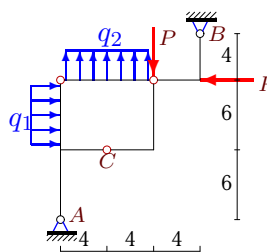
3



$q_1 = 1 \text{ кН/м},$
 $q_2 = 9 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.28.

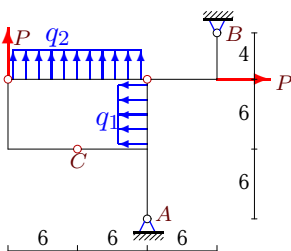
3



$q_1 = 5 \text{ кН/м},$
 $q_2 = 10 \text{ кН/м},$
 $P = 10 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.29.

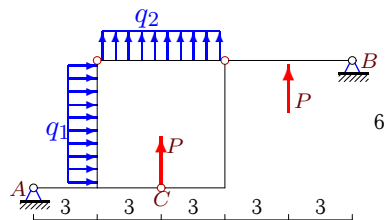
3



$q_1 = 2 \text{ кН/м},$
 $q_2 = 7 \text{ кН/м},$
 $P = 35 \text{ кН}.$
 $\Delta y_C = ?$

Задача 21.30.

3



$q_1 = 1 \text{ кН/м},$
 $q_2 = 7 \text{ кН/м},$
 $P = 25 \text{ кН}.$
 $\Delta y_C = ?$

Статически определимая рама

№	X_A	X_B	Y_A	Y_B	x_A	x_B	y_A	y_B	$EJ\Delta \cdot 10^{-3}$
1	-15.500	97.500	7.000	65.000	0.500	-0.500	-0.667	-0.333	-6.164
2	40.824	5.176	49.882	-3.882	-0.471	0.471	-0.647	-0.353	-4.317
3	-413.500	374.500	443.000	-502.000	-4.500	4.500	5.000	-6.000	359.025
4	-44.000	39.000	-100.500	-22.500	-0.375	0.375	-1.000	0.000	6.678
5	-0.800	2.800	-5.200	-2.800	-0.400	0.400	-0.600	-0.400	0.107
6	301.500	-312.500	73.714	-179.714	4.667	-4.667	1.667	-2.667	355.068
7	141.214	-140.214	-14.020	-78.980	1.500	-1.500	-0.143	-0.857	28.087
8	-93.750	48.750	-46.500	-10.500	-1.000	1.000	-1.000	0.000	8.352
9	1.000	46.000	-63.500	2.500	-0.429	0.429	-1.000	0.000	2.883
10	-19.225	-11.775	-27.065	7.065	-0.250	0.250	-0.850	-0.150	0.926
11	-11.150	35.150	-0.150	35.150	-0.100	-0.900	0.900	-0.900	-3.670
12	24.806	40.194	2.000	10.000	-0.500	-0.500	0.000	0.000	-5.020
13	-11.536	-27.464	-31.971	21.971	0.357	-0.357	-1.286	0.286	-0.592
14	84.429	-122.429	17.943	-97.943	1.071	-1.071	-0.143	-0.857	10.022
15	-131.875	121.875	-23.214	58.214	3.500	-3.500	1.000	-2.000	-73.586
16	-44.500	19.500	45.500	17.500	0.444	-0.444	-1.000	0.000	-12.800
17	24.000	-88.000	0.000	-88.000	2.000	-2.000	1.000	-2.000	15.829
18	75.200	-75.200	-88.000	-28.000	1.200	-1.200	-1.000	0.000	5.533
19	-64.000	27.000	-115.000	-18.000	-0.300	0.300	-0.800	-0.200	3.442
20	-39.618	-42.382	11.382	-42.382	0.706	-0.706	-0.294	-0.706	-3.372
21	109.500	-133.500	-275.000	89.000	0.500	-0.500	-1.333	0.333	15.251
22	135.000	-172.000	-13.000	-88.000	4.000	-4.000	1.000	-2.000	130.475
23	10.179	-80.179	20.000	15.000	-0.500	-0.500	0.000	0.000	-0.337
24	-174.333	139.333	225.667	-278.667	-2.000	2.000	3.000	-4.000	38.079
25	-18.643	-2.357	62.500	12.500	-0.500	-0.500	0.000	0.000	1.111
26	-11.750	1.750	-52.833	-1.167	-0.250	0.250	-0.833	-0.167	2.297
27	178.357	-208.357	5.905	-138.905	1.714	-1.714	0.143	-1.143	33.628
28	-42.500	22.500	-92.500	22.500	-1.000	1.000	-2.000	1.000	8.970
29	80.000	-103.000	-50.333	-68.667	0.500	-0.500	-0.667	-0.333	11.117
30	-88.750	82.750	-79.500	-12.500	-1.000	1.000	-1.000	0.000	6.264

№	1	2	3	4	5	6	7	8
1	0.000	-1.560	-1.040	0.000	-0.738	0.000	-2.592	-0.558
2	0.000	0.029	0.022	-3.410	0.058	-0.164	0.029	-0.689
3	0.000	27.108	36.144	-0.000	135.918	-0.000	0.423	159.480
4	0.000	0.000	0.000	0.136	0.000	4.428	0.000	2.816
5	0.000	0.024	0.024	0.328	0.048	0.015	0.024	0.067
6	0.000	54.793	31.310	101.885	70.448	25.575	54.793	14.047
7	0.000	7.740	4.423	0.000	9.077	0.000	5.031	1.832
8	0.000	0.000	0.000	6.741	-0.000	0.693	-0.000	0.992
9	0.000	0.000	0.000	1.330	-0.000	2.196	-0.000	-0.049
10	0.000	-0.044	-0.026	-0.141	-0.149	0.781	-0.107	0.550
11	0.000	-0.675	-0.675	-0.003	-1.518	-0.483	-0.675	0.271
12	0.000	0.000	0.000	-2.690	0.000	0.000	0.000	-3.014
13	0.000	0.262	0.209	0.000	0.034	0.000	-0.625	-0.471
14	0.000	3.498	2.798	0.000	1.872	0.000	2.708	-0.854
15	0.000	-13.312	-7.607	-16.707	-15.213	-4.655	-13.312	-2.654
16	0.000	0.000	0.000	0.000	0.198	0.000	-8.192	-4.806
17	0.000	3.755	3.755	2.048	4.096	0.512	2.048	0.000
18	0.000	0.000	0.000	0.000	3.640	0.000	0.016	1.877
19	0.000	0.259	0.173	-0.108	-0.878	3.514	-0.878	1.382
20	0.000	0.638	0.638	0.000	-3.565	0.000	-0.512	-0.571
21	0.000	2.136	1.424	0.000	-0.054	0.000	7.776	3.942
22	0.000	30.037	15.019	16.043	30.037	10.240	30.037	-2.219
23	0.000	0.000	0.000	0.745	0.000	0.000	0.000	-0.582
24	0.000	2.972	5.945	-0.000	14.578	-0.000	0.037	14.443
25	0.000	0.000	0.000	0.000	0.045	0.000	0.000	1.066
26	0.000	0.014	0.009	0.488	0.019	1.550	0.014	0.501
27	0.000	11.430	7.620	1.128	5.822	0.616	6.986	0.061
28	0.000	0.480	0.480	-0.180	1.680	2.240	1.120	3.060
29	0.000	1.648	1.099	0.000	-0.108	0.000	5.544	2.880
30	0.000	0.000	0.000	4.968	0.000	0.527	0.000	0.716