

Трение качения

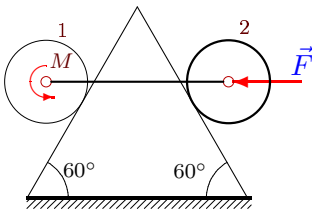
Система состоит из двух цилиндров весом P_1 и P_2 с одинаковыми радиусами R , соединенных однородным стержнем весом P_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). В каких пределах меняется внешний момент M при условии равновесия системы?

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.

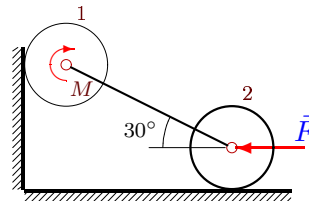
1



$P_1 = 10 \text{ Н}$, $P_2 = 22 \text{ Н}$, $P_3 = 30 \text{ Н}$,
 $F = 5 \text{ Н}$, $R = 15 \text{ см}$, $\delta = 1 \text{ мм}$.

Задача S-18.2.

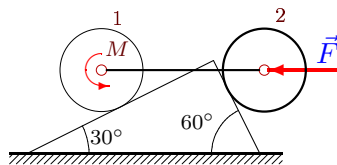
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$P_1 = 5 \text{ Н}$, $P_2 = 25 \text{ Н}$, $P_3 = 40 \text{ Н}$,
 $F = 20 \text{ Н}$, $R = 30 \text{ см}$, $\delta = 2 \text{ мм}$.

Задача S-18.3.

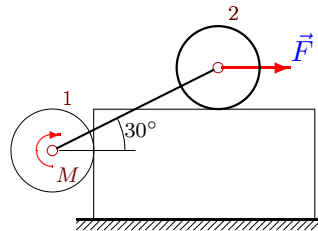
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$P_1 = 23 \text{ Н}$, $P_2 = 28 \text{ Н}$, $P_3 = 40 \text{ Н}$,
 $F = 15 \text{ Н}$, $R = 35 \text{ см}$, $\delta = 2 \text{ мм}$.

Задача S-18.4.

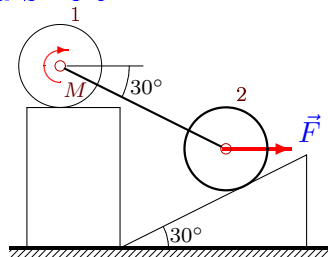
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$P_1 = 24 \text{ Н}$, $P_2 = 26 \text{ Н}$, $P_3 = 40 \text{ Н}$,
 $F = 20 \text{ Н}$, $R = 60 \text{ см}$, $\delta = 4 \text{ мм}$.

Задача S-18.5.

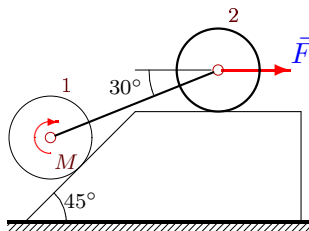
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$P_1 = 21 \text{ Н}$, $P_2 = 22 \text{ Н}$, $P_3 = 40 \text{ Н}$,
 $F = 5 \text{ Н}$, $R = 45 \text{ см}$, $\delta = 4 \text{ мм}$.

Задача S-18.6.

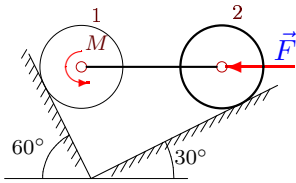
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$P_1 = 21 \text{ Н}$, $P_2 = 22 \text{ Н}$, $P_3 = 10 \text{ Н}$,
 $F = 5 \text{ Н}$, $R = 35 \text{ см}$, $\delta = 3 \text{ мм}$.

Задача S-18.7.

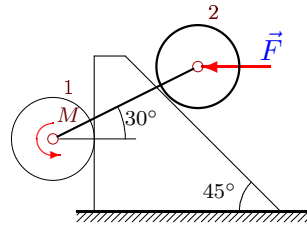
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$P_1 = 22 \text{ H}, P_2 = 27 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.8.

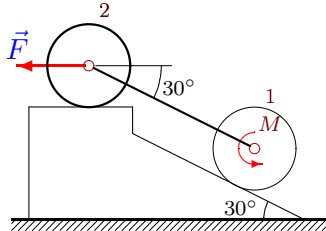
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$P_1 = 23 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 35 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.9.

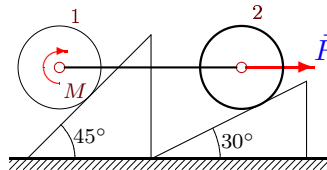
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$P_1 = 24 \text{ H}, P_2 = 29 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.10.

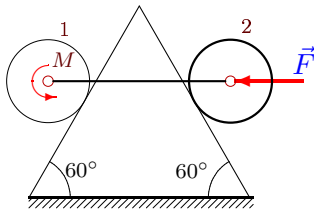
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$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 30 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.11.

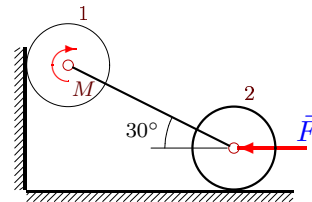
1



$P_1 = 11 \text{ H}, P_2 = 24 \text{ H}, P_3 = 10 \text{ H},$
 $F = 15 \text{ H}, R = 55 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.12.

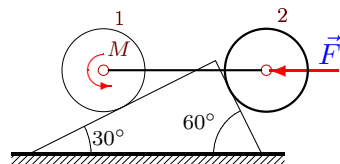
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$P_1 = 5 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.13.

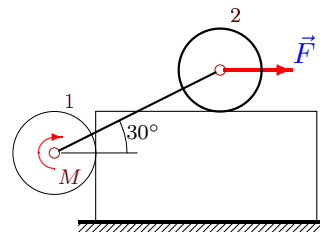
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$P_1 = 22 \text{ H}, P_2 = 23 \text{ H}, P_3 = 10 \text{ H},$
 $F = 10 \text{ H}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.14.

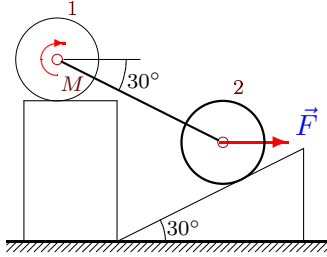
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$P_1 = 23 \text{ H}, P_2 = 25 \text{ H}, P_3 = 20 \text{ H},$
 $F = 15 \text{ H}, R = 55 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.15.

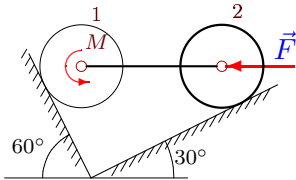
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$P_1 = 21 \text{ H}, P_2 = 22 \text{ H}, P_3 = 20 \text{ H},$
 $F = 5 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.17.

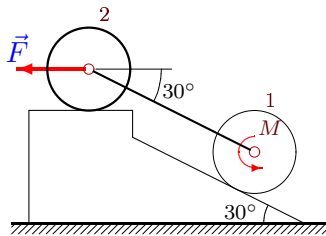
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$P_1 = 21 \text{ H}, P_2 = 25 \text{ H}, P_3 = 10 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.19.

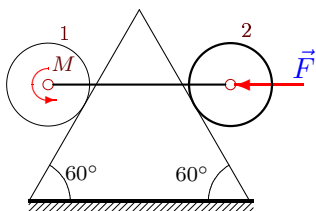
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$P_1 = 23 \text{ H}, P_2 = 28 \text{ H}, P_3 = 40 \text{ H},$
 $F = 15 \text{ H}, R = 45 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.21.

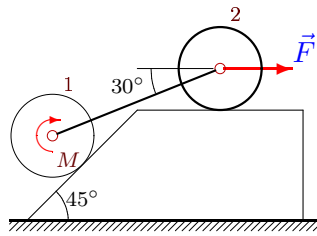
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$P_1 = 12 \text{ H}, P_2 = 29 \text{ H}, P_3 = 10 \text{ H},$
 $F = 25 \text{ H}, R = 65 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.16.

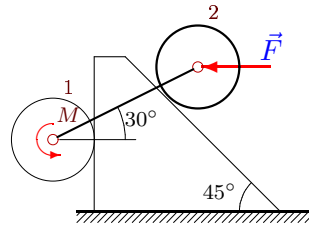
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$P_1 = 25 \text{ H}, P_2 = 28 \text{ H}, P_3 = 20 \text{ H},$
 $F = 25 \text{ H}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.18.

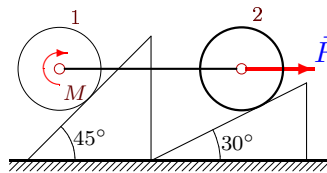
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$P_1 = 22 \text{ H}, P_2 = 25 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.20.

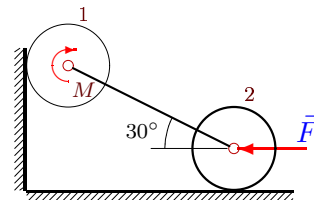
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$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.22.

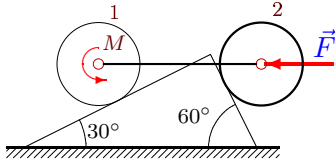
1



$P_1 = 6 \text{ H}, P_2 = 27 \text{ H}, P_3 = 10 \text{ H},$
 $F = 40 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.23.

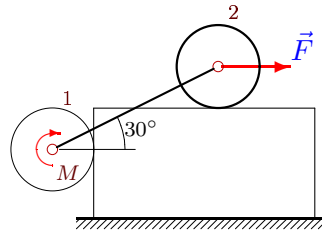
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$P_1 = 21 \text{ H}, P_2 = 22 \text{ H}, P_3 = 10 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.24.

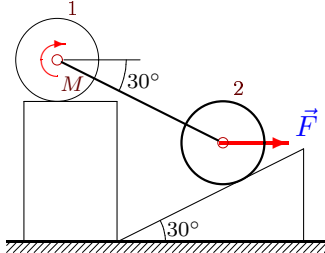
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$P_1 = 22 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.25.

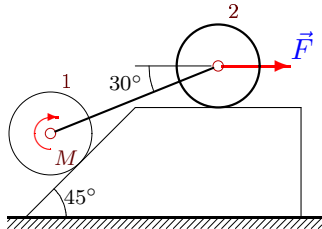
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$P_1 = 23 \text{ H}, P_2 = 26 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 45 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.26.

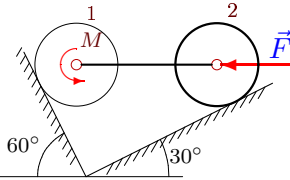
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$P_1 = 24 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 20 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.27.

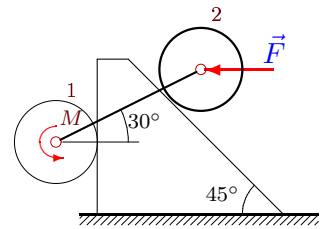
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$P_1 = 25 \text{ H}, P_2 = 30 \text{ H}, P_3 = 10 \text{ H},$
 $F = 25 \text{ H}, R = 75 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.28.

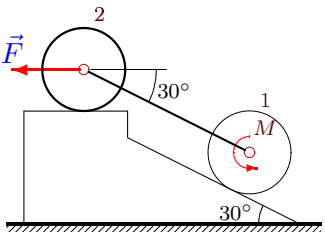
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$P_1 = 21 \text{ H}, P_2 = 24 \text{ H}, P_3 = 50 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.29.

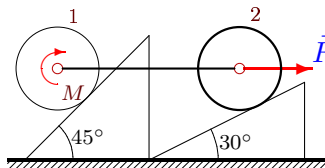
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$P_1 = 25 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 25 \text{ H}, R = 75 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.30.

1



$P_1 = 23 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 15 \text{ H}, R = 35 \text{ см}, \delta = 2 \text{ мм}.$

S-18

Ответы.

Трение качения

19.12.2014

	N_1	N_2	M	N_1	N_2	M
	H		Hm	H		Hm
1	62.825	73.155	1.111	64.534	74.864	1.259
2	20.378	56.765	-3.970	19.624	56.330	-4.101
3	70.765	95.059	12.799	71.862	96.960	13.464
4	19.618	57.326	19.604	20.385	57.769	19.338
5	23.719	68.805	13.470	24.923	66.719	12.531
6	19.803	29.740	4.582	19.956	30.035	4.382
7	58.562	60.276	6.138	57.761	59.814	6.277
8	57.187	102.675	-1.744	61.199	107.150	-0.933
9	38.105	60.722	-0.578	38.105	60.373	-0.298
10	25.508	55.532	11.015	25.809	55.319	10.925
11	37.788	57.278	1.838	39.250	58.740	2.302
12	10.489	57.056	-8.380	9.516	56.494	-8.577
13	42.354	55.519	3.872	42.914	56.489	4.066
14	14.684	43.478	13.487	15.319	43.844	13.286
15	18.990	51.015	3.120	19.662	49.850	2.946
16	32.176	52.347	-1.039	32.265	52.520	-1.156
17	32.629	34.813	3.914	32.035	34.470	4.034
18	79.954	128.068	1.248	85.814	134.603	2.263
19	37.239	56.879	1.684	37.239	56.443	2.076
20	25.356	55.640	22.122	25.959	55.213	21.760
21	37.132	67.283	1.175	38.582	68.733	1.720
22	40.369	55.307	7.384	39.634	54.883	7.130
23	42.943	53.210	7.833	43.869	54.814	8.394
24	9.717	56.610	8.278	10.285	56.938	8.212
25	30.113	56.668	6.148	30.860	55.375	5.565
26	33.452	51.349	3.391	33.657	51.746	2.931
27	54.421	40.571	2.416	53.882	40.260	2.649
28	99.817	149.515	4.070	108.677	159.397	5.861
29	43.301	65.687	-3.280	43.301	65.183	-2.524
30	19.050	41.707	9.667	19.437	41.433	9.531

S-18 файл о18s1B