

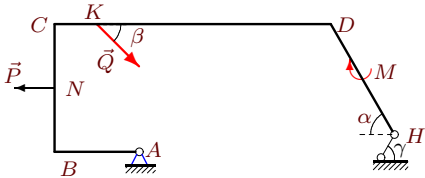
Определение реакций опор рамы

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.

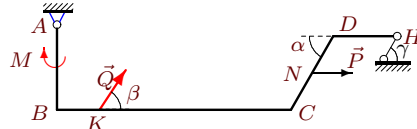
4



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 34$ кН,
 $M = 20$ кНм, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 4$ м, $BC = 6$ м, $CD = 13$ м,
 $DH = 6$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.2.

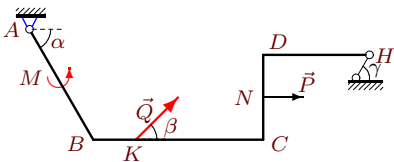
4



$\rho = 1$ кН/м, $P = 7$ кН, $Q = 31$ кН,
 $M = 15$ кНм, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 4$ м, $BC = 11$ м, $CD = 4$ м,
 $DH = 3$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.3.

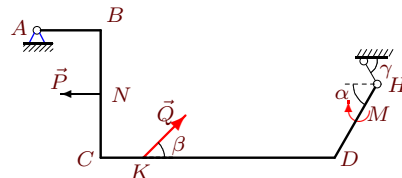
4



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 11$ кН,
 $M = 50$ кНм, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 6$ м, $BC = 8$ м, $CD = 4$ м,
 $DH = 5$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.4.

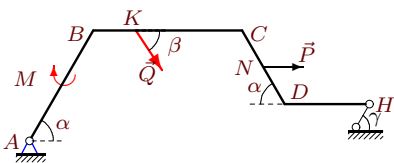
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$\rho = 1$ кН/м, $P = 5$ кН, $Q = 33$ кН,
 $M = 15$ кНм, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 3$ м, $BC = 6$ м, $CD = 11$ м,
 $DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.5.

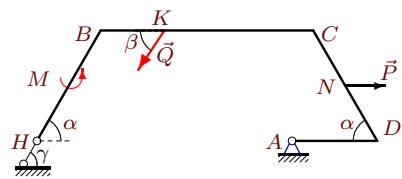
4



$\rho = 2$ кН/м, $P = 8$ кН, $Q = 25$ кН,
 $M = 20$ кНм, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 45^\circ$,
 $AB = 6$ м, $BC = 7$ м, $CD = 4$ м,
 $DH = 4$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.6.

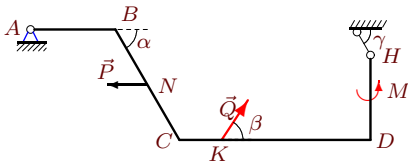
4



$\rho = 3$ кН/м, $P = 9$ кН, $Q = 19$ кН,
 $M = 70$ кНм, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 6$ м, $BC = 10$ м, $CD = 6$ м,
 $DA = 4$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.7.

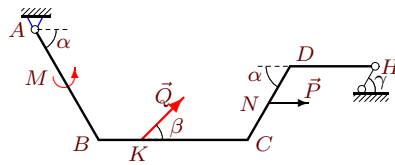
4



$\rho = 2 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 12 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 6 \text{ м}$, $CD = 9 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.8.

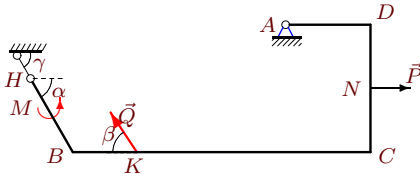
4



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 20 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 6 \text{ м}$, $BC = 7 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.9.

4



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 12 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 14 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.10.

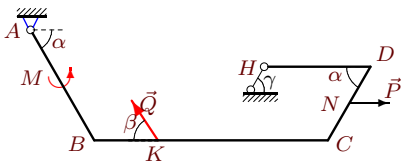
4



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 30 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 14 \text{ м}$, $CD = 4 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.11.

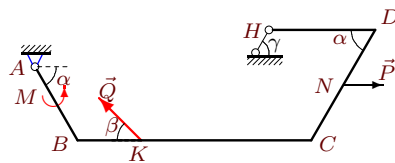
4



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 18 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 11 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.12.

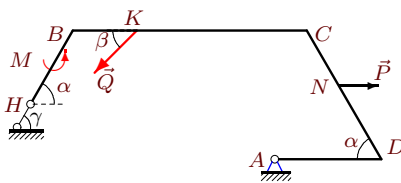
4



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 20 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 11 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.13.

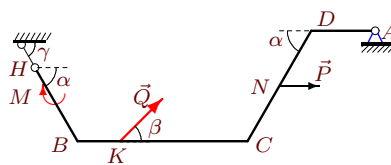
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$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 18 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 11 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.14.

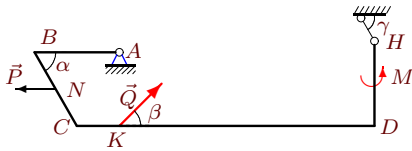
4



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 23 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 8 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 3 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.15.

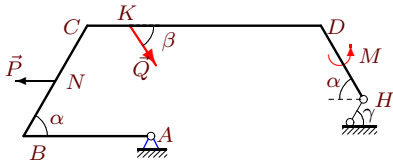
4



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

Задача S4.17.

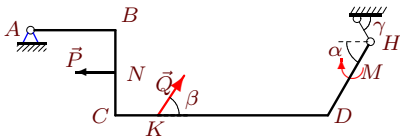
4



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 16 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 6 \text{ м}$, $CD = 11 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.19.

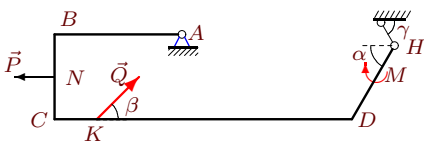
4



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 34 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 10 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.21.

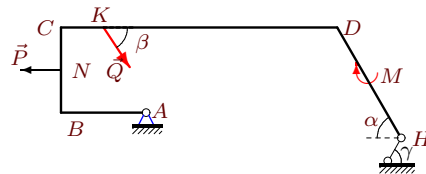
4



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 34 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 4 \text{ м}$, $CD = 14 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.16.

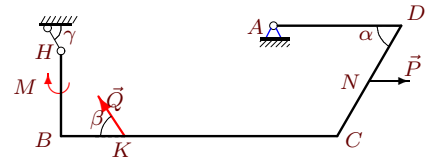
4



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 13 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.18.

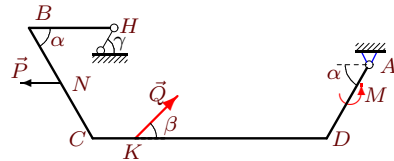
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$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 28 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 13 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 6 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.20.

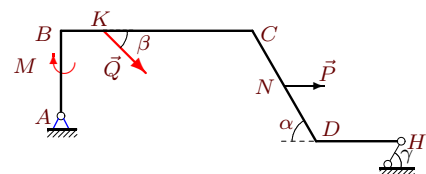
4



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 20 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 6 \text{ м}$, $CD = 11 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.22.

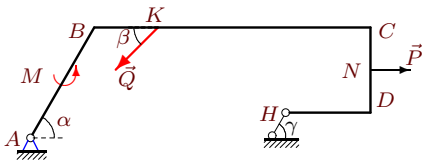
4



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 32 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 9 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.23.

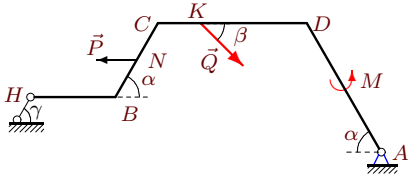
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$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 15 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 13 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.25.

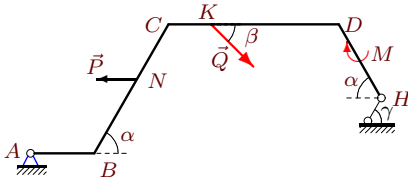
4



$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 18 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 7 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.27.

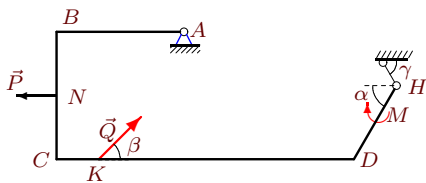
4



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 22 \text{ кН}$,
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 $AB = 3 \text{ м}$, $BC = 7 \text{ м}$, $CD = 8 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.29.

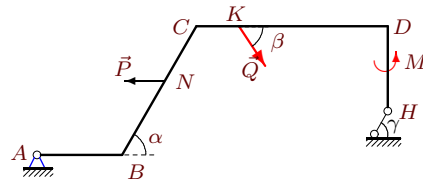
4



$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 6 \text{ м}$, $CD = 14 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.24.

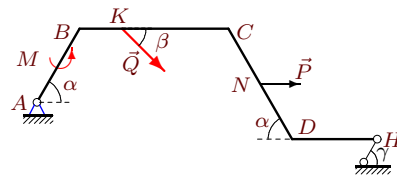
4



$\rho = 2 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 15 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 7 \text{ м}$, $CD = 9 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.26.

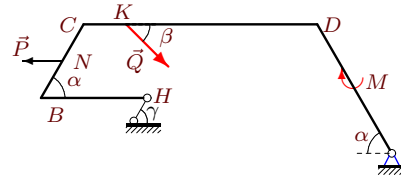
4



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 20 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 7 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.28.

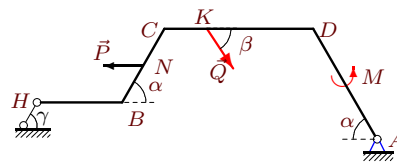
4



$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 24 \text{ кН}$,
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 $HB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 11 \text{ м}$,
 $DA = 7 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.30.

4



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 18 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

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	-96.167	21.000	-127.0	7.917	-36.885	62.199	28.062
2	115.694	15.876	-152.0	8.464	-26.125	-6.940	4.186
3	79.307	22.373	-353.0	12.160	-26.485	26.515	16.557
4	253.973	-15.000	-176.0	5.804	-30.737	11.633	-8.266
5	-173.205	-27.713	-309.0	10.089	-57.640	26.510	52.525
6	148.090	-23.383	240.0	-10.392	-20.415	58.229	41.830
7	124.708	-20.785	-417.0	10.468	19.771	17.837	25.132
8	140.000	20.785	-309.0	12.538	-28.859	26.461	7.833
9	-108.746	27.000	162.0	-11.660	3.443	62.448	12.886
10	-225.000	12.124	294.0	-10.124	21.753	58.199	5.543
11	46.765	24.249	-230.0	7.000	-13.958	1.198	18.427
12	21.721	6.062	-482.0	6.553	-36.472	-5.757	61.680
13	159.890	-27.713	152.3	-11.258	-11.013	66.464	31.481
14	-34.500	18.187	514.5	-14.722	-10.848	23.665	32.141
15	34.293	-10.392	-98.0	6.464	2.009	12.689	6.822
16	-7.235	14.000	-71.5	7.036	-16.314	44.716	11.333
17	-27.713	18.187	-18.5	3.500	-0.512	41.138	-0.564
18	-242.487	23.383	121.5	-9.258	-1.621	74.220	-13.243
19	244.669	-14.000	-174.0	7.536	-14.789	-4.680	-5.529
20	-50.000	-6.062	688.5	-11.258	-41.517	10.966	62.393
21	49.779	-10.000	-8.0	4.536	-27.649	12.850	-3.699
22	-135.765	-9.813	-319.0	12.160	-57.807	40.448	39.852
23	-8.526	-19.177	-252.5	4.964	-39.043	12.405	50.402
24	-168.875	27.713	-444.5	10.209	-36.601	23.889	52.469
25	31.028	34.641	495.8	-15.588	-24.981	43.649	40.506
26	-100.000	-4.330	-161.5	9.500	-43.819	18.588	24.824
27	-209.000	17.321	-183.8	6.000	-70.406	0.464	65.072
28	109.253	34.641	729.8	-11.258	-46.660	32.690	75.379
29	38.184	-18.000	4.0	2.804	-15.928	12.546	-3.275
30	77.942	31.177	463.5	-14.722	-21.824	40.787	43.649

S4 файл о4s4B