

Трение качения

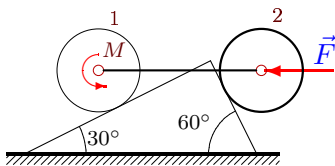
Система состоит из двух цилиндров весом P_1 и P_2 с одинаковыми радиусами R , соединенных однородным стержнем весом P_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). В каких пределах меняется внешний момент M при условии равновесия системы?

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.

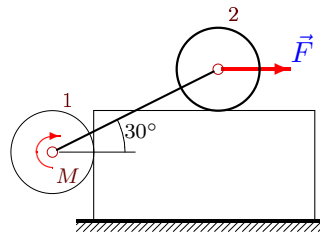
4



$$P_1 = 25 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 40 \text{ Н}, \\ F = 25 \text{ Н}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$$

Задача S-18.2.

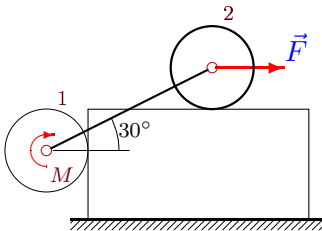
4



$$P_1 = 21 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 40 \text{ Н}, \\ F = 5 \text{ Н}, R = 55 \text{ см}, \delta = 5 \text{ мм}.$$

Задача S-18.3.

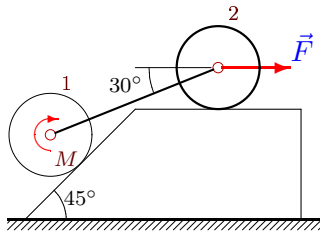
4



$$P_1 = 24 \text{ Н}, P_2 = 28 \text{ Н}, P_3 = 30 \text{ Н}, \\ F = 20 \text{ Н}, R = 50 \text{ см}, \delta = 3 \text{ мм}.$$

Задача S-18.4.

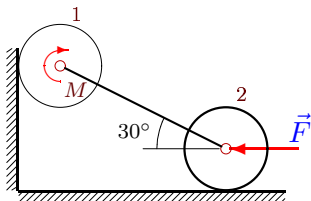
4



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

Задача S-18.5.

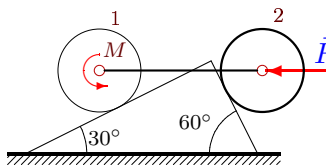
4



$$P_1 = 6 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 10 \text{ Н}, \\ F = 50 \text{ Н}, R = 35 \text{ см}, \delta = 1 \text{ мм}.$$

Задача S-18.6.

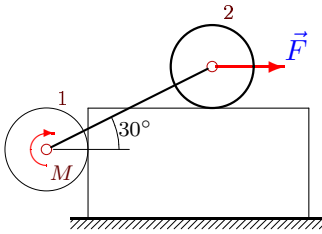
4



$$P_1 = 23 \text{ Н}, P_2 = 27 \text{ Н}, P_3 = 50 \text{ Н}, \\ F = 15 \text{ Н}, R = 65 \text{ см}, \delta = 5 \text{ мм}.$$

Задача S-18.7.

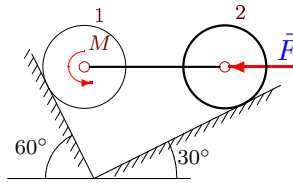
4



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

Задача S-18.8.

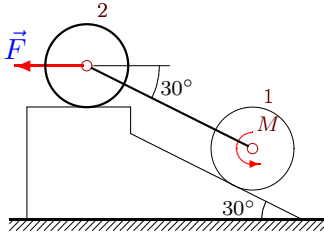
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$P_1 = 21 \text{ H}, P_2 = 22 \text{ H}, P_3 = 40 \text{ H},$
 $F = 5 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.9.

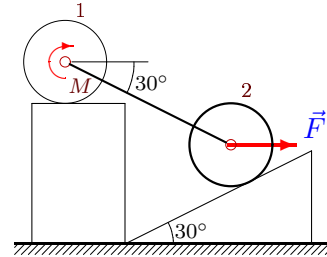
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$P_1 = 22 \text{ H}, P_2 = 24 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.10.

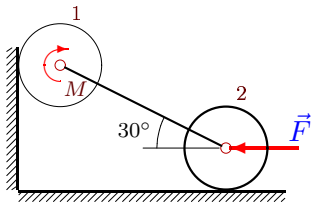
4



$P_1 = 22 \text{ H}, P_2 = 24 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.11.

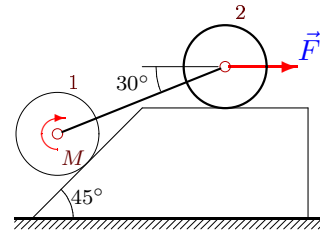
4



$P_1 = 6 \text{ H}, P_2 = 30 \text{ H}, P_3 = 20 \text{ H},$
 $F = 50 \text{ H}, R = 45 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.12.

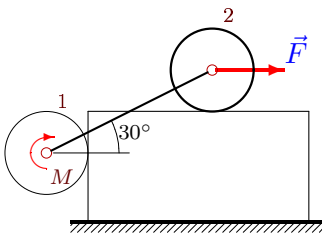
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$P_1 = 23 \text{ H}, P_2 = 26 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 45 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.13.

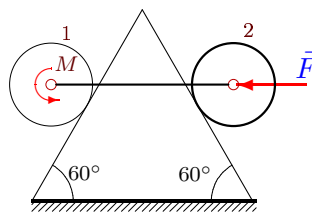
4



$P_1 = 22 \text{ H}, P_2 = 23 \text{ H}, P_3 = 20 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.14.

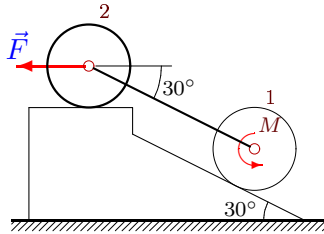
4



$P_1 = 10 \text{ H}, P_2 = 22 \text{ H}, P_3 = 40 \text{ H},$
 $F = 5 \text{ H}, R = 25 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.15.

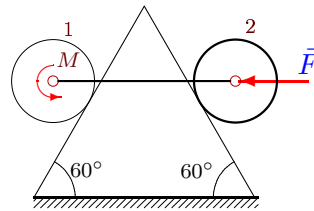
4



$P_1 = 22 \text{ H}, P_2 = 25 \text{ H}, P_3 = 10 \text{ H},$
 $F = 10 \text{ H}, R = 60 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.16.

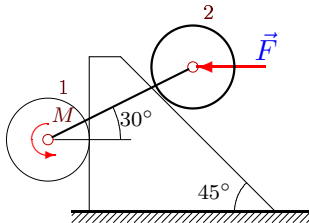
4



$P_1 = 11 \text{ H}, P_2 = 26 \text{ H}, P_3 = 10 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.17.

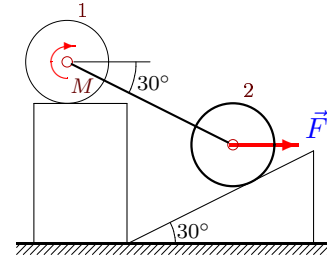
4



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

Задача S-18.18.

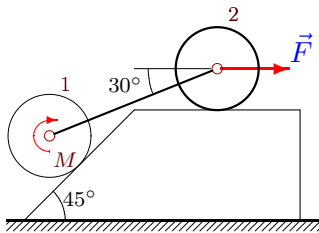
4



$P_1 = 22 \text{ H}, P_2 = 24 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.19.

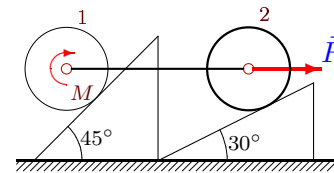
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$P_1 = 22 \text{ H}, P_2 = 24 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 30 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.20.

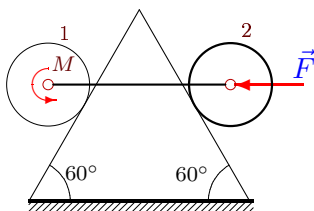
4



$P_1 = 21 \text{ H}, P_2 = 25 \text{ H}, P_3 = 50 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.21.

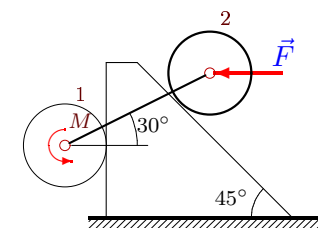
4



$P_1 = 10 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 5 \text{ H}, R = 55 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.22.

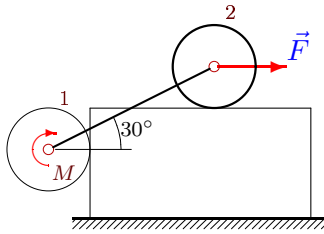
4



$P_1 = 21 \text{ H}, P_2 = 24 \text{ H}, P_3 = 30 \text{ H},$
 $F = 5 \text{ H}, R = 25 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.23.

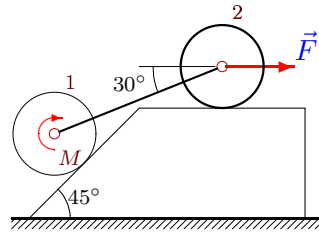
4



$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 30 \text{ H},$
 $F = 20 \text{ H}, R = 50 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.24.

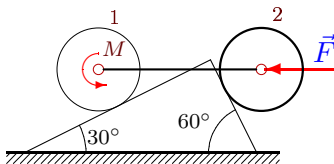
4



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

Задача S-18.25.

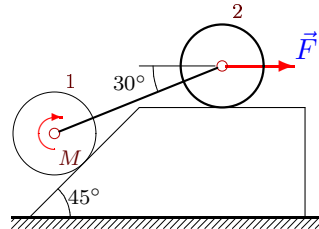
4



$P_1 = 24 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 20 \text{ H}, R = 70 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.26.

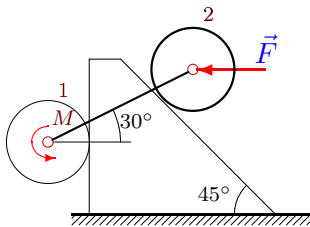
4



$P_1 = 21 \text{ H}, P_2 = 24 \text{ H}, P_3 = 20 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.27.

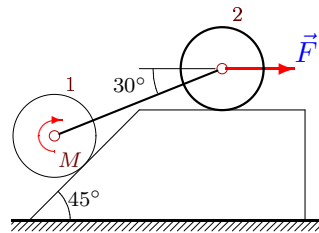
4



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

Задача S-18.28.

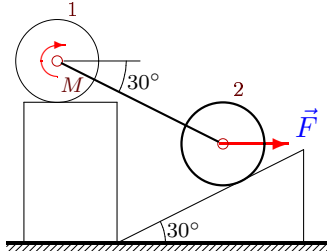
4



$P_1 = 25 \text{ H}, P_2 = 30 \text{ H}, P_3 = 40 \text{ H},$
 $F = 25 \text{ H}, R = 65 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.29.

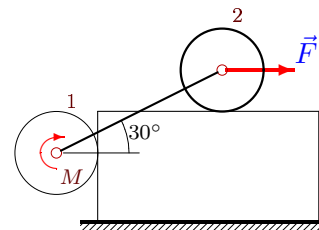
4



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

Задача S-18.30.

4



$P_1 = 24 \text{ H}, P_2 = 29 \text{ H}, P_3 = 50 \text{ H},$
 $F = 20 \text{ H}, R = 30 \text{ см}, \delta = 1 \text{ мм}.$

S-18

Ответы.

Трение качения

19.12.2014

	N_1	N_2	M	N_1	N_2	M
	H		Hm	H		Hm
1	66.907	93.537	9.060	67.444	94.467	9.386
2	4.558	48.632	21.103	5.447	49.145	20.820
3	19.674	54.359	13.821	20.328	54.737	13.632
4	32.613	49.630	3.764	32.762	49.918	3.653
5	50.171	59.966	6.288	49.829	59.769	6.219
6	78.313	102.633	25.767	79.913	105.404	27.569
7	14.750	37.516	8.768	15.252	37.806	8.637
8	46.155	48.685	3.104	45.508	48.311	3.160
9	40.703	55.012	4.591	40.703	54.537	4.970
10	30.591	75.856	11.368	31.715	73.910	10.590
11	50.307	69.045	5.870	49.695	68.691	5.711
12	31.254	49.470	4.728	31.452	49.852	4.396
13	9.743	38.625	7.913	10.259	38.923	7.823
14	72.522	82.852	1.807	74.850	85.180	2.143
15	23.383	35.946	0.964	23.383	35.602	1.377
16	45.132	61.292	2.275	46.564	62.724	2.523
17	49.681	106.323	-12.238	54.545	111.749	-10.131
18	30.655	75.745	8.493	31.654	74.016	7.974
19	32.588	49.583	5.674	32.787	49.966	5.452
20	15.244	58.022	17.433	16.052	57.451	17.151
21	88.089	100.419	5.744	91.302	103.632	6.764
22	77.304	117.334	2.158	83.779	124.556	3.092
23	19.674	54.359	13.821	20.328	54.737	13.632
24	35.642	57.214	0.619	35.871	57.656	-0.021
25	50.114	71.120	13.160	51.143	72.902	14.407
26	23.321	36.705	5.843	23.510	37.070	5.596
27	24.574	70.542	-13.528	27.547	73.858	-12.412
28	39.173	64.206	2.845	39.410	64.664	2.270
29	21.348	39.038	4.895	21.964	37.971	4.361
30	19.782	65.421	11.274	20.219	65.673	11.198

S-18 файл о18s4B