

Трение качения

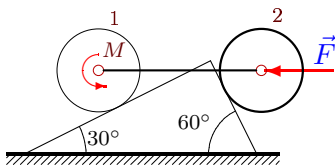
Система состоит из двух цилиндров весом P_1 и P_2 с одинаковыми радиусами R , соединенных однородным стержнем весом P_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). В каких пределах меняется внешний момент M при условии равновесия системы?

В ответах даны нормальные реакции опор и момент M для движения цилиндра 2 по часовой стрелке и против (последние три столбца).

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.— М.: ФИЗМАТЛИТ, 2008. — 384 с. (с.80.)

Задача S-18.1.

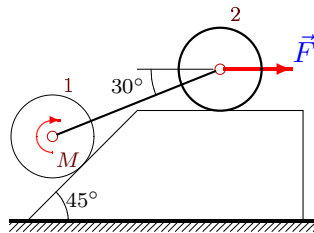
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$$P_1 = 22 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 30 \text{ Н}, \\ F = 10 \text{ Н}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$$

Задача S-18.2.

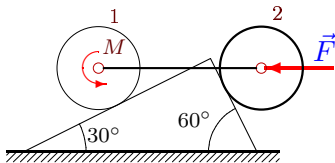
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$$P_1 = 24 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 20 \text{ Н}, \\ F = 20 \text{ Н}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$$

Задача S-18.3.

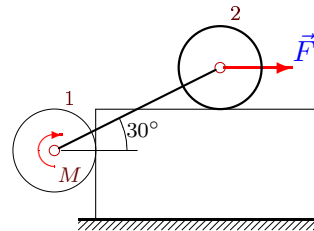
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$$P_1 = 22 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 20 \text{ Н}, \\ F = 10 \text{ Н}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$$

Задача S-18.4.

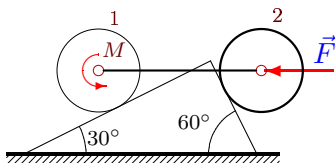
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$$P_1 = 23 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 50 \text{ Н}, \\ F = 15 \text{ Н}, R = 35 \text{ см}, \delta = 2 \text{ мм}.$$

Задача S-18.5.

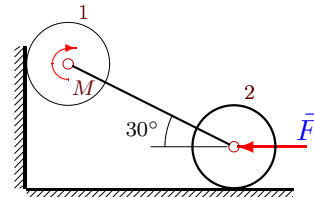
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$$P_1 = 23 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 20 \text{ Н}, \\ F = 15 \text{ Н}, R = 25 \text{ см}, \delta = 1 \text{ мм}.$$

Задача S-18.6.

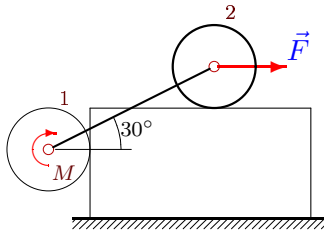
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$$P_1 = 5 \text{ Н}, P_2 = 24 \text{ Н}, P_3 = 20 \text{ Н}, \\ F = 10 \text{ Н}, R = 45 \text{ см}, \delta = 4 \text{ мм}.$$

Задача S-18.7.

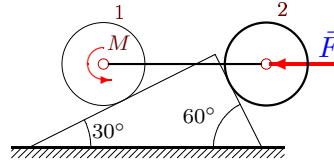
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$P_1 = 21 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 5 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.8.

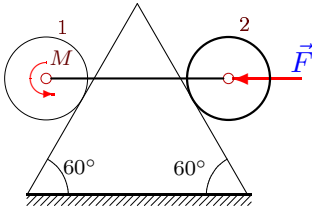
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$P_1 = 23 \text{ H}, P_2 = 24 \text{ H}, P_3 = 10 \text{ H},$
 $F = 15 \text{ H}, R = 45 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.9.

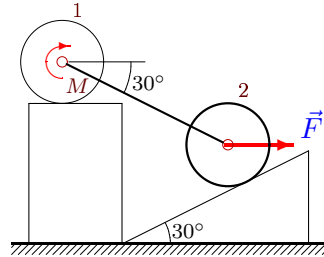
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$P_1 = 11 \text{ H}, P_2 = 27 \text{ H}, P_3 = 10 \text{ H},$
 $F = 10 \text{ H}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.10.

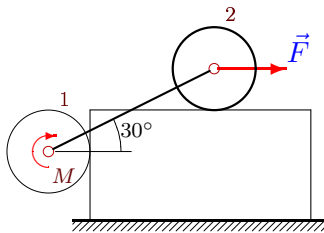
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$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 50 \text{ H},$
 $F = 20 \text{ H}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.11.

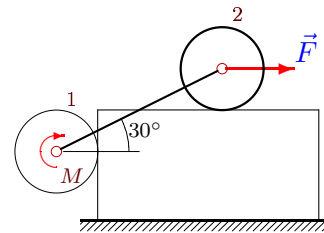
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$P_1 = 24 \text{ H}, P_2 = 27 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 70 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.12.

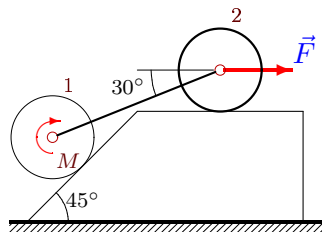
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$P_1 = 23 \text{ H}, P_2 = 25 \text{ H}, P_3 = 20 \text{ H},$
 $F = 15 \text{ H}, R = 65 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.13.

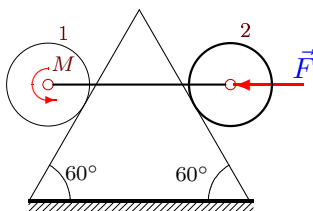
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$P_1 = 22 \text{ H}, P_2 = 23 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 50 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.14.

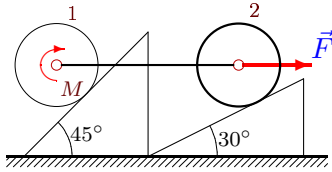
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$P_1 = 11 \text{ H}, P_2 = 24 \text{ H}, P_3 = 40 \text{ H},$
 $F = 15 \text{ H}, R = 25 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.15.

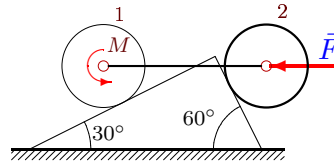
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$P_1 = 23 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 15 \text{ H}, R = 55 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.16.

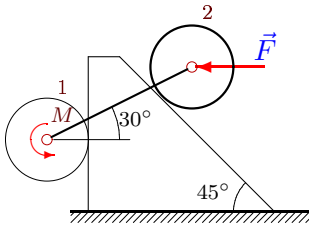
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$P_1 = 24 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 20 \text{ H}, R = 70 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.17.

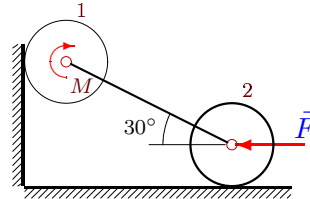
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$P_1 = 25 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 25 \text{ H}, R = 55 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.18.

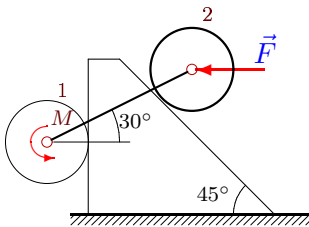
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$P_1 = 6 \text{ H}, P_2 = 26 \text{ H}, P_3 = 30 \text{ H},$
 $F = 50 \text{ H}, R = 55 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.19.

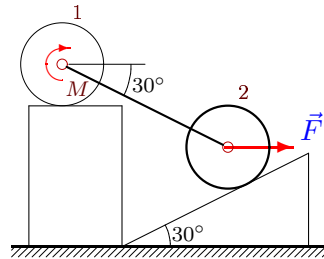
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$P_1 = 25 \text{ H}, P_2 = 29 \text{ H}, P_3 = 30 \text{ H},$
 $F = 25 \text{ H}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.20.

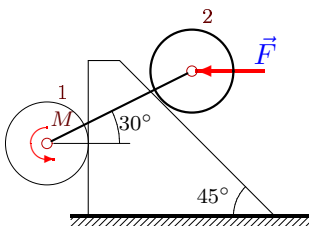
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$P_1 = 25 \text{ H}, P_2 = 28 \text{ H}, P_3 = 50 \text{ H},$
 $F = 25 \text{ H}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.21.

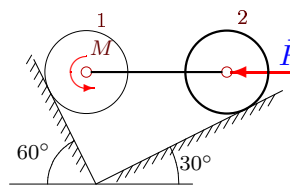
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$P_1 = 25 \text{ H}, P_2 = 29 \text{ H}, P_3 = 30 \text{ H},$
 $F = 25 \text{ H}, R = 55 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.22.

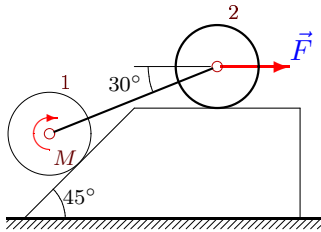
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$P_1 = 21 \text{ H}, P_2 = 25 \text{ H}, P_3 = 10 \text{ H},$
 $F = 5 \text{ H}, R = 55 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.23.

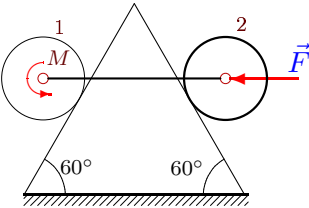
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$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 10 \text{ H},$
 $F = 20 \text{ H}, R = 30 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.25.

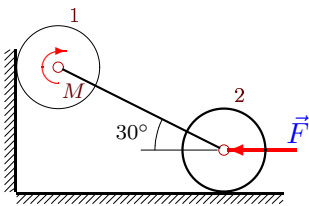
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$P_1 = 11 \text{ H}, P_2 = 27 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.27.

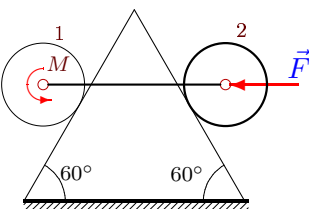
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$P_1 = 6 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 40 \text{ H}, R = 70 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.29.

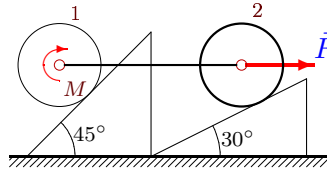
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$P_1 = 10 \text{ H}, P_2 = 24 \text{ H}, P_3 = 30 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.24.

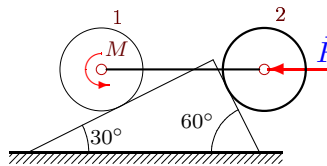
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$P_1 = 22 \text{ H}, P_2 = 25 \text{ H}, P_3 = 20 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.26.

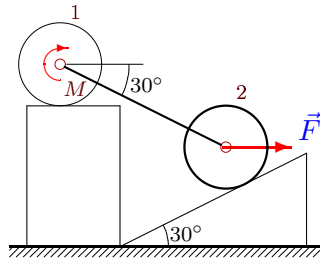
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$P_1 = 21 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 5 \text{ H}, R = 25 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.28.

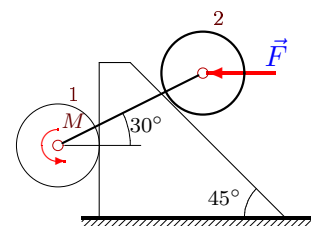
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$P_1 = 25 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 25 \text{ H}, R = 65 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.30.

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$P_1 = 22 \text{ H}, P_2 = 26 \text{ H}, P_3 = 10 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

S-18

Ответы.

Трение качения

19.12.2014

	N_1	N_2	M	N_1	N_2	M
	H		Hm	H		Hm
1	62.144	81.296	6.727	62.964	82.716	7.011
2	29.946	48.407	0.802	30.092	48.688	0.585
3	54.208	73.051	11.956	55.318	74.974	12.725
4	14.655	60.461	13.839	15.348	60.861	13.699
5	52.828	73.491	6.375	53.420	74.516	6.631
6	10.355	39.979	-4.060	9.648	39.570	-4.243
7	4.642	53.680	6.498	5.361	54.095	6.436
8	41.481	57.338	7.131	42.255	58.678	7.734
9	46.790	63.451	1.708	47.899	64.559	1.836
10	39.458	72.426	6.611	40.176	71.182	6.113
11	19.584	58.307	22.885	20.420	58.789	22.547
12	14.666	43.467	15.946	15.337	43.855	15.694
13	36.095	53.526	11.279	36.352	54.023	10.799
14	67.904	87.395	0.852	69.124	88.614	1.028
15	18.996	41.745	15.220	19.490	41.395	14.948
16	57.852	79.022	15.541	58.995	81.002	16.927
17	24.736	70.722	-11.395	27.371	73.662	-10.559
18	50.382	70.088	4.449	49.620	69.648	4.206
19	44.019	97.887	-5.105	45.910	99.997	-4.723
20	44.959	67.131	3.056	45.341	66.470	2.825
21	43.185	96.957	-8.287	46.798	100.986	-7.140
22	32.647	34.824	6.145	32.017	34.460	6.346
23	26.439	44.461	-0.491	26.528	44.633	-0.590
24	15.161	40.590	12.037	15.656	40.240	11.839
25	76.134	92.795	3.264	78.577	95.237	3.828
26	80.700	100.606	11.944	82.332	103.433	12.651
27	40.453	63.355	1.649	39.551	62.835	1.284
28	38.418	37.756	-3.848	38.878	36.960	-4.366
29	65.529	76.859	3.138	67.845	79.175	3.606
30	47.849	82.360	0.188	51.618	86.563	0.840

S-18 файл о18s10B