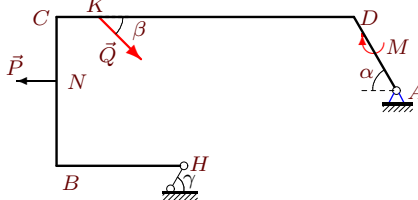


Определение реакций опор рамы

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.

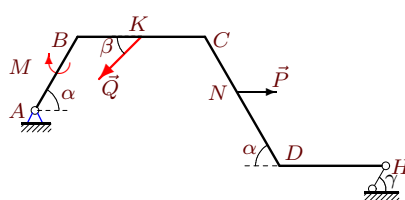
Курсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.31.)

Задача S4.1.



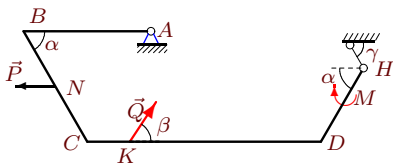
$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 6 \text{ м}$, $BC = 7 \text{ м}$, $CD = 14 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.2.



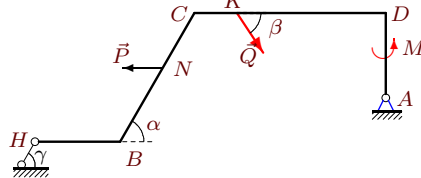
$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 25 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 6 \text{ м}$, $CD = 7 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.3.



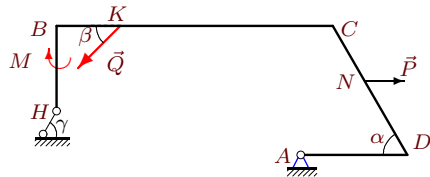
$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 23 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 6 \text{ м}$, $CD = 11 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.4.



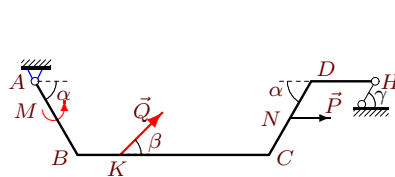
$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 14 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 7 \text{ м}$, $CD = 9 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.5.



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 13 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

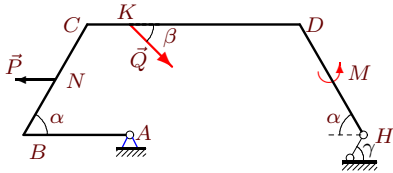
Задача S4.6.



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 17 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 9 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 3 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.7.

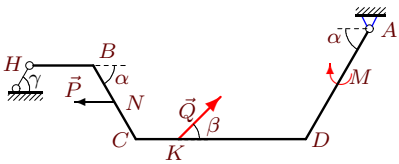
1



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 18 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 5 \text{ м}$, $BC = 6 \text{ м}$, $CD = 10 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.9.

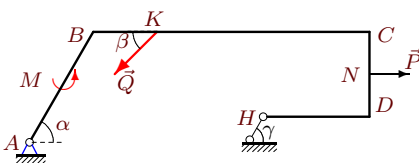
1



$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 22 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 3 \text{ м}$, $BC = 4 \text{ м}$, $CD = 8 \text{ м}$,
 $DA = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.11.

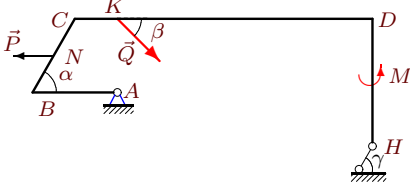
1



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 11 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 6 \text{ м}$, $BC = 13 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.13.

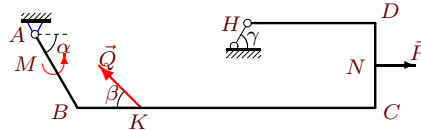
1



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 11 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 14 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.8.

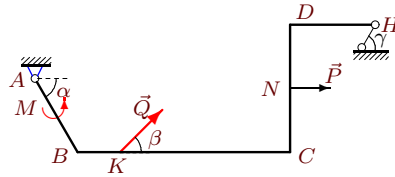
1



$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 15 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 14 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 6 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.10.

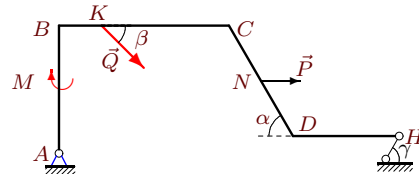
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$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 11 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 10 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.12.

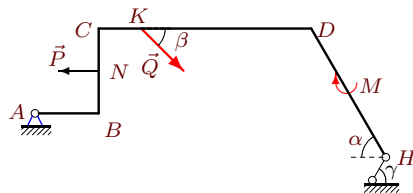
1



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 30 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 8 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.14.

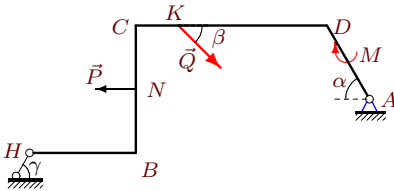
1



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 31 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 3 \text{ м}$, $BC = 4 \text{ м}$, $CD = 10 \text{ м}$,
 $DH = 7 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.15.

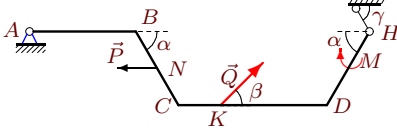
1



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 5 \text{ м}$, $BC = 6 \text{ м}$, $CD = 9 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.17.

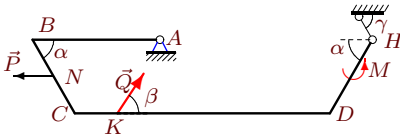
1



$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 24 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 7 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.19.

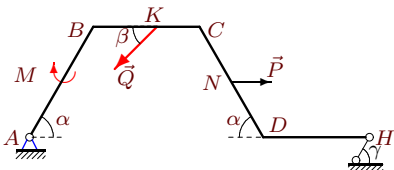
1



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 20 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 4 \text{ м}$, $CD = 12 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.21.

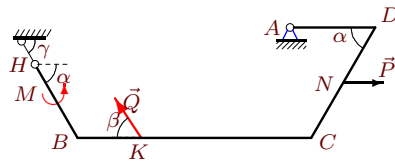
1



$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 24 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 5 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.16.

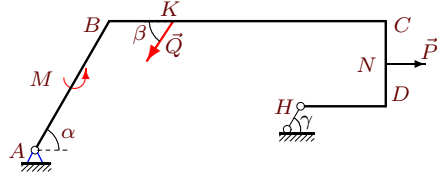
1



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 19 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 11 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.18.

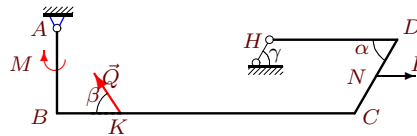
1



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 14 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 7 \text{ м}$, $BC = 13 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.20.

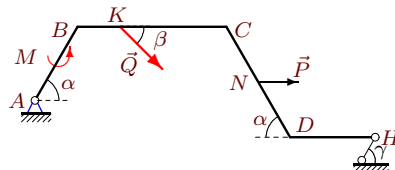
1



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 31 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 14 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 6 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.22.

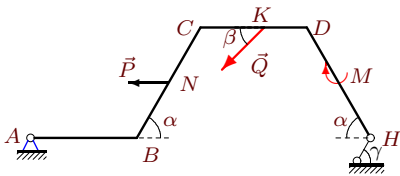
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$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 17 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 7 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.23.

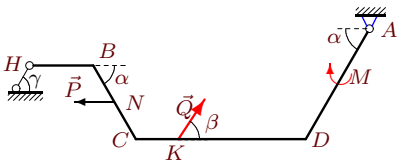
1



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 26 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 5 \text{ м}$, $BC = 6 \text{ м}$, $CD = 5 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.25.

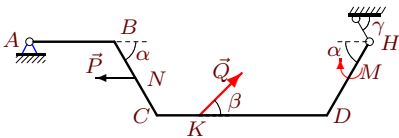
1



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 24 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 3 \text{ м}$, $BC = 4 \text{ м}$, $CD = 8 \text{ м}$,
 $DA = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.27.

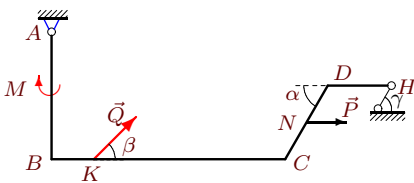
1



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 23 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 8 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.29.

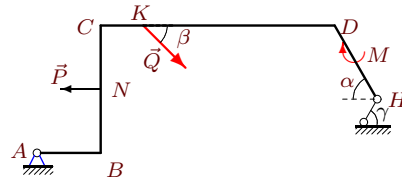
1



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 29 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 6 \text{ м}$, $BC = 11 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 3 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.24.

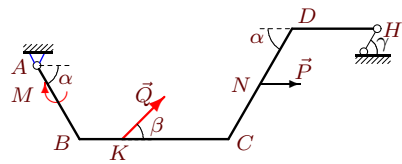
1



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 30 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 3 \text{ м}$, $BC = 6 \text{ м}$, $CD = 11 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.26.

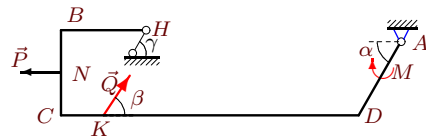
1



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 26 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 7 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.28.

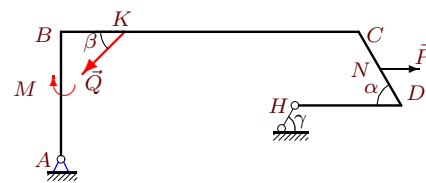
1



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 29 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 14 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.30.

1



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 35 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 6 \text{ м}$, $BC = 14 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

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	201.150	3.713	960.0	-6.892	-93.783	-31.133	165.382
2	-27.151	-5.196	-172.3	10.500	-6.434	29.221	20.914
3	39.837	-18.187	-18.5	3.500	-1.568	5.389	3.386
4	56.870	12.617	521.3	-13.258	-22.918	40.965	49.836
5	256.500	-24.249	227.3	-10.990	-3.385	66.262	39.535
6	85.000	8.660	-154.0	8.000	-23.007	9.604	3.792
7	-81.000	15.588	-107.0	7.778	-20.717	51.872	15.738
8	16.291	8.785	-272.0	4.536	-36.810	-6.519	47.824
9	-59.174	-27.713	469.5	-12.990	-21.321	23.603	27.529
10	55.000	2.321	-202.0	5.804	-31.638	8.620	19.759
11	-6.252	-22.373	-528.0	6.932	-50.898	12.102	73.081
12	-185.885	-17.010	-156.5	7.304	-75.373	14.370	51.260
13	-33.000	10.392	-244.0	10.278	-18.428	46.598	21.074
14	-197.283	14.000	-399.5	13.125	-47.394	37.447	45.925
15	40.500	3.249	588.0	-12.588	-40.482	43.759	48.199
16	-164.545	23.383	211.5	-11.258	6.733	47.750	12.465
17	211.523	-10.392	-170.0	8.000	-12.717	4.038	-2.016
18	-36.373	-28.435	-266.3	4.464	-58.405	6.404	67.440
19	0.000	-12.124	-22.0	5.000	-2.286	8.267	0.825
20	18.540	15.876	-236.0	5.464	-25.827	-18.666	39.638
21	-13.642	-15.588	-161.0	8.000	-11.246	26.144	25.654
22	-89.725	-5.196	-161.5	9.500	-38.661	21.104	23.834
23	-26.000	12.990	-191.0	8.000	3.808	21.312	27.376
24	-230.885	18.000	-352.0	9.521	-63.421	19.560	61.434
25	-124.708	-31.177	469.5	-12.990	-14.109	22.974	22.218
26	130.000	4.330	-161.5	6.500	-33.135	4.756	6.488
27	161.000	-8.660	-168.0	8.000	-11.600	6.584	3.833
28	-301.377	-13.177	750.0	-10.660	-24.751	19.541	38.502
29	179.688	25.608	-304.0	13.107	-37.519	27.096	9.057
30	74.246	-29.876	-451.0	5.985	-32.656	32.344	71.283

S4 файл о4s1B