

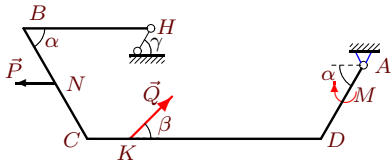
## Определение реакций опор рамы

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  $\rho$ , найти реакции опор.

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

### Задача S4.1.

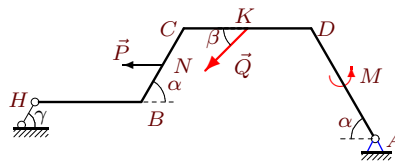
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$\rho = 3 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 25 \text{ кН}$ ,  
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 $HB = 6 \text{ м}$ ,  $BC = 6 \text{ м}$ ,  $CD = 11 \text{ м}$ ,  
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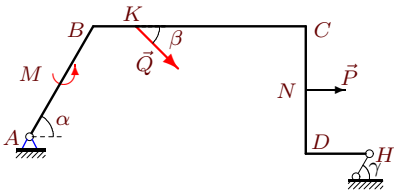
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$\rho = 3 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 20 \text{ кН}$ ,  
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 $HB = 5 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 6 \text{ м}$ ,  
 $DA = 6 \text{ м}$ ,  $CK = 3 \text{ м}$ ,  $CN = 2 \text{ м}$ .

### Задача S4.3.

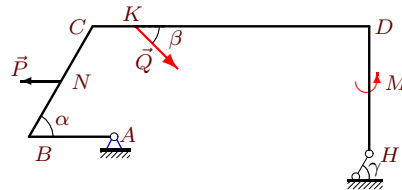
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$\rho = 2 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 15 \text{ кН}$ ,  
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 $DH = 3 \text{ м}$ ,  $BK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

### Задача S4.4.

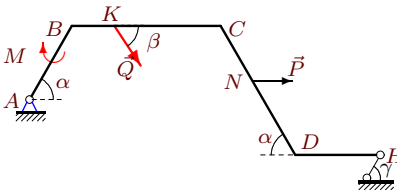
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 $DH = 6 \text{ м}$ ,  $CK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

### Задача S4.5.

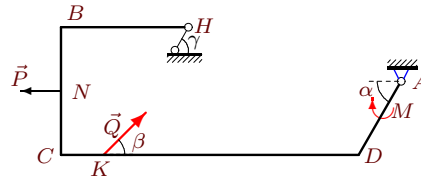
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$\rho = 2 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 26 \text{ кН}$ ,  
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### Задача S4.6.

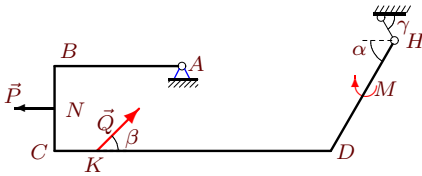
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### Задача S4.7.

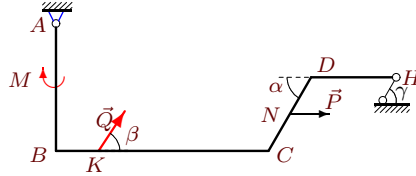
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### Задача S4.8.

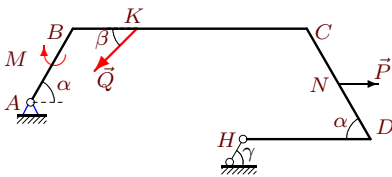
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### Задача S4.9.

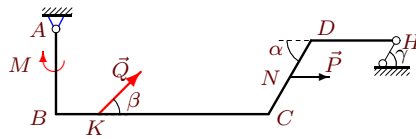
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### Задача S4.10.

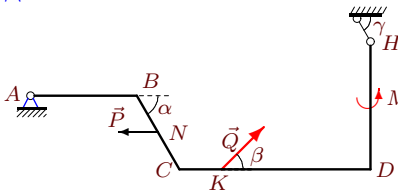
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$\rho = 1 \text{ кН/м}$ ,  $P = 5 \text{ кН}$ ,  $Q = 32 \text{ кН}$ ,  
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### Задача S4.11.

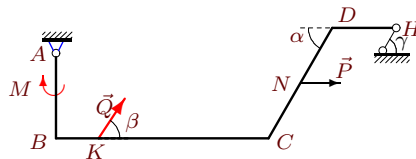
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$\rho = 2 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 14 \text{ кН}$ ,  
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### Задача S4.12.

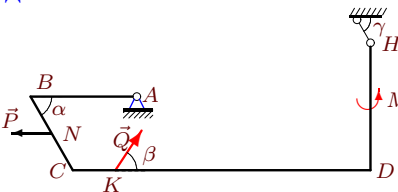
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$\rho = 2 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 32 \text{ кН}$ ,  
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 $DH = 3 \text{ м}$ ,  $BK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

### Задача S4.13.

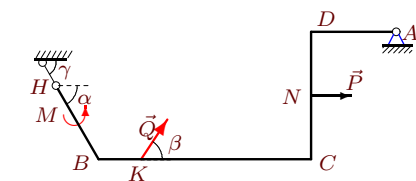
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$\rho = 2 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 15 \text{ кН}$ ,  
 $M = 50 \text{ кНм}$ ,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  $\gamma = 45^\circ$ ,  
 $AB = 5 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 14 \text{ м}$ ,  
 $DH = 6 \text{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

### Задача S4.14.

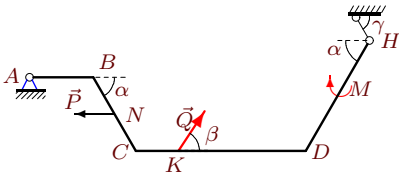
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$\rho = 3 \text{ кН/м}$ ,  $P = 9 \text{ кН}$ ,  $Q = 13 \text{ кН}$ ,  
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**Задача S4.15.**

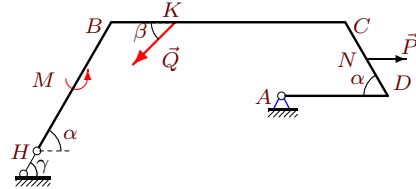
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$\rho = 1 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 22 \text{ кН}$ ,  
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**Задача S4.16.**

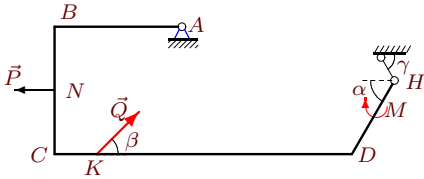
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$\rho = 3 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 19 \text{ кН}$ ,  
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**Задача S4.17.**

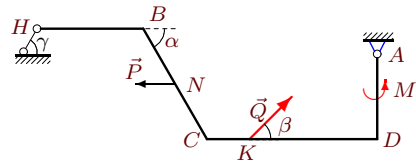
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**Задача S4.18.**

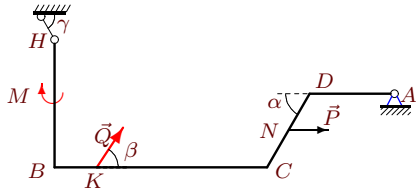
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$\rho = 3 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 15 \text{ кН}$ ,  
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**Задача S4.19.**

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$\rho = 3 \text{ кН/м}$ ,  $P = 9 \text{ кН}$ ,  $Q = 33 \text{ кН}$ ,  
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 $HB = 6 \text{ м}$ ,  $BC = 10 \text{ м}$ ,  $CD = 4 \text{ м}$ ,  
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**Задача S4.20.**

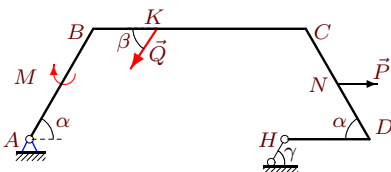
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$\rho = 3 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 32 \text{ кН}$ ,  
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 $HB = 4 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 14 \text{ м}$ ,  
 $DA = 4 \text{ м}$ ,  $CK = 2 \text{ м}$ ,  $CN = 2 \text{ м}$ .

**Задача S4.21.**

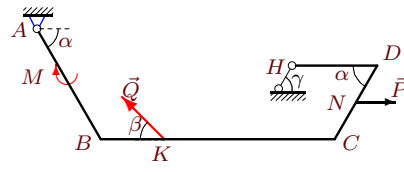
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 $DH = 4 \text{ м}$ ,  $BK = 3 \text{ м}$ ,  $CN = 3 \text{ м}$ .

**Задача S4.22.**

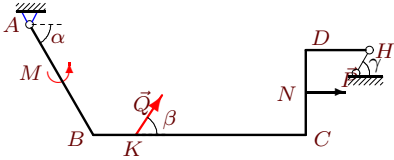
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**Задача S4.23.**

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$\rho = 2 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 12 \text{ кН}$ ,  
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**Задача S4.25.**

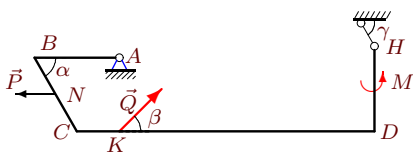
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$\rho = 1 \text{ кН/м}$ ,  $P = 5 \text{ кН}$ ,  $Q = 32 \text{ кН}$ ,  
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 $AB = 6 \text{ м}$ ,  $BC = 13 \text{ м}$ ,  $CD = 6 \text{ м}$ ,  
 $DH = 4 \text{ м}$ ,  $BK = 3 \text{ м}$ ,  $CN = 3 \text{ м}$ .

**Задача S4.27.**

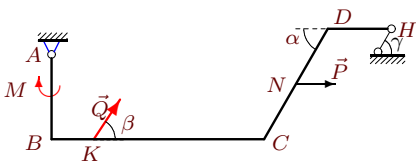
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$\rho = 2 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 14 \text{ кН}$ ,  
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 $AB = 4 \text{ м}$ ,  $BC = 4 \text{ м}$ ,  $CD = 14 \text{ м}$ ,  
 $DH = 4 \text{ м}$ ,  $CK = 2 \text{ м}$ ,  $CN = 2 \text{ м}$ .

**Задача S4.29.**

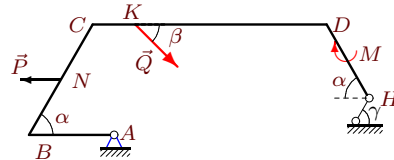
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$\rho = 1 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 32 \text{ кН}$ ,  
 $M = 15 \text{ кНм}$ ,  $\alpha = 60^\circ$ ,  $\beta = 60^\circ$ ,  $\gamma = 30^\circ$ ,  
 $AB = 4 \text{ м}$ ,  $BC = 10 \text{ м}$ ,  $CD = 6 \text{ м}$ ,  
 $DH = 3 \text{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

**Задача S4.24.**

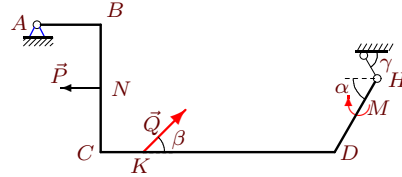
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$\rho = 2 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 25 \text{ кН}$ ,  
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 $AB = 4 \text{ м}$ ,  $BC = 6 \text{ м}$ ,  $CD = 11 \text{ м}$ ,  
 $DH = 4 \text{ м}$ ,  $CK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

**Задача S4.26.**

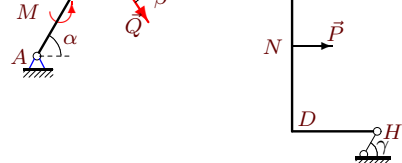
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$\rho = 1 \text{ кН/м}$ ,  $P = 6 \text{ кН}$ ,  $Q = 34 \text{ кН}$ ,  
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 $AB = 3 \text{ м}$ ,  $BC = 6 \text{ м}$ ,  $CD = 11 \text{ м}$ ,  
 $DH = 4 \text{ м}$ ,  $CK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

**Задача S4.28.**

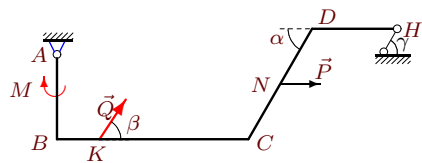
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$\rho = 1 \text{ кН/м}$ ,  $P = 7 \text{ кН}$ ,  $Q = 12 \text{ кН}$ ,  
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 $DH = 4 \text{ м}$ ,  $BK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

**Задача S4.30.**

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$\rho = 2 \text{ кН/м}$ ,  $P = 8 \text{ кН}$ ,  $Q = 33 \text{ кН}$ ,  
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 $AB = 4 \text{ м}$ ,  $BC = 9 \text{ м}$ ,  $CD = 6 \text{ м}$ ,  
 $DH = 4 \text{ м}$ ,  $BK = 2 \text{ м}$ ,  $CN = 3 \text{ м}$ .

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

04.03.2012

	$M_A(Q)$	$M_A(P)$	$\sum_k M_A(G_k)$	$h$	$X_A$	$Y_A$	$R_H$
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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