

Трение качения

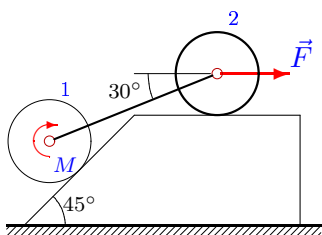
Система состоит из двух цилиндров весом P_1 и P_2 с одинаковыми радиусами R , соединенных однородным стержнем весом P_3 . Цилиндры могут кататься без проскальзывания, цилиндр 1 без сопротивления, а цилиндр 2 с трением качения (δ). Какова вероятность того, что система будет находиться в равновесии, если момент M есть случайная величина, равномерно распределенная на отрезке $[M_1, M_2]$

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

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

Задача L-26.1.

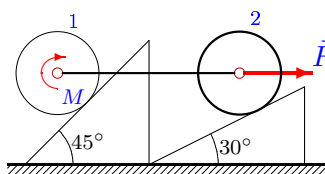
2



$P_1 = 25$ Н, $P_2 = 26$ Н, $P_3 = 50$ Н,
 $M \in [2, 5]$ Нм, $F = 25$ Н, $R = 45$ см,
 $\delta = 2$ мм.

Задача L-26.2.

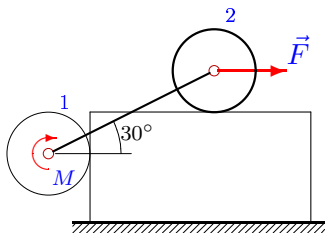
2



$P_1 = 23$ Н, $P_2 = 28$ Н, $P_3 = 50$ Н,
 $M \in [28, 30]$ Нм, $F = 15$ Н, $R = 65$ см,
 $\delta = 5$ мм.

Задача L-26.3.

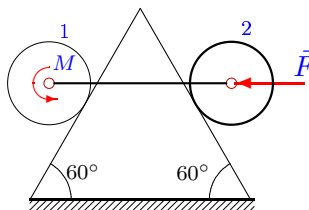
2



$P_1 = 21$ Н, $P_2 = 22$ Н, $P_3 = 20$ Н,
 $M \in [12, 14]$ Нм, $F = 5$ Н, $R = 45$ см,
 $\delta = 4$ мм.

Задача L-26.4.

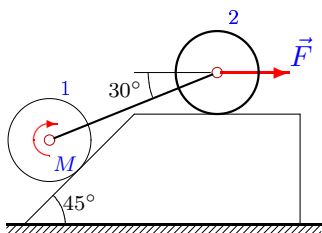
2



$P_1 = 11$ Н, $P_2 = 26$ Н, $P_3 = 40$ Н,
 $M \in [2, 5]$ Нм, $F = 15$ Н, $R = 65$ см,
 $\delta = 5$ мм.

Задача L-26.5.

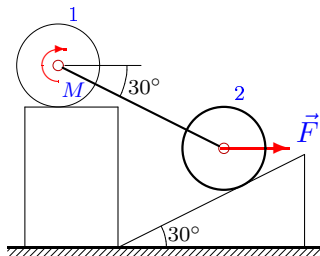
2



$P_1 = 21$ Н, $P_2 = 22$ Н, $P_3 = 30$ Н,
 $M \in [8, 10]$ Нм, $F = 5$ Н, $R = 45$ см,
 $\delta = 4$ мм.

Задача L-26.6.

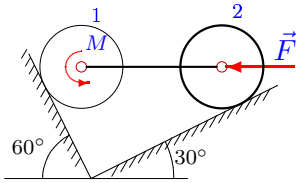
2



$P_1 = 25$ Н, $P_2 = 26$ Н, $P_3 = 40$ Н,
 $M \in [0, 2]$ Нм, $F = 25$ Н, $R = 35$ см,
 $\delta = 1$ мм.

Задача L-26.7.

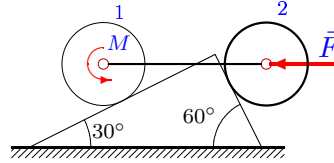
2



$P_1 = 24 \text{ H}$, $P_2 = 26 \text{ H}$, $P_3 = 20 \text{ H}$,
 $M \in [4, 7] \text{ Нм}$, $F = 20 \text{ H}$, $R = 60 \text{ см}$,
 $\delta = 4 \text{ мм}$.

Задача L-26.8.

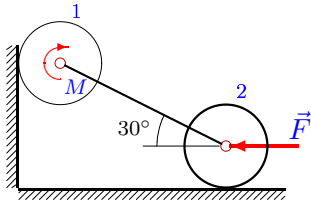
2



$P_1 = 23 \text{ H}$, $P_2 = 27 \text{ H}$, $P_3 = 20 \text{ H}$,
 $M \in [10, 13] \text{ Нм}$, $F = 15 \text{ H}$, $R = 45 \text{ см}$,
 $\delta = 3 \text{ мм}$.

Задача L-26.9.

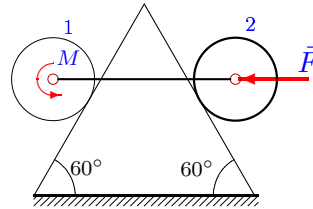
2



$P_1 = 6 \text{ H}$, $P_2 = 29 \text{ H}$, $P_3 = 40 \text{ H}$,
 $M \in [-3, -1] \text{ Нм}$, $F = 40 \text{ H}$, $R = 70 \text{ см}$,
 $\delta = 5 \text{ мм}$.

Задача L-26.10.

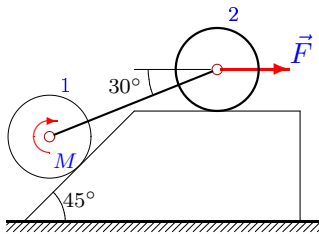
2



$P_1 = 11 \text{ H}$, $P_2 = 24 \text{ H}$, $P_3 = 50 \text{ H}$,
 $M \in [1, 3] \text{ Нм}$, $F = 15 \text{ H}$, $R = 55 \text{ см}$,
 $\delta = 4 \text{ мм}$.

Задача L-26.11.

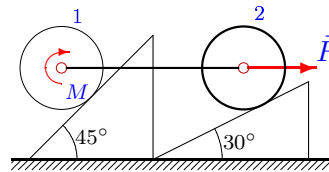
2



$P_1 = 25 \text{ H}$, $P_2 = 28 \text{ H}$, $P_3 = 50 \text{ H}$,
 $M \in [3, 5] \text{ Нм}$, $F = 25 \text{ H}$, $R = 55 \text{ см}$,
 $\delta = 3 \text{ мм}$.

Задача L-26.12.

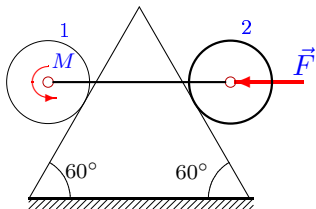
2



$P_1 = 23 \text{ H}$, $P_2 = 25 \text{ H}$, $P_3 = 40 \text{ H}$,
 $M \in [16, 18] \text{ Нм}$, $F = 15 \text{ H}$, $R = 45 \text{ см}$,
 $\delta = 3 \text{ мм}$.

Задача L-26.13.

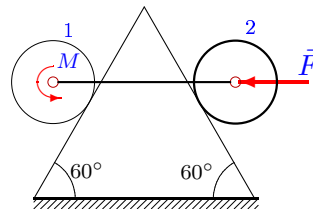
2



$P_1 = 11 \text{ H}$, $P_2 = 27 \text{ H}$, $P_3 = 40 \text{ H}$,
 $M \in [1, 3] \text{ Нм}$, $F = 15 \text{ H}$, $R = 35 \text{ см}$,
 $\delta = 2 \text{ мм}$.

Задача L-26.14.

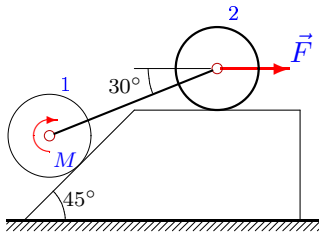
2



$P_1 = 12 \text{ H}$, $P_2 = 27 \text{ H}$, $P_3 = 50 \text{ H}$,
 $M \in [0, 3] \text{ Нм}$, $F = 20 \text{ H}$, $R = 50 \text{ см}$,
 $\delta = 3 \text{ мм}$.

Задача L-26.15.

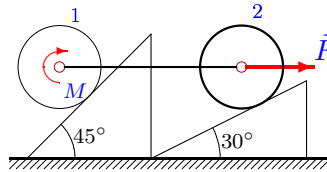
2



$P_1 = 24 \text{ H}$, $P_2 = 29 \text{ H}$, $P_3 = 30 \text{ H}$,
 $M \in [1, 4] \text{ Нм}$, $F = 20 \text{ H}$, $R = 50 \text{ см}$,
 $\delta = 3 \text{ мм}$.

Задача L-26.16.

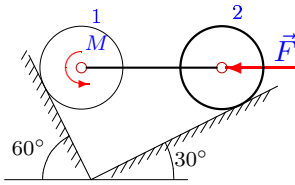
2



$P_1 = 25 \text{ H}$, $P_2 = 29 \text{ H}$, $P_3 = 50 \text{ H}$,
 $M \in [17, 19] \text{ Нм}$, $F = 25 \text{ H}$, $R = 45 \text{ см}$,
 $\delta = 2 \text{ мм}$.

Задача L-26.17.

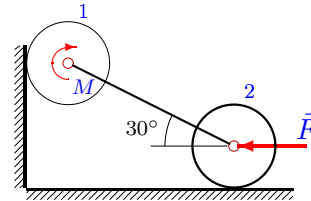
2



$P_1 = 22 \text{ H}$, $P_2 = 26 \text{ H}$, $P_3 = 30 \text{ H}$,
 $M \in [6, 9] \text{ Нм}$, $F = 10 \text{ H}$, $R = 50 \text{ см}$,
 $\delta = 4 \text{ мм}$.

Задача L-26.18.

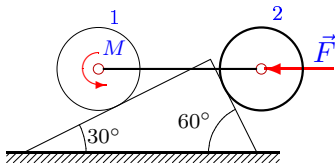
2



$P_1 = 5 \text{ H}$, $P_2 = 23 \text{ H}$, $P_3 = 10 \text{ H}$,
 $M \in [-3, -1] \text{ Нм}$, $F = 10 \text{ H}$, $R = 45 \text{ см}$,
 $\delta = 4 \text{ мм}$.

Задача L-26.19.

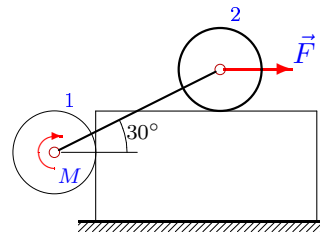
2



$P_1 = 21 \text{ H}$, $P_2 = 26 \text{ H}$, $P_3 = 50 \text{ H}$,
 $M \in [11, 14] \text{ Нм}$, $F = 5 \text{ H}$, $R = 25 \text{ см}$,
 $\delta = 2 \text{ мм}$.

Задача L-26.20.

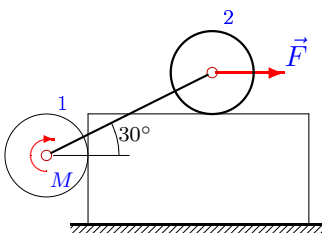
2



$P_1 = 23 \text{ H}$, $P_2 = 25 \text{ H}$, $P_3 = 30 \text{ H}$,
 $M \in [15, 17] \text{ Нм}$, $F = 15 \text{ H}$, $R = 55 \text{ см}$,
 $\delta = 4 \text{ мм}$.

Задача L-26.21.

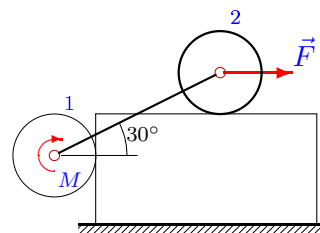
2



$P_1 = 25 \text{ H}$, $P_2 = 28 \text{ H}$, $P_3 = 50 \text{ H}$,
 $M \in [11, 13] \text{ Нм}$, $F = 25 \text{ H}$, $R = 35 \text{ см}$,
 $\delta = 1 \text{ мм}$.

Задача L-26.22.

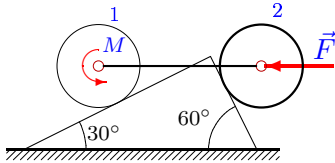
2



$P_1 = 24 \text{ H}$, $P_2 = 25 \text{ H}$, $P_3 = 40 \text{ H}$,
 $M \in [9, 11] \text{ Нм}$, $F = 20 \text{ H}$, $R = 30 \text{ см}$,
 $\delta = 1 \text{ мм}$.

Задача L-26.23.

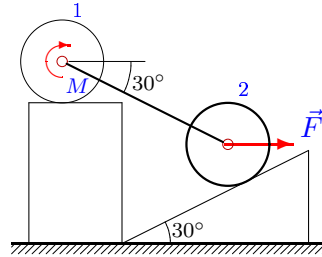
2



$P_1 = 25 \text{ H}, P_2 = 28 \text{ H}, P_3 = 40 \text{ H},$
 $M \in [9, 11] \text{ Нм}, F = 25 \text{ H}, R = 35 \text{ см},$
 $\delta = 1 \text{ мм}.$

Задача L-26.24.

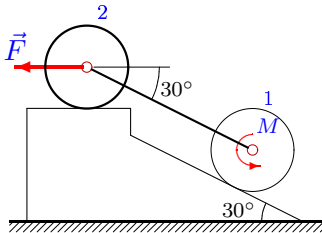
2



$P_1 = 25 \text{ H}, P_2 = 29 \text{ H}, P_3 = 10 \text{ H},$
 $M \in [-4, -2] \text{ Нм}, F = 25 \text{ H}, R = 35 \text{ см},$
 $\delta = 1 \text{ мм}.$

Задача L-26.25.

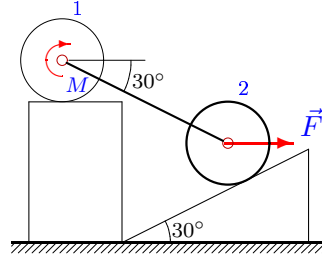
2



$P_1 = 21 \text{ H}, P_2 = 23 \text{ H}, P_3 = 10 \text{ H},$
 $M \in [0, 2] \text{ Нм}, F = 5 \text{ H}, R = 15 \text{ см}, \delta = 1 \text{ мм}.$

Задача L-26.26.

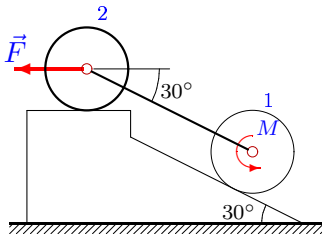
2



$P_1 = 22 \text{ H}, P_2 = 26 \text{ H}, P_3 = 10 \text{ H},$
 $M \in [4, 6] \text{ Нм}, F = 10 \text{ H}, R = 40 \text{ см},$
 $\delta = 3 \text{ мм}.$

Задача L-26.27.

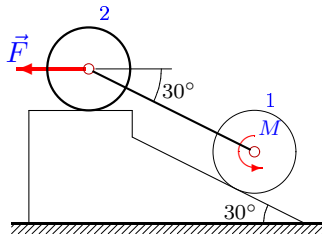
2



$P_1 = 24 \text{ H}, P_2 = 27 \text{ H}, P_3 = 20 \text{ H},$
 $M \in [-4, -1] \text{ Нм}, F = 20 \text{ H}, R = 40 \text{ см},$
 $\delta = 2 \text{ мм}.$

Задача L-26.28.

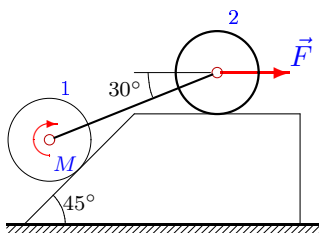
2



$P_1 = 24 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $M \in [-3, -1] \text{ Нм}, F = 20 \text{ H}, R = 60 \text{ см},$
 $\delta = 4 \text{ мм}.$

Задача L-26.29.

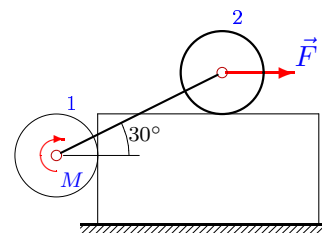
2



$P_1 = 25 \text{ H}, P_2 = 27 \text{ H}, P_3 = 20 \text{ H},$
 $M \in [-3, -1] \text{ Нм}, F = 25 \text{ H}, R = 65 \text{ см},$
 $\delta = 4 \text{ мм}.$

Задача L-26.30.

2



$P_1 = 22 \text{ H}, P_2 = 25 \text{ H}, P_3 = 30 \text{ H},$
 $M \in [11, 14] \text{ Нм}, F = 10 \text{ H}, R = 40 \text{ см},$
 $\delta = 3 \text{ мм}.$

Отвeты.
Трение качения

22-Jan-16

	N_1	N_2	M	N_1	N_2	M	p
	H		Hm	H		Hm	%
1	42.740	65.266	3.508	42.914	65.602	3.216	9.731
2	22.524	61.472	29.483	23.293	60.929	28.983	24.985
3	4.691	34.709	12.731	5.312	35.067	12.570	8.057
4	70.300	90.790	3.115	72.752	93.242	4.035	30.672
5	26.845	39.683	9.123	27.057	40.093	8.767	17.796
6	43.494	54.946	0.913	43.806	54.405	0.724	9.470
7	52.599	41.730	5.335	52.044	41.410	5.527	6.400
8	52.634	73.155	11.324	53.621	74.864	12.093	25.638
9	40.517	72.393	-1.825	39.487	71.798	-2.241	20.812
10	77.290	96.781	1.680	79.760	99.250	2.464	39.206
11	42.717	67.222	4.334	42.937	67.647	3.883	22.564
12	22.357	52.162	17.304	22.923	51.762	17.050	12.728
13	72.088	93.079	2.039	73.949	94.940	2.415	18.802
14	78.110	102.930	1.186	80.272	105.092	1.810	20.802
15	33.455	55.355	2.820	33.654	55.740	2.449	12.391
16	30.761	62.514	17.977	31.213	62.194	17.774	10.182
17	48.041	47.562	7.494	47.283	47.125	7.712	7.289
18	10.302	33.948	-1.824	9.701	33.601	-1.980	7.800
19	80.700	100.606	11.944	82.332	103.433	12.651	23.560
20	14.648	48.457	16.249	15.355	48.865	16.024	11.238
21	24.808	67.323	12.487	25.193	67.545	12.409	3.893
22	19.812	56.438	9.768	20.189	56.656	9.703	3.265
23	67.767	95.527	9.582	68.316	96.477	9.914	16.628
24	34.553	34.058	-2.760	34.747	33.723	-2.878	5.870
25	22.517	31.006	1.048	22.517	30.768	1.120	3.567
26	19.828	44.269	4.969	20.484	43.133	4.515	22.708
27	29.445	48.688	-2.550	29.445	48.407	-2.326	7.474
28	33.775	51.746	-2.395	33.775	51.349	-1.919	23.809
29	32.126	51.252	-1.809	32.315	51.617	-2.268	22.947
30	9.658	45.576	12.570	10.345	45.973	12.411	5.286

L-26 файл o26L2A