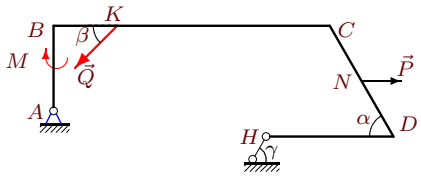
Определение реакций опор рамы

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.

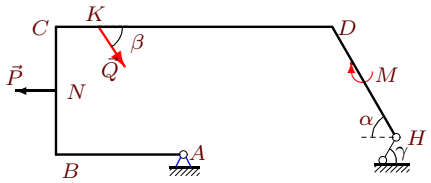
10



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 32$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 13$ м, $CD = 6$ м,
$DH = 6$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.2.

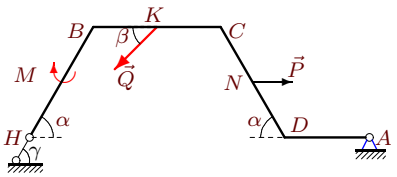
10



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

Задача S4.3.

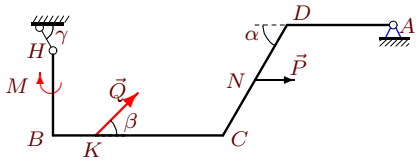
10



$\rho = 3$ кН/м, $P = 8$ кН, $Q = 26$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 6$ м, $CD = 6$ м,
$DA = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.4.

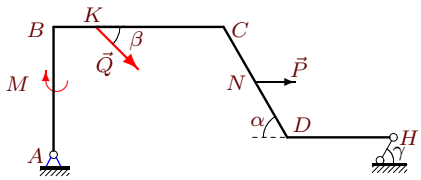
10



$\rho = 3$ кН/м, $P = 7$ кН, $Q = 33$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 8$ м, $CD = 6$ м,
$DA = 5$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.5.

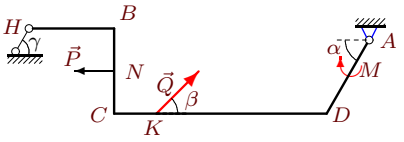
10



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 29$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 8$ м, $CD = 6$ м,
$DH = 5$ м, $BK = 2$ м, $CN = 3$ м.

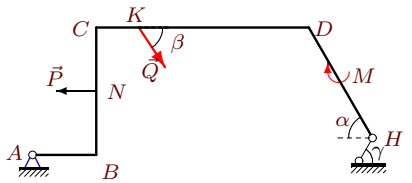
Задача S4.6.

10



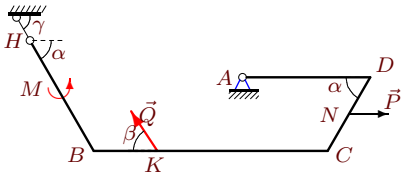
$\rho = 3$ кН/м, $P = 8$ кН, $Q = 34$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 4$ м, $CD = 10$ м,
$DA = 4$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.7.



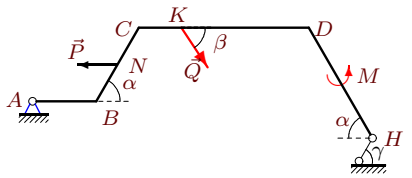
$\rho = 2$ кН/м, $P = 8$ кН, $Q = 35$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 3$ м, $BC = 6$ м, $CD = 10$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.8.



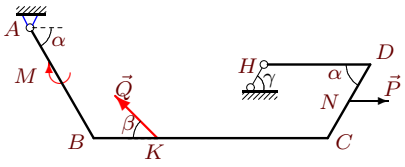
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 17$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 11$ м, $CD = 4$ м,
$DA = 6$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.9.



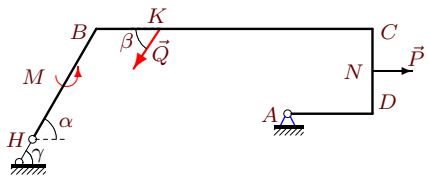
$\rho = 1$ кН/м, $P = 7$ кН, $Q = 17$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 4$ м, $CD = 8$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.10.



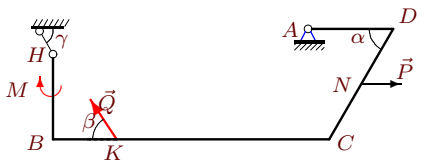
$\rho = 2$ кН/м, $P = 7$ кН, $Q = 24$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 45°$,
$AB = 6$ м, $BC = 11$ м, $CD = 4$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.11.



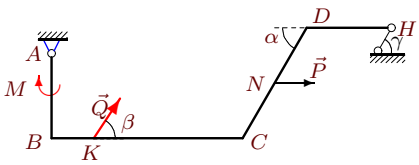
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 15$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 6$ м, $BC = 13$ м, $CD = 4$ м,
$DA = 4$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.12.



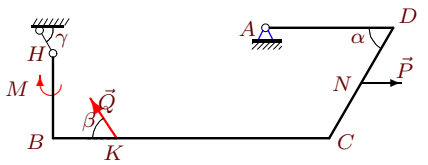
$\rho = 3$ кН/м, $P = 9$ кН, $Q = 34$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 13$ м, $CD = 6$ м,
$DA = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.13.



$\rho = 1$ кН/м, $P = 7$ кН, $Q = 33$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 9$ м, $CD = 6$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 3$ м.

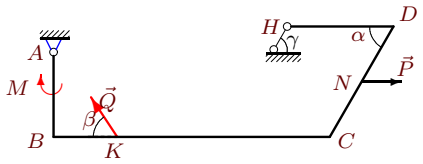
Задача S4.14.



$\rho = 3$ кН/м, $P = 9$ кН, $Q = 30$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 13$ м, $CD = 6$ м,
$DA = 6$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.15.

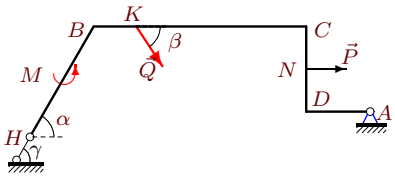
10



$\rho = 1$ кН/м, $P = 7$ кН, $Q = 30$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 13$ м, $CD = 6$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.16.

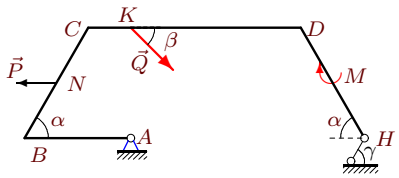
10



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

Задача S4.17.

10



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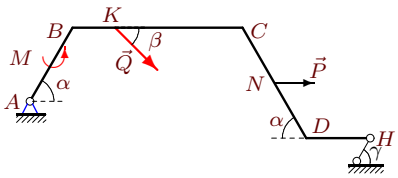
$M = 20$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 45°$,
$AB = 5$ м, $BC = 6$ м, $CD = 10$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.18.

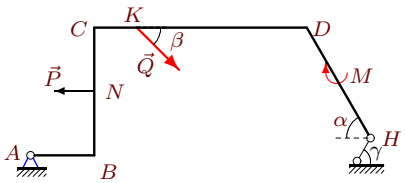
10



$\rho = 1$ кН/м, $P = 5$ кН, $Q = 17$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 8$ м, $CD = 6$ м,
$DH = 3$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.19.

10



$\rho = 1$ кН/м, $P = 6$ кН, $Q = 33$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 6$ м, $CD = 10$ м,
$DH = 6$ м, $CK = 2$ м, $CN = 3$ м.

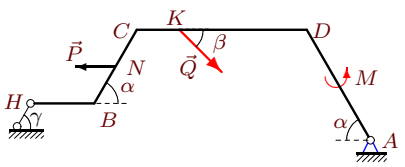
Задача S4.20.

10

$\rho = 2$ кН/м, $P = 8$ кН, $Q = 30$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 14$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.21.

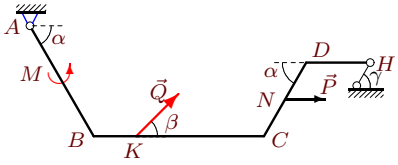
10



$\rho = 3$ кН/м, $P = 8$ кН, $Q = 18$ кН,
$M = 70$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 60°$,
$HB = 3$ м, $BC = 4$ м, $CD = 8$ м,
$DA = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.22.

10



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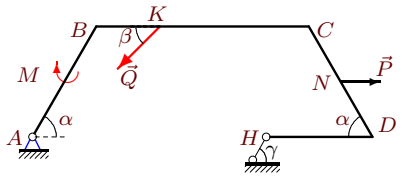
$AB = 6$ м, $BC = 8$ м, $CD = 4$ м,
$DH = 3$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.23.

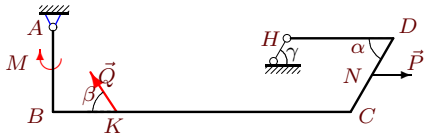
10



$\rho = 1$ кН/м, $P = 6$ кН, $Q = 26$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 45°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 10$ м, $CD = 6$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.24.

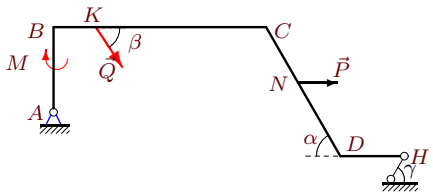
10



$\rho = 1$ кН/м, $P = 7$ кН, $Q = 35$ кН,
$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 14$ м, $CD = 4$ м,
$DH = 5$ м, $BK = 3$ м, $CN = 2$ м.

Задача S4.25.

10



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$M = 15$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
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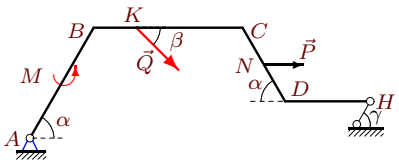
$DH = 3$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.26.

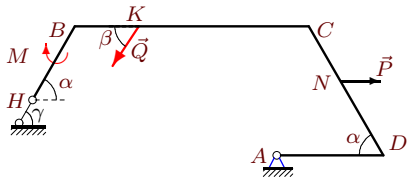
10



$\rho = 1$ кН/м, $P = 5$ кН, $Q = 18$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 6$ м, $BC = 7$ м, $CD = 4$ м,
$DH = 4$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.27.

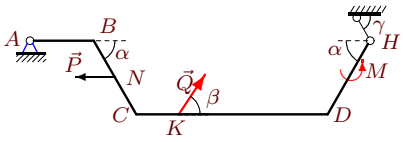
10



$\rho = 3$ кН/м, $P = 9$ кН, $Q = 24$ кН,
$M = 25$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 60°$,
$HB = 4$ м, $BC = 11$ м, $CD = 7$ м,
$DA = 5$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.28.

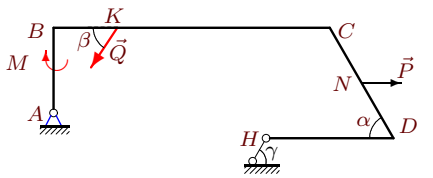
10



$\rho = 1$ кН/м, $P = 7$ кН, $Q = 17$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 30°$,
$AB = 3$ м, $BC = 4$ м, $CD = 9$ м,
$DH = 4$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.29.

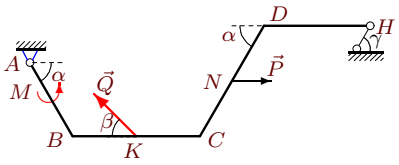
10



$\rho = 2$ кН/м, $P = 8$ кН, $Q = 30$ кН,
$M = 20$ кНм, $\alpha = 60°$, $\beta = 60°$, $\gamma = 45°$,
$AB = 4$ м, $BC = 13$ м, $CD = 6$ м,
$DH = 6$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.30.

10



$\rho = 1$ кН/м, $P = 5$ кН, $Q = 19$ кН,
$M = 30$ кНм, $\alpha = 60°$, $\beta = 30°$, $\gamma = 30°$,
$AB = 4$ м, $BC = 6$ м, $CD = 6$ м,
$DH = 5$ м, $BK = 3$ 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	22.627	-9.813	-499.0	7.917	-29.583	35.417	63.938
2	13.923	21.000	-3.5	4.304	-4.695	58.889	-3.816
3	279.378	-20.785	564.0	-13.856	-18.396	34.535	57.561
4	-82.500	18.187	634.5	-14.454	-16.720	19.836	37.717
5	-164.049	-23.813	-313.0	10.745	-61.782	36.230	48.473
6	-157.134	-11.713	534.0	-14.124	-28.083	21.102	24.083
7	-256.554	24.000	-379.0	10.745	-51.060	38.751	58.775
8	-88.335	15.588	88.5	-7.794	5.001	56.749	11.002
9	-132.502	12.124	-179.5	9.500	-26.102	21.518	28.408
10	13.642	24.249	-460.0	9.003	-24.754	0.305	49.107
11	107.942	-18.000	214.5	-9.794	-20.615	60.881	38.231
12	-353.338	23.383	289.5	-10.990	5.022	56.713	-5.956
13	123.158	9.813	-159.5	6.964	-28.664	-8.560	5.963
14	-259.808	23.383	121.5	-9.258	-1.557	74.108	-15.113
15	17.942	9.813	-239.0	4.464	-35.891	-23.321	50.681
16	97.842	-18.000	550.5	-13.258	-41.911	34.512	52.823
17	-103.500	15.588	-107.0	7.778	-33.456	45.963	27.630
18	-85.000	-4.330	-164.5	9.500	-40.127	17.719	23.561
19	-256.680	18.000	-189.5	7.304	-69.883	17.996	60.678
20	17.942	18.144	-428.0	8.864	-25.859	-6.840	46.469
21	48.415	27.713	469.5	-14.722	-25.636	39.515	41.816
22	147.000	20.785	-313.0	12.538	-29.556	26.130	7.594
23	-14.779	-15.588	-243.5	5.500	-33.100	19.124	52.521
24	20.933	15.876	-225.5	5.964	-19.077	-20.387	34.153
25	-111.962	-9.813	-177.3	10.036	-49.098	34.336	31.290
26	-126.000	-17.321	-154.5	6.500	-56.271	9.398	41.203
27	207.846	-31.177	152.3	-11.258	-10.498	78.406	26.995
28	132.502	-12.124	-166.0	8.000	0.191	4.301	1.953
29	-17.942	-11.215	-499.0	7.917	-41.959	35.021	69.239
30	-9.500	4.330	-158.5	6.500	-6.355	1.218	20.565

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