

Трение качения

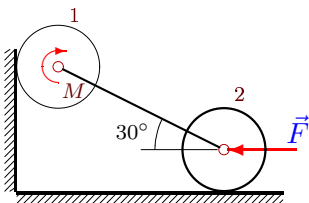
Система состоит из двух цилиндров весом P_1 и P_2 с одинаковыми радиусами R , соединенных однородным стержнем весом P_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). В каких пределах меняется внешний момент M при условии равновесия системы?

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.

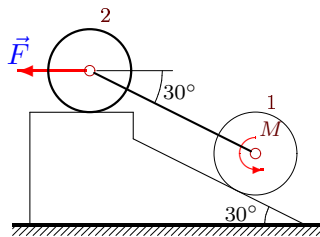
3



$$P_1 = 5 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 10 \text{ Н}, \\ F = 30 \text{ Н}, R = 25 \text{ см}, \delta = 1 \text{ мм}.$$

Задача S-18.2.

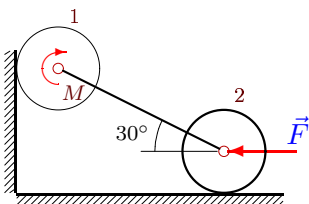
3



$$P_1 = 25 \text{ Н}, P_2 = 28 \text{ Н}, P_3 = 10 \text{ Н}, \\ F = 25 \text{ Н}, R = 55 \text{ см}, \delta = 3 \text{ мм}.$$

Задача S-18.3.

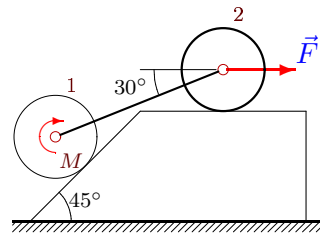
3



$$P_1 = 6 \text{ Н}, P_2 = 28 \text{ Н}, P_3 = 10 \text{ Н}, \\ F = 40 \text{ Н}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$$

Задача S-18.4.

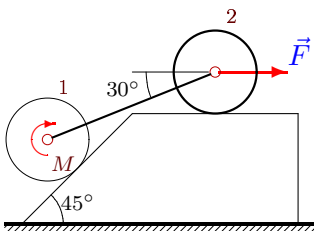
3



$$P_1 = 24 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 20 \text{ Н}, \\ F = 20 \text{ Н}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$$

Задача S-18.5.

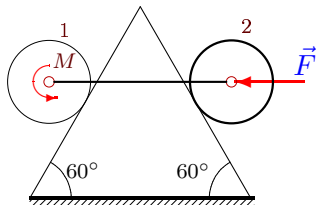
3



$$P_1 = 22 \text{ Н}, P_2 = 24 \text{ Н}, P_3 = 10 \text{ Н}, \\ F = 10 \text{ Н}, R = 60 \text{ см}, \delta = 5 \text{ мм}.$$

Задача S-18.6.

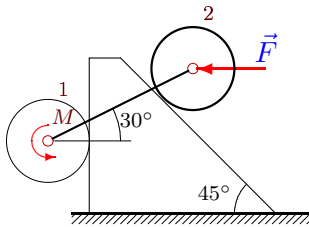
3



$$P_1 = 12 \text{ Н}, P_2 = 26 \text{ Н}, P_3 = 40 \text{ Н}, \\ F = 25 \text{ Н}, R = 45 \text{ см}, \delta = 2 \text{ мм}.$$

Задача S-18.7.

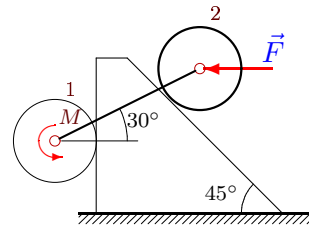
3



$P_1 = 23 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 45 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.8.

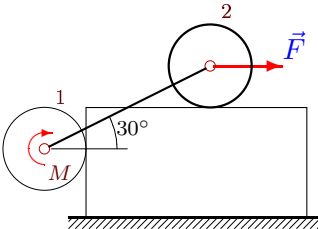
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$P_1 = 23 \text{ H}, P_2 = 27 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 45 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.9.

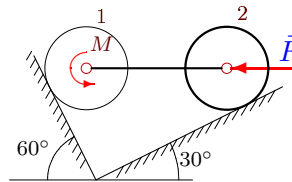
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$P_1 = 24 \text{ H}, P_2 = 26 \text{ H}, P_3 = 10 \text{ H},$
 $F = 20 \text{ H}, R = 70 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.10.

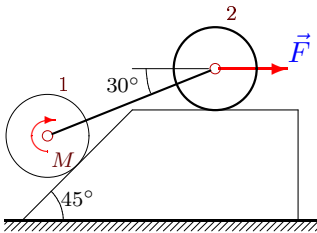
3



$P_1 = 22 \text{ H}, P_2 = 26 \text{ H}, P_3 = 10 \text{ H},$
 $F = 10 \text{ H}, R = 60 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.11.

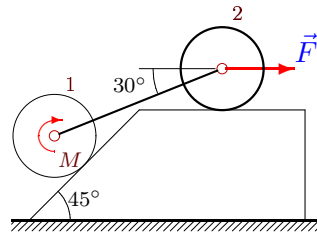
3



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

Задача S-18.12.

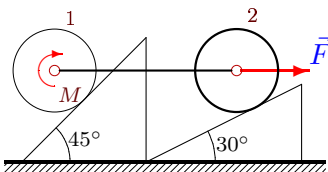
3



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

Задача S-18.13.

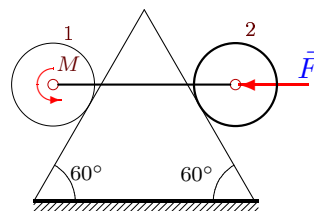
3



$P_1 = 23 \text{ H}, P_2 = 25 \text{ H}, P_3 = 10 \text{ H},$
 $F = 15 \text{ H}, R = 65 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.14.

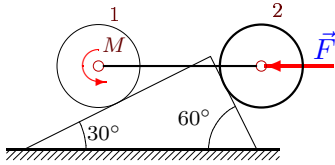
3



$P_1 = 11 \text{ H}, P_2 = 26 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.15.

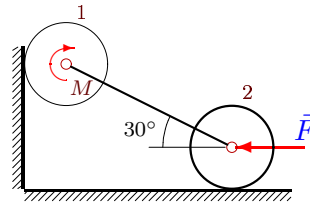
3



$P_1 = 24 \text{ H}, P_2 = 28 \text{ H}, P_3 = 30 \text{ H},$
 $F = 20 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.16.

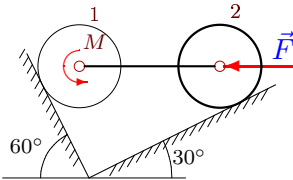
3



$P_1 = 6 \text{ H}, P_2 = 27 \text{ H}, P_3 = 50 \text{ H},$
 $F = 40 \text{ H}, R = 60 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.17.

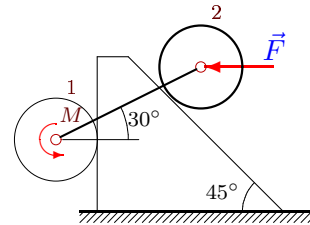
3



$P_1 = 25 \text{ H}, P_2 = 26 \text{ H}, P_3 = 30 \text{ H},$
 $F = 25 \text{ H}, R = 75 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.18.

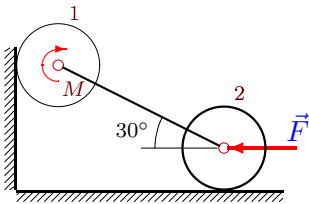
3



$P_1 = 22 \text{ H}, P_2 = 23 \text{ H}, P_3 = 50 \text{ H},$
 $F = 10 \text{ H}, R = 40 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.19.

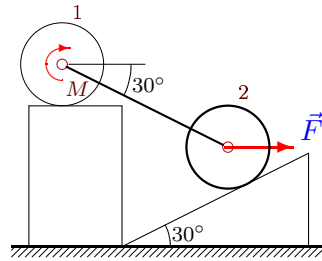
3



$P_1 = 5 \text{ H}, P_2 = 26 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 55 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.20.

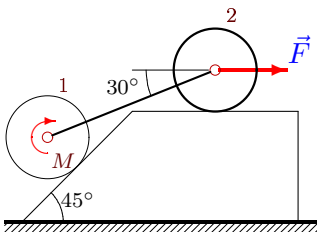
3



$P_1 = 21 \text{ H}, P_2 = 22 \text{ H}, P_3 = 30 \text{ H},$
 $F = 5 \text{ H}, R = 55 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.21.

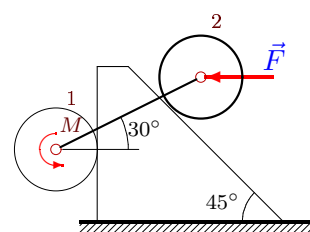
3



$P_1 = 25 \text{ H}, P_2 = 26 \text{ H}, P_3 = 50 \text{ H},$
 $F = 25 \text{ H}, R = 65 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.22.

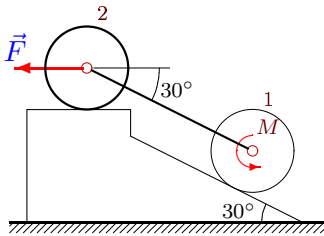
3



$P_1 = 21 \text{ H}, P_2 = 24 \text{ H}, P_3 = 30 \text{ H},$
 $F = 5 \text{ H}, R = 55 \text{ см}, \delta = 5 \text{ мм}.$

Задача S-18.23.

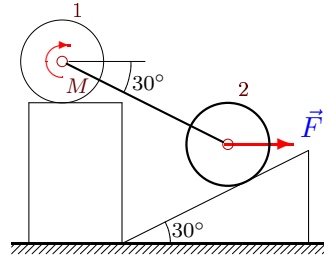
3



$P_1 = 24 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $F = 20 \text{ H}, R = 40 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.24.

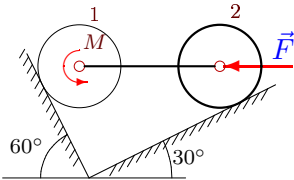
3



$P_1 = 25 \text{ H}, P_2 = 29 \text{ H}, P_3 = 30 \text{ H},$
 $F = 25 \text{ H}, R = 45 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.25.

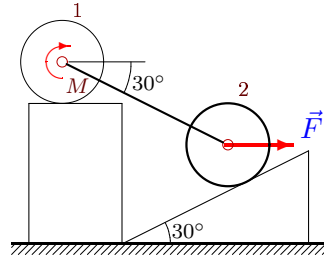
3



$P_1 = 21 \text{ H}, P_2 = 22 \text{ H}, P_3 = 40 \text{ H},$
 $F = 5 \text{ H}, R = 35 \text{ см}, \delta = 3 \text{ мм}.$

Задача S-18.26.

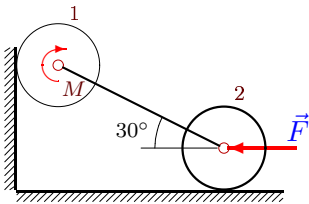
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$P_1 = 23 \text{ H}, P_2 = 24 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 35 \text{ см}, \delta = 2 \text{ мм}.$

Задача S-18.27.

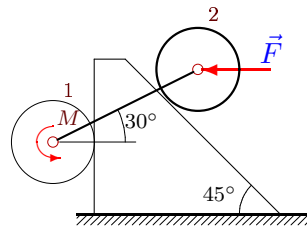
3



$P_1 = 5 \text{ H}, P_2 = 26 \text{ H}, P_3 = 20 \text{ H},$
 $F = 20 \text{ H}, R = 50 \text{ см}, \delta = 4 \text{ мм}.$

Задача S-18.28.

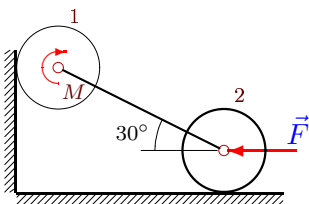
3



$P_1 = 22 \text{ H}, P_2 = 27 \text{ H}, P_3 = 20 \text{ H},$
 $F = 10 \text{ H}, R = 20 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.29.

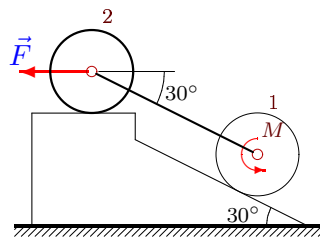
3



$P_1 = 5 \text{ H}, P_2 = 25 \text{ H}, P_3 = 40 \text{ H},$
 $F = 10 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Задача S-18.30.

3



$P_1 = 23 \text{ H}, P_2 = 24 \text{ H}, P_3 = 30 \text{ H},$
 $F = 15 \text{ H}, R = 35 \text{ см}, \delta = 2 \text{ мм}.$

S-18

Ответы.

Трение качения

19.12.2014

	N_1	N_2	M	N_1	N_2	M
	H		Hm	H		Hm
1	30.194	48.432	1.858	29.807	48.209	1.802
2	25.981	47.584	-7.792	25.981	47.285	-7.463
3	40.281	56.256	4.903	39.720	55.933	4.773
4	29.948	47.410	0.800	30.090	47.685	0.587
5	21.994	34.607	4.956	22.167	34.942	4.568
6	62.647	91.297	-0.352	64.063	92.714	0.016
7	56.868	102.319	-2.325	61.550	107.540	-1.109
8	61.455	108.849	-1.134	66.435	114.403	0.160
9	19.697	42.372	12.339	20.305	42.723	12.094
10	37.960	35.969	5.556	37.363	35.624	5.763
11	40.560	65.421	3.775	40.691	65.673	3.629
12	29.061	45.598	4.605	29.243	45.950	4.400
13	17.940	34.796	14.078	18.375	34.488	13.795
14	74.660	90.820	2.924	77.051	93.211	3.476
15	60.447	85.018	16.019	61.594	87.005	17.210
16	40.503	75.384	-4.570	39.501	74.806	-4.916
17	62.467	47.526	7.592	61.836	47.161	7.865
18	86.460	137.445	1.167	93.557	145.361	2.806
19	10.473	52.047	-10.424	9.532	51.503	-10.723
20	21.284	60.031	14.019	22.359	58.170	12.995
21	42.707	65.202	5.147	42.948	65.667	4.563
22	76.890	116.872	4.616	84.250	125.081	6.953
23	33.775	51.696	-1.557	33.775	51.399	-1.319
24	39.421	51.608	0.451	39.876	50.819	0.096
25	46.248	48.739	7.225	45.416	48.259	7.393
26	31.187	53.075	4.130	31.788	52.035	3.766
27	20.382	47.768	-1.616	19.621	47.328	-1.836
28	62.167	102.572	0.778	65.664	106.473	1.182
29	10.340	50.970	-2.855	9.663	50.579	-2.913
30	32.909	47.818	0.477	32.909	47.504	0.698

S-18 файл о18s3B