

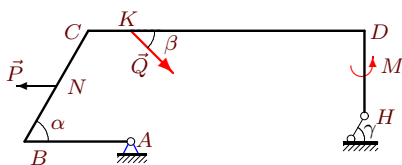
Определение реакций опор рамы

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.

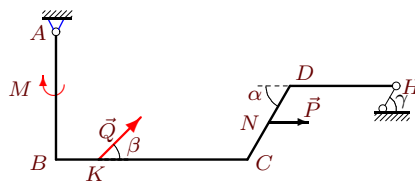
7



$\rho = 1$ кН/м, $P = 5$ кН, $Q = 14$ кН,
 $M = 30$ кНм, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 5$ м, $BC = 6$ м, $CD = 13$ м,
 $DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.2.

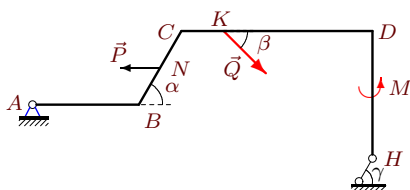
7



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 30$ кН,
 $M = 20$ кНм, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 6$ м, $BC = 9$ м, $CD = 4$ м,
 $DH = 5$ м, $BK = 2$ м, $CN = 2$ м.

Задача S4.3.

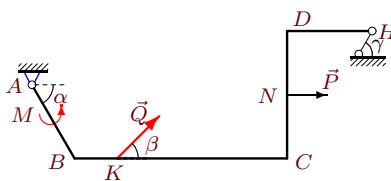
7



$\rho = 1$ кН/м, $P = 6$ кН, $Q = 12$ кН,
 $M = 30$ кНм, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 5$ м, $BC = 4$ м, $CD = 9$ м,
 $DH = 6$ м, $CK = 2$ м, $CN = 2$ м.

Задача S4.4.

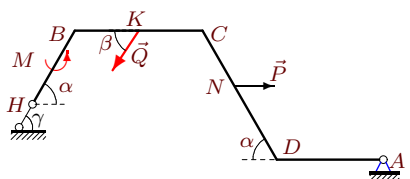
7



$\rho = 1$ кН/м, $P = 5$ кН, $Q = 12$ кН,
 $M = 30$ кНм, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 4$ м, $BC = 10$ м, $CD = 6$ м,
 $DH = 4$ м, $BK = 2$ м, $CN = 3$ м.

Задача S4.5.

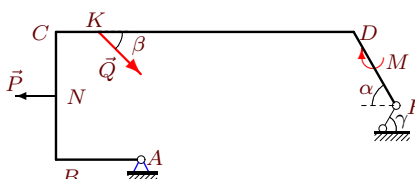
7



$\rho = 3$ кН/м, $P = 9$ кН, $Q = 16$ кН,
 $M = 70$ кНм, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4$ м, $BC = 6$ м, $CD = 7$ м,
 $DA = 5$ м, $BK = 3$ м, $CN = 3$ м.

Задача S4.6.

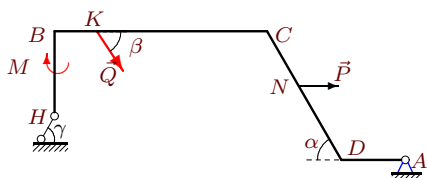
7



$\rho = 2$ кН/м, $P = 7$ кН, $Q = 33$ кН,
 $M = 20$ кНм, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 4$ м, $BC = 6$ м, $CD = 14$ м,
 $DH = 4$ м, $CK = 2$ м, $CN = 3$ м.

Задача S4.7.

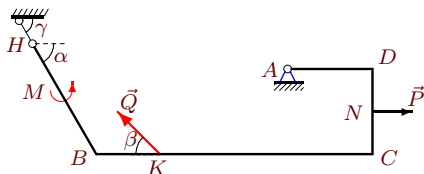
7



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 32 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 10 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 3 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.9.

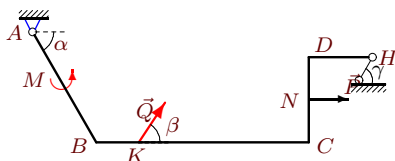
7



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 12 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 6 \text{ м}$, $BC = 13 \text{ м}$, $CD = 4 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.11.

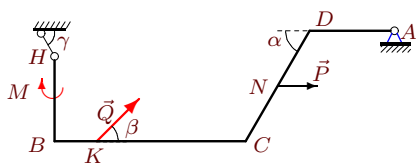
7



$\rho = 1 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 13 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 10 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 3 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.13.

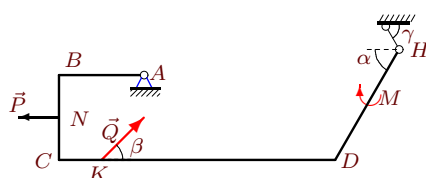
7



$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 30 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 9 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.8.

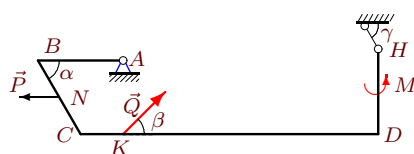
7



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 28 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 13 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.10.

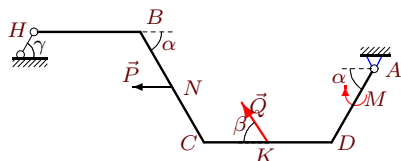
7



$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 12 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 14 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.12.

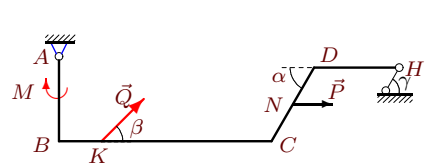
7



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 23 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 5 \text{ м}$, $BC = 6 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.14.

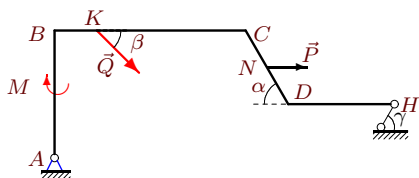
7



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 10 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.15.

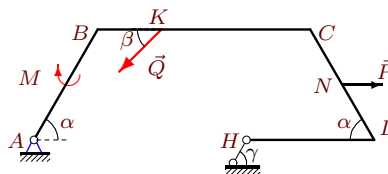
7



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 30 \text{ кН}$,
 $M = 20 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 6 \text{ м}$, $BC = 9 \text{ м}$, $CD = 4 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.16.

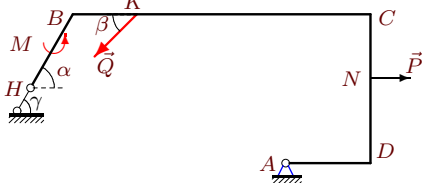
7



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 24 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 6 \text{ м}$, $BC = 10 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 6 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.17.

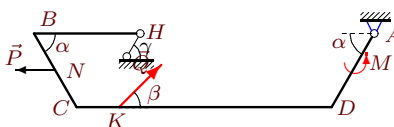
7



$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 12 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 14 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.18.

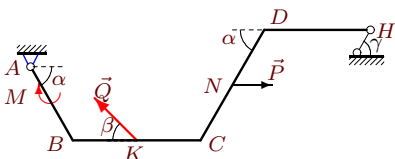
7



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 17 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 12 \text{ м}$,
 $DA = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.19.

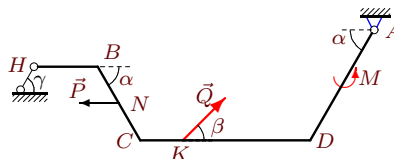
7



$\rho = 1 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 22 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 30^\circ$,
 $AB = 4 \text{ м}$, $BC = 6 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.20.

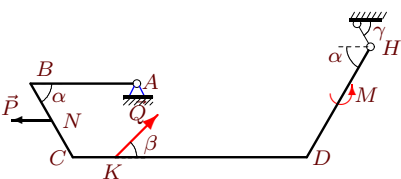
7



$\rho = 3 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 21 \text{ кН}$,
 $M = 70 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 60^\circ$,
 $HB = 3 \text{ м}$, $BC = 4 \text{ м}$, $CD = 8 \text{ м}$,
 $DA = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.21.

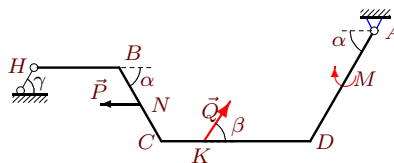
7



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 19 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 11 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.22.

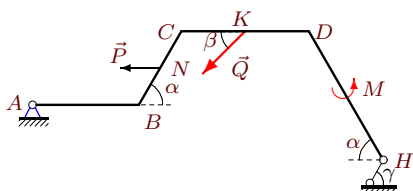
7



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 22 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 4 \text{ м}$, $BC = 4 \text{ м}$, $CD = 7 \text{ м}$,
 $DA = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.23.

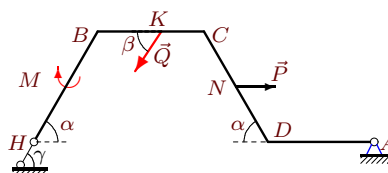
7



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 21 \text{ кН}$,
 $M = 30 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 7 \text{ м}$, $CK = 3 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.24.

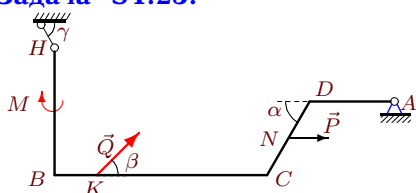
7



$\rho = 3 \text{ кН/м}$, $P = 9 \text{ кН}$, $Q = 24 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 60^\circ$, $\gamma = 60^\circ$,
 $HB = 6 \text{ м}$, $BC = 5 \text{ м}$, $CD = 6 \text{ м}$,
 $DA = 5 \text{ м}$, $BK = 3 \text{ м}$, $CN = 3 \text{ м}$.

Задача S4.25.

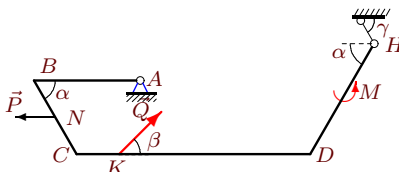
7



$\rho = 3 \text{ кН/м}$, $P = 8 \text{ кН}$, $Q = 31 \text{ кН}$,
 $M = 25 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 60^\circ$,
 $HB = 6 \text{ м}$, $BC = 10 \text{ м}$, $CD = 4 \text{ м}$,
 $DA = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.26.

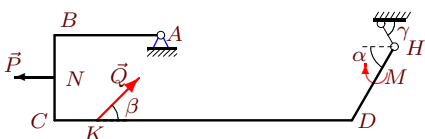
7



$\rho = 2 \text{ кН/м}$, $P = 6 \text{ кН}$, $Q = 19 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 45^\circ$,
 $AB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 11 \text{ м}$,
 $DH = 6 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.27.

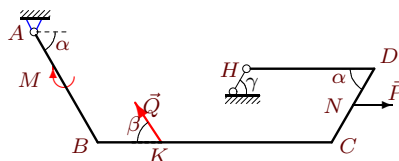
7



$\rho = 1 \text{ кН/м}$, $P = 5 \text{ кН}$, $Q = 27 \text{ кН}$,
 $M = 15 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 30^\circ$, $\gamma = 30^\circ$,
 $AB = 5 \text{ м}$, $BC = 4 \text{ м}$, $CD = 14 \text{ м}$,
 $DH = 4 \text{ м}$, $CK = 2 \text{ м}$, $CN = 2 \text{ м}$.

Задача S4.28.

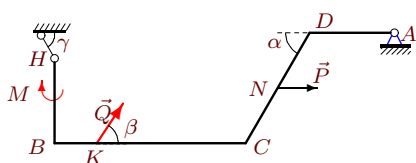
7



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

Задача S4.29.

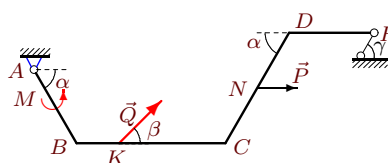
7



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

Задача S4.30.

7



$\rho = 2 \text{ кН/м}$, $P = 7 \text{ кН}$, $Q = 17 \text{ кН}$,
 $M = 50 \text{ кНм}$, $\alpha = 60^\circ$, $\beta = 45^\circ$, $\gamma = 45^\circ$,
 $AB = 4 \text{ м}$, $BC = 7 \text{ м}$, $CD = 6 \text{ м}$,
 $DH = 4 \text{ м}$, $BK = 2 \text{ м}$, $CN = 3 \text{ м}$.

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	-63.000	12.990	-69.0	4.464	-24.392	25.031	19.939
2	169.706	29.876	-296.0	13.107	-34.494	20.506	8.882
3	-105.761	10.392	-236.0	10.196	-28.083	17.707	29.557
4	60.000	2.321	-202.0	5.804	-31.758	8.551	18.898
5	207.846	-31.177	572.3	-15.588	-27.267	34.361	52.534
6	-93.338	21.000	-108.0	6.692	-37.503	58.166	29.936
7	304.841	-31.177	656.3	-15.321	-54.533	48.561	59.066
8	39.598	-14.000	-143.0	9.331	-2.387	23.789	14.725
9	-77.569	14.000	214.5	-9.794	14.671	55.465	22.557
10	29.394	-10.392	-98.0	6.464	4.079	13.725	7.580
11	90.067	22.373	-184.5	9.036	-17.531	9.414	4.655
12	-139.430	-7.794	475.5	-14.722	10.200	25.242	20.600
13	-186.758	20.785	625.5	-14.454	-14.182	21.753	30.062
14	120.531	13.608	-300.0	11.693	-40.623	19.260	15.896
15	-185.885	-25.608	-296.0	9.521	-71.158	23.822	55.406
16	36.000	-12.990	-254.0	5.000	-26.822	15.401	49.198
17	118.794	-32.000	150.0	-12.160	-12.129	73.636	25.229
18	-51.000	-12.124	682.5	-9.526	-43.905	3.829	72.366
19	23.893	5.196	-158.5	6.500	-9.684	-5.665	22.217
20	0.000	-24.249	469.5	-12.990	-31.019	18.150	39.664
21	47.500	-10.392	-112.0	9.003	-8.499	40.545	2.765
22	-95.263	-31.177	463.5	-12.990	-14.011	23.143	24.022
23	-42.000	8.660	-199.8	10.500	6.436	22.829	19.342
24	270.200	-23.383	573.0	-13.856	-25.680	37.109	57.361
25	-230.950	13.856	702.0	-12.588	-11.653	18.440	36.534
26	47.500	-10.392	-112.0	9.003	-8.499	40.545	2.765
27	53.031	-10.000	-35.5	5.036	-17.098	12.758	1.483
28	59.756	24.249	-240.5	6.500	-18.349	-6.111	26.384
29	-285.788	23.383	625.5	-14.454	-12.305	22.763	23.390
30	89.725	6.062	-323.0	10.089	-31.441	17.559	17.565

S4 файл о4s7B