

Трение качения

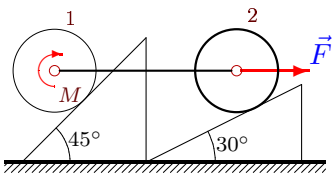
Система состоит из двух цилиндров весом P_1 и P_2 с одинаковыми радиусами R , соединенных однородным стержнем весом P_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). В каких пределах меняется внешний момент M при условии равновесия системы?

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

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

Задача S-18.1.

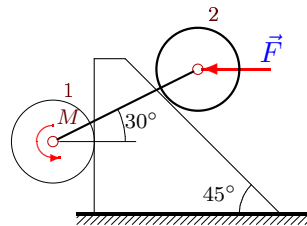
5



$P_1 = 21 \text{ Н}, P_2 = 22 \text{ Н}, P_3 = 40 \text{ Н},$
 $F = 5 \text{ Н}, R = 25 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.2.

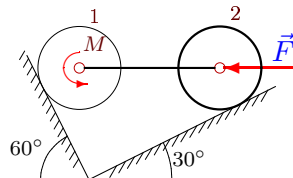
5



$P_1 = 25 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 50 \text{ Н},$
 $F = 25 \text{ Н}, R = 55 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.3.

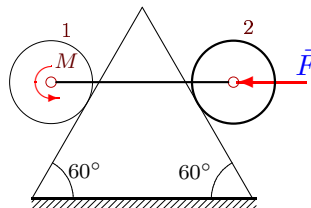
5



$P_1 = 24 \text{ Н}, P_2 = 25 \text{ Н}, P_3 = 50 \text{ Н},$
 $F = 20 \text{ Н}, R = 30 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.4.

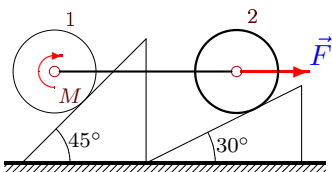
5



$P_1 = 11 \text{ Н}, P_2 = 28 \text{ Н}, P_3 = 40 \text{ Н},$
 $F = 15 \text{ Н}, R = 55 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.5.

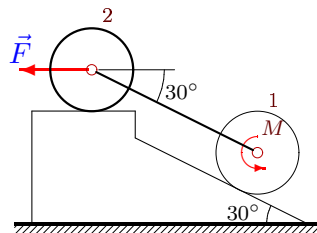
5



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

Задача S-18.6.

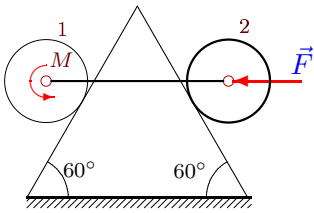
5



$P_1 = 22 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 10 \text{ Н},$
 $F = 10 \text{ Н}, R = 50 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.7.

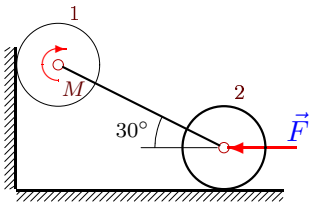
5



$P_1 = 12 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 20 \text{ H}, R = 40 \text{ cm}, \delta = 2 \text{ mm}.$

Задача S-18.9.

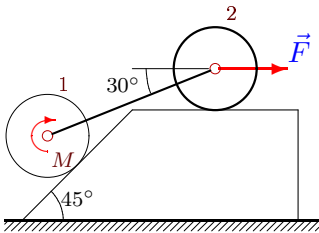
5



$P_1 = 5 \text{ H}, P_2 = 26 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 20 \text{ cm}, \delta = 1 \text{ mm}.$

Задача S-18.11.

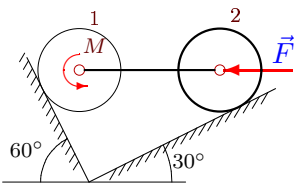
5



$P_1 = 24 \text{ H}, P_2 = 29 \text{ H}, P_3 = 10 \text{ H},$
 $F = 20 \text{ H}, R = 60 \text{ cm}, \delta = 4 \text{ mm}.$

Задача S-18.13.

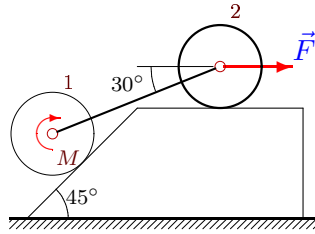
5



$P_1 = 25 \text{ H}, P_2 = 28 \text{ H}, P_3 = 30 \text{ H},$
 $F = 25 \text{ H}, R = 75 \text{ cm}, \delta = 5 \text{ mm}.$

Задача S-18.8.

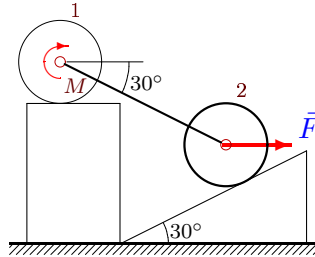
5



$P_1 = 25 \text{ H}, P_2 = 27 \text{ H}, P_3 = 10 \text{ H},$
 $F = 25 \text{ H}, R = 65 \text{ cm}, \delta = 4 \text{ mm}.$

Задача S-18.10.

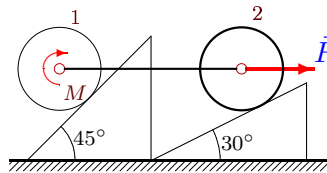
5



$P_1 = 21 \text{ H}, P_2 = 22 \text{ H}, P_3 = 20 \text{ H},$
 $F = 5 \text{ H}, R = 55 \text{ cm}, \delta = 5 \text{ mm}.$

Задача S-18.12.

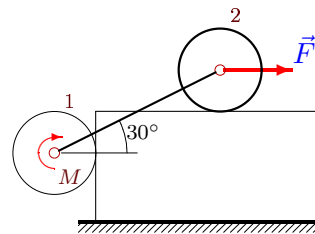
5



$P_1 = 23 \text{ H}, P_2 = 26 \text{ H}, P_3 = 40 \text{ H},$
 $F = 15 \text{ H}, R = 35 \text{ cm}, \delta = 2 \text{ mm}.$

Задача S-18.14.

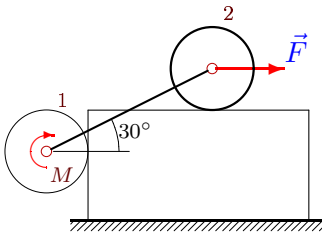
5



$P_1 = 23 \text{ H}, P_2 = 28 \text{ H}, P_3 = 40 \text{ H},$
 $F = 15 \text{ H}, R = 25 \text{ cm}, \delta = 1 \text{ mm}.$

Задача S-18.15.

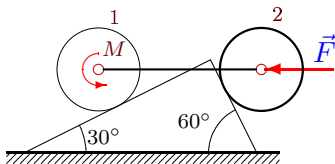
5



$P_1 = 22 \text{ H}, P_2 = 24 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.17.

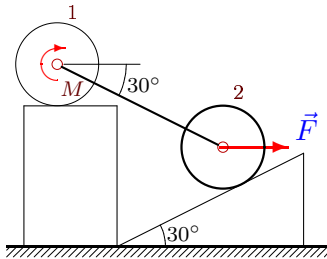
5



$P_1 = 24 \text{ H}, P_2 = 26 \text{ H}, P_3 = 40 \text{ H},$
 $F = 20 \text{ H}, R = 50 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.19.

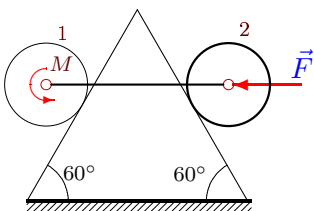
5



$P_1 = 23 \text{ H}, P_2 = 25 \text{ H}, P_3 = 10 \text{ H},$
 $F = 15 \text{ H}, R = 55 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.21.

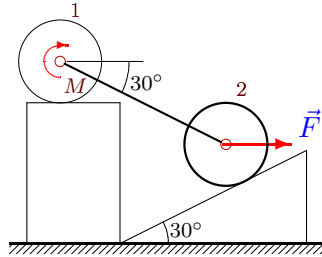
5



$P_1 = 12 \text{ H}, P_2 = 25 \text{ H}, P_3 = 50 \text{ H},$
 $F = 20 \text{ H}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.16.

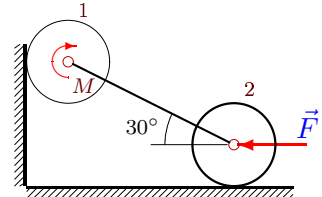
5



$P_1 = 25 \text{ H}, P_2 = 26 \text{ H}, P_3 = 10 \text{ H},$
 $F = 25 \text{ H}, R = 75 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.18.

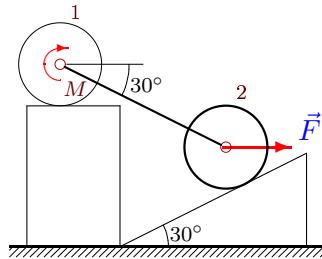
5



$P_1 = 5 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.20.

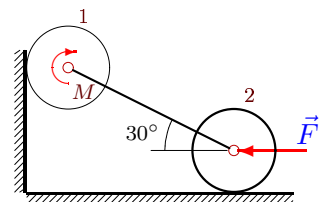
5



$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 50 \text{ H},$
 $F = 20 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.22.

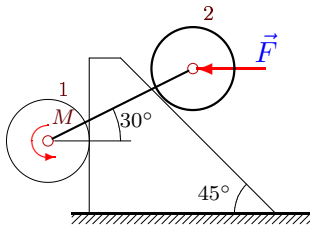
5



$P_1 = 5 \text{ H}, P_2 = 28 \text{ H}, P_3 = 50 \text{ H},$
 $F = 30 \text{ H}, R = 55 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.23.

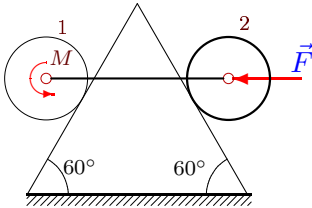
5



$P_1 = 21 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.25.

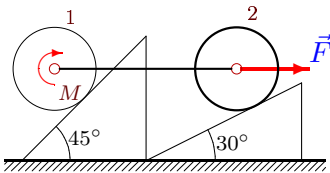
5



$P_1 = 12 \text{ H}, P_2 = 28 \text{ H}, P_3 = 20 \text{ H},$
 $F = 25 \text{ H}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.27.

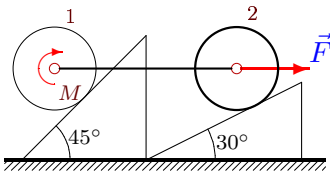
5



$P_1 = 24 \text{ H}, P_2 = 27 \text{ H}, P_3 = 50 \text{ H},$
 $F = 20 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.29.

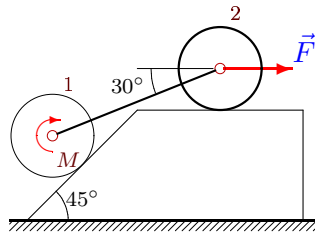
5



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

Задача S-18.24.

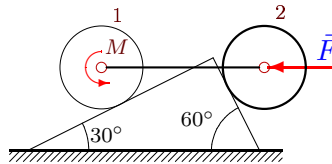
5



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

Задача S-18.26.

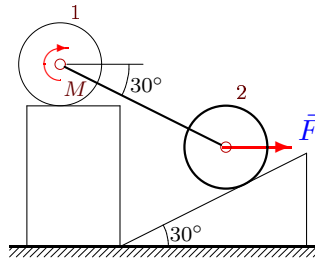
5



$P_1 = 22 \text{ H}, P_2 = 23 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.28.

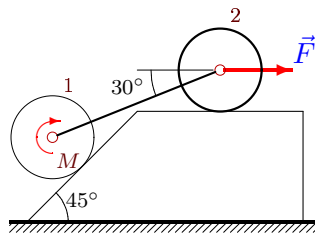
5



$P_1 = 25 \text{ H}, P_2 = 30 \text{ H}, P_3 = 20 \text{ H},$
 $F = 25 \text{ H}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.30.

5



$P_1 = 25 \text{ H}, P_2 = 27 \text{ H}, P_3 = 40 \text{ H},$
 $F = 25 \text{ H}, R = 75 \text{ см}, \delta = 5 \text{ мм}.$

S-18

Ответы.

Трение качения

19.12.2014

	N_1	N_2	M	N_1	N_2	M
	H		Hm	H		Hm
1	15.062	48.722	10.730	15.696	48.274	10.572
2	59.328	119.912	-8.661	63.796	124.895	-7.242
3	67.013	57.846	5.367	66.628	57.624	5.434
4	73.315	94.806	3.593	75.734	97.225	4.361
5	25.845	54.428	14.552	26.288	54.115	14.375
6	23.383	37.949	0.801	23.383	37.600	1.150
7	47.061	71.382	0.707	48.308	72.629	0.995
8	28.600	46.269	-4.130	28.770	46.599	-4.544
9	20.289	57.714	-2.657	19.713	57.381	-2.724
10	18.864	51.232	11.561	19.781	49.644	10.687
11	26.393	45.372	-0.878	26.574	45.723	-1.285
12	21.984	53.292	13.589	22.480	52.942	13.416
13	63.483	49.844	7.152	62.821	49.462	7.439
14	14.774	56.530	8.618	15.227	56.791	8.552
15	9.752	49.630	7.274	10.250	49.918	7.216
16	35.957	29.029	-7.739	36.340	28.366	-8.236
17	67.396	91.054	14.367	68.500	92.966	15.323
18	10.380	56.993	-3.601	9.623	56.556	-3.667
19	25.718	37.433	2.174	26.256	36.502	1.662
20	39.336	72.637	10.043	40.294	70.979	9.048
21	75.321	99.141	0.305	77.053	100.874	0.705
22	30.514	70.617	-6.811	29.491	70.026	-7.135
23	79.360	120.334	3.436	86.490	128.287	4.877
24	29.926	46.369	1.248	30.112	46.727	0.832
25	45.975	75.626	0.399	46.727	76.378	0.551
26	68.045	85.018	10.157	69.192	87.005	10.753
27	27.233	60.276	25.238	27.887	59.814	24.846
28	36.523	44.502	-0.924	36.777	44.064	-1.077
29	14.920	59.117	7.520	15.561	58.664	7.424
30	39.169	61.198	3.293	39.414	61.671	2.608

S-18 файл о18s5B