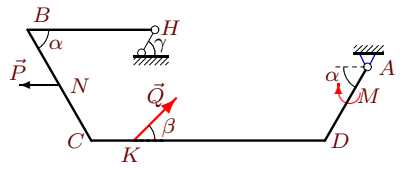
Определение реакций опор рамы

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.

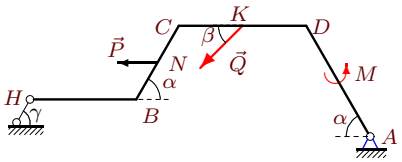
5



$\rho = 3$ кН/м, $P = 7$ кН, $Q = 25$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 6$ м, $CD = 11$ м,
$DA = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.2.

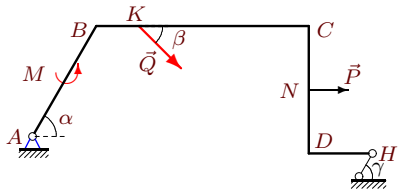
5



$\rho = 3$ кН/м, $P = 7$ кН, $Q = 20$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 60°$,
$HB = 5$ м, $BC = 4$ м, $CD = 6$ м,
$DA = 6$ м, $CK = 3$ м, $CN = 2$ м.

Задача S4.3.

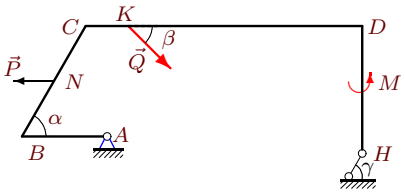
5



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 15$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 10$ м, $CD = 6$ м,
$DH = 3$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.4.

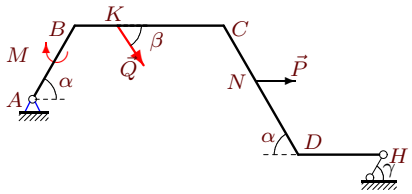
5



$\rho = 2$ кН/м, $P = 6$ кН, $Q = 12$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 6$ м, $CD = 13$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.5.

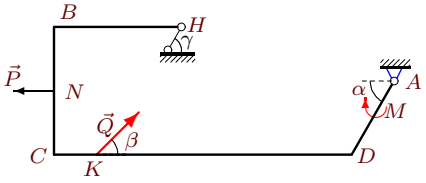
5



$\rho = 2$ кН/м, $P = 8$ кН, $Q = 26$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 7$ м, $CD = 7$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 3$ м.

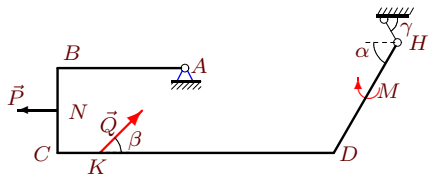
Задача S4.6.

5



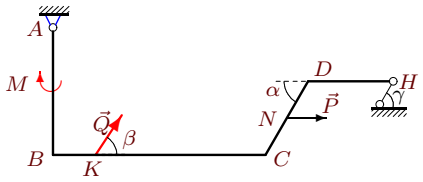
$\rho = 3$ кН/м, $P = 8$ кН, $Q = 34$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 6$ м, $CD = 14$ м,
$DA = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.7.



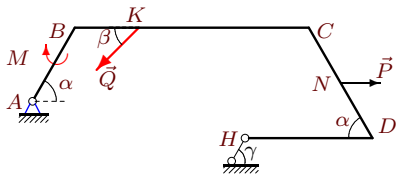
$\rho = 1$ кН/м, $P = 6$ кН, $Q = 32$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 4$ м, $CD = 13$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.8.



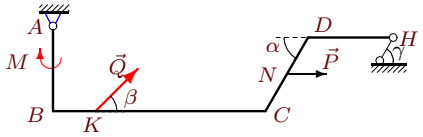
$\rho = 2$ кН/м, $P = 8$ кН, $Q = 30$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 10$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.9.



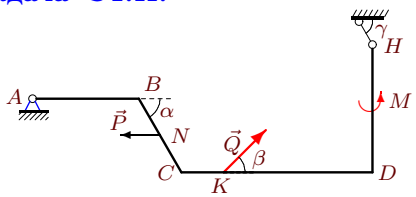
$\rho = 2$ кН/м, $P = 7$ кН, $Q = 25$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 11$ м, $CD = 6$ м,
$DH = 6$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.10.



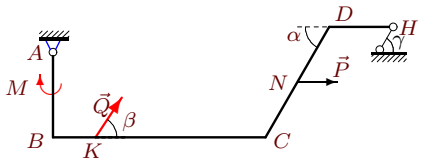
$\rho = 1$ кН/м, $P = 5$ кН, $Q = 32$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 10$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.11.



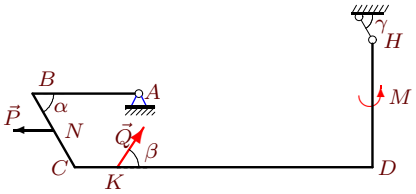
$\rho = 2$ кН/м, $P = 7$ кН, $Q = 14$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 4$ м, $CD = 9$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.12.



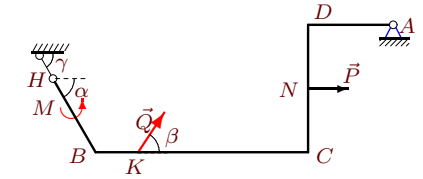
$\rho = 2$ кН/м, $P = 8$ кН, $Q = 32$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 10$ м, $CD = 6$ м,
$DH = 3$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.13.



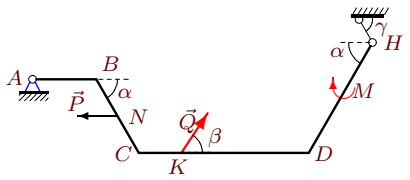
$\rho = 2$ кН/м, $P = 8$ кН, $Q = 15$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 4$ м, $CD = 14$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.14.



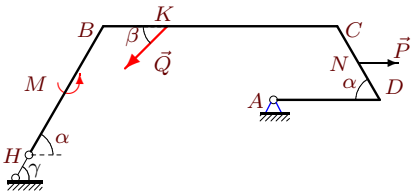
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 13$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 10$ м, $CD = 6$ м,
$DA = 4$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.15.



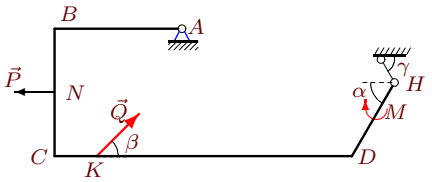
$\rho = 1$ кН/м, $P = 7$ кН, $Q = 22$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 4$ м, $CD = 8$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.16.



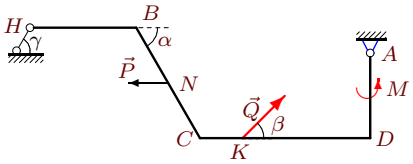
$\rho = 3$ кН/м, $P = 7$ кН, $Q = 19$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 60°$,
$HB = 7$ м, $BC = 11$ м, $CD = 4$ м,
$DA = 5$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.17.



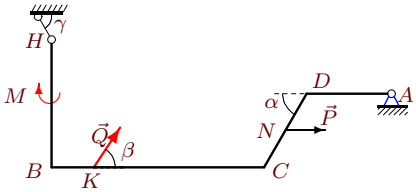
$\rho = 2$ кН/м, $P = 6$ кН, $Q = 35$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 6$ м, $CD = 14$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.18.



$\rho = 3$ кН/м, $P = 8$ кН, $Q = 15$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 5$ м, $BC = 6$ м, $CD = 8$ м,
$DA = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.19.

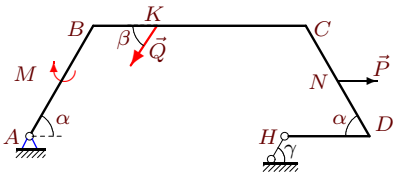


$\rho = 3$ кН/м, $P = 9$ кН, $Q = 33$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 10$ м, $CD = 4$ м,
$DA = 4$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.20.

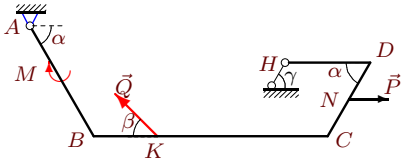
$\rho = 3$ кН/м, $P = 8$ кН, $Q = 32$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 4$ м, $CD = 14$ м,
$DA = 4$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.21.



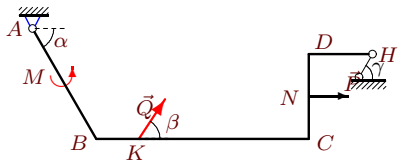
$\rho = 2$ кН/м, $P = 8$ кН, $Q = 24$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 10$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.22.



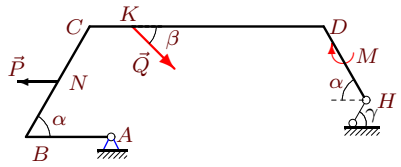
$\rho = 2$ кН/м, $P = 7$ кН, $Q = 23$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 11$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.23.



$\rho = 2$ кН/м, $P = 8$ кН, $Q = 12$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 10$ м, $CD = 4$ м,
$DH = 3$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.24.

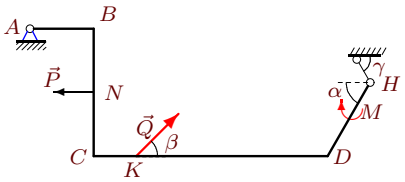


$\rho = 2$ кН/м, $P = 7$ кН, $Q = 25$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 6$ м, $CD = 11$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.25.

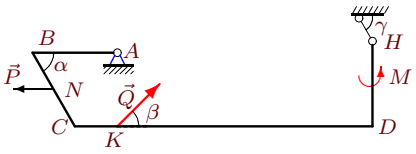
$\rho = 1$ кН/м, $P = 5$ кН, $Q = 32$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 13$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.26.



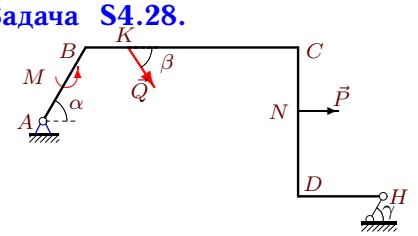
$\rho = 1$ кН/м, $P = 6$ кН, $Q = 34$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 6$ м, $CD = 11$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.27.



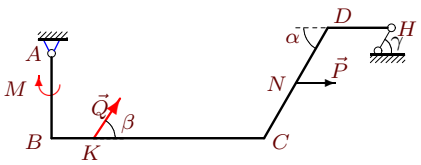
$\rho = 2$ кН/м, $P = 7$ кН, $Q = 14$ кН,
$M = 50$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 4$ м, $CD = 14$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.28.



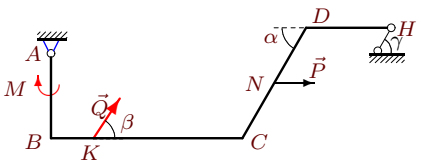
$\rho = 1$ кН/м, $P = 7$ кН, $Q = 12$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 10$ м, $CD = 7$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.29.



$\rho = 1$ кН/м, $P = 7$ кН, $Q = 32$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 10$ м, $CD = 6$ м,
$DH = 3$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.30.



$\rho = 2$ кН/м, $P = 8$ кН, $Q = 33$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 9$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 3$ м.

S4 **Ответы.**

Определение реакций опор рамы

08.04.2012

	$M_A(Q)$	$M_A(P)$	$\Sigma_k M_A(G_k)$	h	X_A	Y_A	R_H
1	-62.500	-6.062	754.5	-9.526	-49.341	8.415	69.380
2	150.000	24.249	457.5	-14.722	0.488	31.721	47.665
3	-108.147	-15.373	-421.0	11.882	-47.036	31.178	41.619
4	-60.000	15.588	-241.0	9.054	-22.778	45.614	26.002
5	-135.100	-6.928	-351.5	13.504	-47.889	39.628	38.027
6	-253.300	-3.713	912.0	-9.928	-47.769	11.005	63.454
7	0.000	-12.000	-15.5	6.036	-10.530	2.852	7.041
8	141.962	34.144	-300.0	13.107	-30.763	14.256	10.979
9	-27.151	-6.062	-503.0	8.296	-36.732	24.268	67.047
10	142.851	11.340	-150.0	8.464	-33.819	5.361	1.277
11	123.388	-12.124	-472.0	13.107	13.865	21.336	23.708
12	119.426	11.215	-325.0	10.468	-38.480	3.807	20.478
13	12.990	-13.856	-187.0	9.571	10.685	34.824	14.404
14	-96.100	27.000	546.0	-15.124	2.580	29.426	36.160
15	171.473	-12.124	-179.5	9.500	-0.796	0.097	3.700
16	104.500	-12.124	201.8	-8.660	-11.568	54.087	42.046
17	111.865	-18.000	8.0	5.278	-35.279	53.468	-15.511
18	-21.213	-11.215	469.5	-14.454	-20.147	28.013	35.081
19	-342.946	15.588	702.0	-12.588	-11.613	19.367	27.775
20	-238.400	-11.713	750.0	-10.660	-36.901	16.793	44.547
21	-62.354	-20.785	-464.0	8.485	-43.262	25.523	66.838
22	13.073	24.249	-437.0	9.710	-21.298	3.175	43.221
23	83.138	25.569	-369.0	12.160	-26.229	23.379	17.294
24	-109.534	18.187	-141.0	7.261	-35.254	43.101	34.756
25	118.277	-17.010	-227.5	5.304	-0.348	31.686	26.628
26	264.458	-18.000	-176.0	5.804	-26.317	4.736	-9.555
27	34.293	-12.124	-196.0	8.864	6.979	32.222	13.970
28	-62.354	-3.249	-214.0	11.062	-32.541	24.111	22.564
29	119.426	9.813	-162.5	6.964	-29.002	-8.178	6.930
30	123.158	11.215	-319.0	10.468	-38.323	3.599	19.548

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