# Определение реакций опор рамы

Тяжелая однородная рама расположена в вертикальной плоскости и опирается на неподвижный шарнир A и наклонный невесомый стержень H. К раме приложены горизонтальная сила P, наклонная сила Q и момент M. Учитывая погонный вес рамы ρ, найти реакции опор.

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.31.)
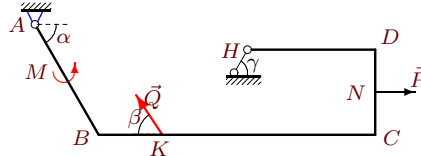

Задача S4.1. 2
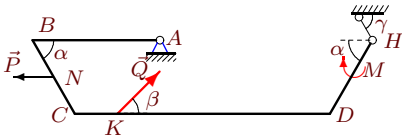
$\rho = 2$ кН/м, $P = 6$ кН, $Q = 25$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 4$ м, $CD = 12$ м,
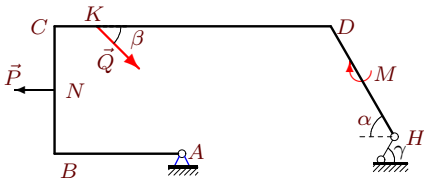$DH = 4$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.2. 2

$\rho = 2$ кН/м, $P = 8$ кН, $Q = 13$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 13$ м, $CD = 4$ м,
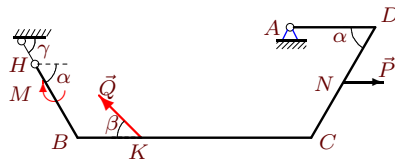$DH = 6$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.3. 2

$\rho = 2$ кН/м, $P = 6$ кН, $Q = 31$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 6$ м, $CD = 13$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.4. 2
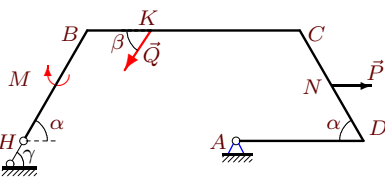

$\rho = 3$ кН/м, $P = 8$ кН, $Q = 24$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 11$ м, $CD = 6$ м,
$DA = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.5. 2
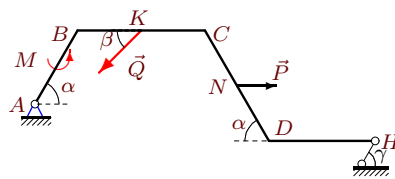

$\rho = 3$ кН/м, $P = 9$ кН, $Q = 24$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 10$ м, $CD = 6$ м,
$DA = 6$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.6. 2
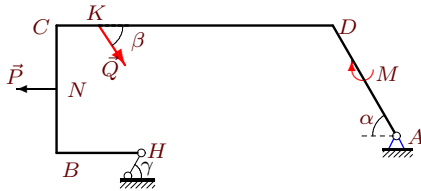

$\rho = 2$ кН/м, $P = 6$ кН, $Q = 19$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 6$ м, $CD = 6$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 3$ м.

$\rho = 3$ кН/м, $P = 9$ кН, $Q = 33$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 6$ м, $CD = 13$ м,
$DA = 6$ м, $CK = 2$ м, $CN = 3$ м.
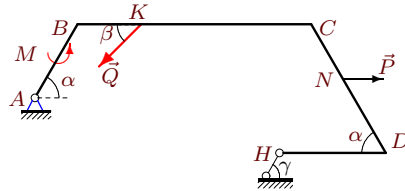
$\rho = 1$ кН/м, $P = 6$ кН, $Q = 20$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 11$ м, $CD = 7$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 3$ м.
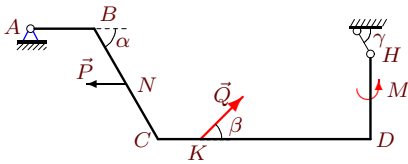
$\rho = 1$ кН/м, $P = 5$ кН, $Q = 15$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 6$ м, $CD = 10$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

$\rho = 2$ кН/м, $P = 7$ кН, $Q = 27$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 10$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 2$ м.
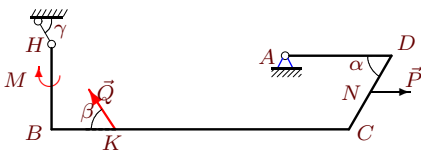
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 31$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 14$ м, $CD = 4$ м,
$DA = 5$ м, $BK = 3$ м, $CN = 2$ м.
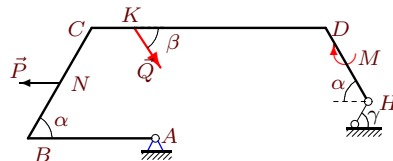
$\rho = 1$ кН/м, $P = 7$ кН, $Q = 25$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 6$ м, $CD = 11$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 3$ м.
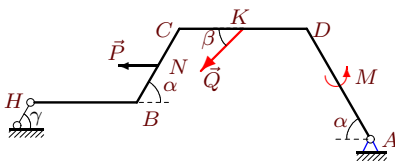
$\rho = 3$ кН/м, $P = 8$ кН, $Q = 16$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 5$ м, $BC = 4$ м, $CD = 6$ м,
$DA = 6$ м, $CK = 3$ м, $CN = 2$ м.
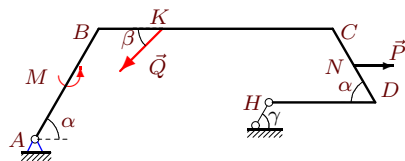
$\rho = 2$ кН/м, $P = 6$ кН, $Q = 20$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 11$ м, $CD = 4$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.15.
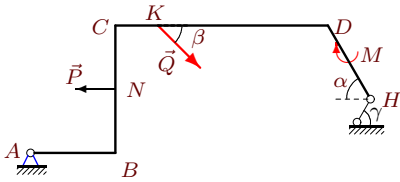
$\rho = 1$ кН/м, $P = 6$ кН, $Q = 27$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 6$ м, $CD = 10$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.16.
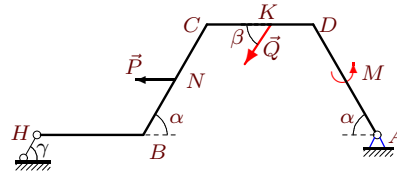
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 21$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 5$ м, $BC = 6$ м, $CD = 5$ м,
$DA = 6$ м, $CK = 3$ м, $CN = 3$ м.

Задача S4.17.
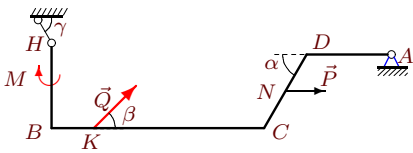
$\rho = 3$ кН/м, $P = 8$ кН, $Q = 27$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 10$ м, $CD = 4$ м,
$DA = 4$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.18.
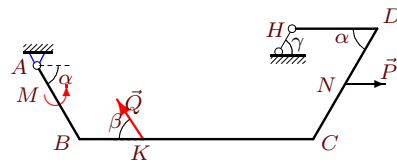
$\rho = 1$ кН/м, $P = 7$ кН, $Q = 18$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 11$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.19.

$\rho = 1$ кН/м, $P = 7$ кН, $Q = 28$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 14$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.20.
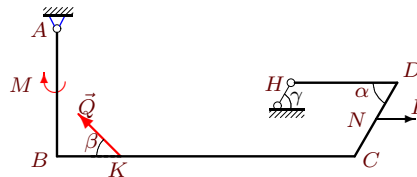
$\rho = 2$ кН/м, $P = 7$ кН, $Q = 29$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 14$ м, $CD = 4$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.21.
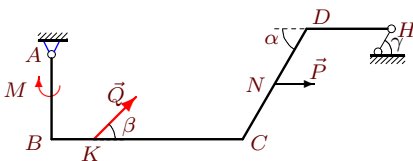
$\rho = 2$ кН/м, $P = 6$ кН, $Q = 33$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 9$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.22.
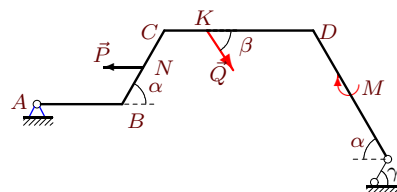
$\rho = 2$ кН/м, $P = 8$ кН, $Q = 24$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 4$ м, $CD = 7$ м,
$DH = 7$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.23.
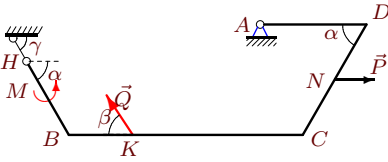
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 17$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 11$ м, $CD = 6$ м,
$DA = 5$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.24.

$\rho = 3$ кН/м, $P = 7$ кН, $Q = 13$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 60°$,
$HB = 5$ м, $BC = 4$ м, $CD = 9$ м,
$DA = 6$ м, $CK = 2$ м, $CN = 2$ м.
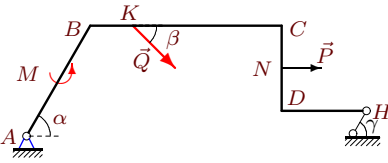
Задача S4.25.

$\rho = 1$ кН/м, $P = 5$ кН, $Q = 14$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 9$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 2$ м.
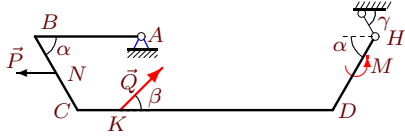
Задача S4.26.

$\rho = 2$ кН/м, $P = 7$ кН, $Q = 16$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 4$ м, $CD = 12$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.27.

$\rho = 1$ кН/м, $P = 7$ кН, $Q = 28$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 6$ м, $CD = 13$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 3$ м.
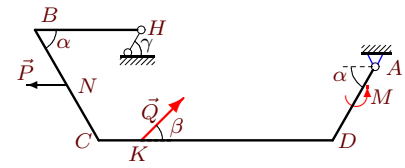
Задача S4.28.

$\rho = 3$ кН/м, $P = 8$ кН, $Q = 17$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 5$ м, $BC = 6$ м, $CD = 11$ м,
$DA = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.29.

$\rho = 2$ кН/м, $P = 6$ кН, $Q = 24$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 10$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.30.
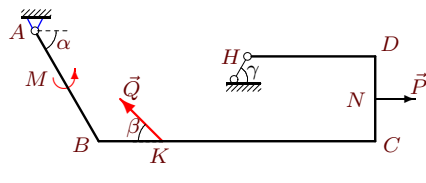
$\rho = 1$ кН/м, $P = 5$ кН, $Q = 14$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 13$ м, $CD = 4$ м,
$DH = 6$ м, $BK = 3$ м, $CN = 2$ м.

S4 **Ответы.**
Определение реакций опор рамы   04.03.2012

	$M_A(Q)$	$M_A(P)$	$\Sigma_k M_A(G_k)$	h	X_A	Y_A	R_H
1	50.000	-10.392	-44.0	7.071	-13.211	37.061	3.450
2	33.775	25.569	-549.0	7.917	-40.768	7.473	55.534
3	-99.081	18.000	-7.0	6.503	-32.600	65.747	16.621
4	-206.976	20.785	211.5	-11.258	8.984	58.006	0.027
5	145.492	-23.383	78.0	-8.660	-7.110	87.274	20.220
6	9.500	-5.196	-317.0	12.538	-4.360	36.685	20.951
7	314.367	19.765	853.5	-9.990	-65.688	14.795	116.375
8	-21.721	-5.196	-259.8	8.000	-19.643	25.100	32.083
9	127.500	-12.990	-205.5	6.964	-0.406	11.121	8.758
10	114.551	15.876	-300.0	11.693	-37.556	13.444	16.213
11	-268.468	15.588	214.5	-9.258	3.077	60.082	-6.846
12	-43.301	18.187	-18.5	3.500	-20.003	40.277	16.747
13	126.670	27.713	457.5	-14.722	-3.844	34.203	46.316
14	30.000	-20.785	-460.0	6.553	-31.924	18.756	61.156
15	-229.103	18.000	-182.0	5.804	-73.987	7.934	70.316
16	145.492	23.383	483.0	-13.856	-6.548	39.069	52.097
17	-201.150	13.856	606.0	-13.588	-12.605	21.816	28.974
18	46.765	6.062	-229.5	4.500	-26.227	-6.885	32.594
19	11.254	-29.876	-214.0	3.804	-49.376	19.700	65.098
20	-61.518	29.876	-451.0	9.571	-23.628	0.360	52.515
21	147.315	8.412	-319.0	10.468	-46.959	17.120	17.508
22	-207.846	13.856	-395.5	13.504	-35.914	32.871	45.133
23	-132.502	23.383	135.0	-10.392	4.113	55.288	9.226
24	22.050	-29.876	444.0	-12.588	-24.363	30.678	40.209
25	-98.000	-15.981	-180.5	6.964	-50.014	11.011	37.978
26	27.878	-12.124	-95.0	7.778	-1.655	36.028	3.760
27	-35.503	21.000	-63.5	5.304	-22.186	44.481	17.535
28	-90.588	-6.928	723.0	-10.392	-37.482	8.022	66.923
29	36.000	-15.588	-464.0	8.485	-23.848	25.368	54.634
30	-21.000	15.981	-274.5	6.036	-28.676	1.330	41.339

S4 файл   o4s2B