

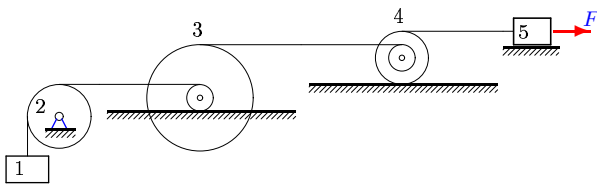
## Теорема об изменении кинетической энергии

Механическая система, состоящая из пяти тел 1, 2, 3, 4 и 5, движется под действием внешних сил. Заданы радиусы цилиндров и блоков. Радиусы инерции  $\rho$  даны для блоков, цилиндры считать однородными. Горизонтальный стержень, находящийся в зацеплении с блоками, считать невесомым. Массы даны в килограммах, радиусы — в сантиметрах. Найти математическое ожидание скорости груза 1 или центра цилиндра (блока) 1, который опустится по вертикали вниз на случайную величину  $S$  с рядом распределения  $p = [0.1, 0.4, 0.3, 0.2]$ . Приблизительно принять  $g = 9.81 \text{ м/с}^2$ .

Кирсанов М.Н. Задачи по теоретической механике с решениями в **Maple 11**. – М.: ФИЗМАТЛИТ, 2010. – 264 с. (с.111)

### Задача L-24.1.

2

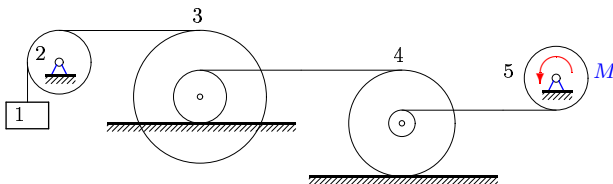


$$\begin{aligned} R_3 &= 4, r_3 = 1, \rho_3 = 3, \\ R_4 &= 2, r_4 = 1, \rho_4 = 1, \\ m_1 &= 8, m_2 = 2, \\ m_3 &= 8, m_4 = 36, \\ m_5 &= 18. \end{aligned}$$

$$S = [1.3, 1.5, 1.6, 1.9] \text{ м.}$$

### Задача L-24.2.

2

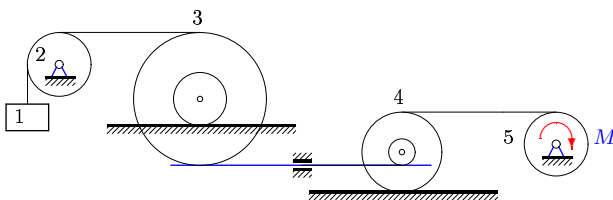


$$\begin{aligned} R_3 &= 5, r_3 = 2, \rho_3 = 4, \\ R_4 &= 4, r_4 = 1, \rho_4 = 3, \\ m_1 &= 8, m_2 = 6, \\ m_3 &= 196, m_4 = 196, \\ m_5 &= 392. \end{aligned}$$

$$S = [1.2, 1.5, 1.6, 1.9] \text{ м.}$$

### Задача L-24.3.

2

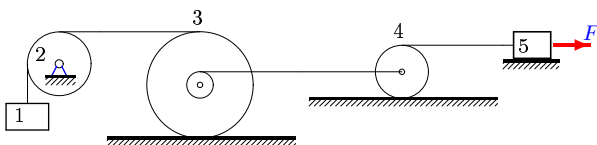


$$\begin{aligned} R_3 &= 5, r_3 = 2, \rho_3 = 4, \\ R_4 &= 3, r_4 = 1, \rho_4 = 2, \\ m_1 &= 14, m_2 = 4, \\ m_3 &= 343, m_4 = 196, \\ m_5 &= 490. \end{aligned}$$

$$S = [2.2, 2.4, 2.7, 2.8] \text{ м.}$$

### Задача L-24.4.

2

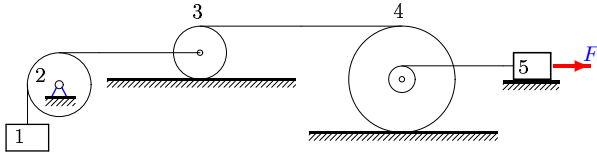


$$\begin{aligned} R_3 &= 4, r_3 = 1, \rho_3 = 3, \\ R_4 &= 2, \\ m_1 &= 5, m_2 = 12, \\ m_3 &= 256, m_4 = 128, \\ m_5 &= 32. \end{aligned}$$

$$S = [3.3, 3.5, 3.6, 3.9] \text{ м.}$$

**Задача L-24.5.**

2



$$R_3 = 2,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 5, m_2 = 8,$$

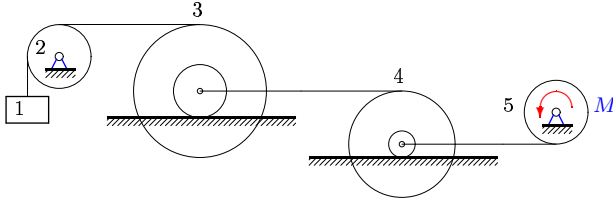
$$m_3 = 8, m_4 = 48,$$

$$m_5 = 32.$$

$$S = [1.2, 1.5, 1.7, 1.9] \text{ м.}$$

**Задача L-24.6.**

2



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 15, m_2 = 6,$$

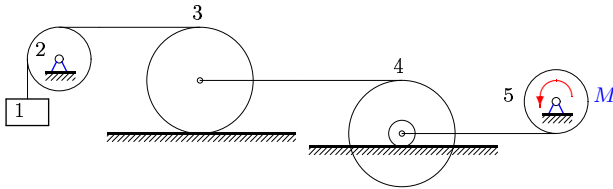
$$m_3 = 196, m_4 = 245,$$

$$m_5 = 2450.$$

$$S = [7.2, 7.4, 7.7, 7.9] \text{ м.}$$

**Задача L-24.7.**

2



$$R_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 11, m_2 = 8,$$

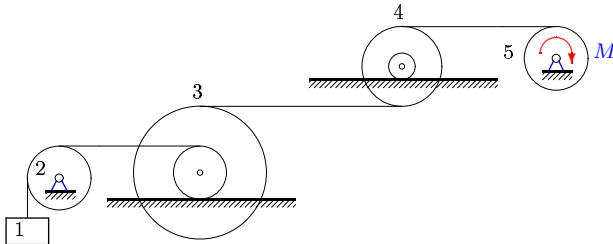
$$m_3 = 32, m_4 = 30,$$

$$m_5 = 200.$$

$$S = [7.2, 7.4, 7.6, 7.8] \text{ м.}$$

**Задача L-24.8.**

2



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 15, m_2 = 10,$$

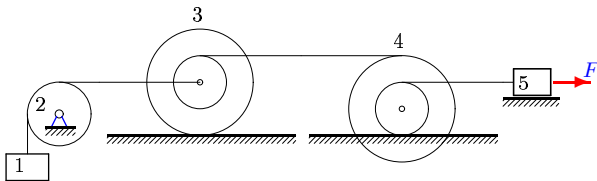
$$m_3 = 16, m_4 = 64,$$

$$m_5 = 16.$$

$$S = [8.2, 8.4, 8.7, 8.9] \text{ м.}$$

**Задача L-24.9.**

2



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

$$m_1 = 11, m_2 = 4,$$

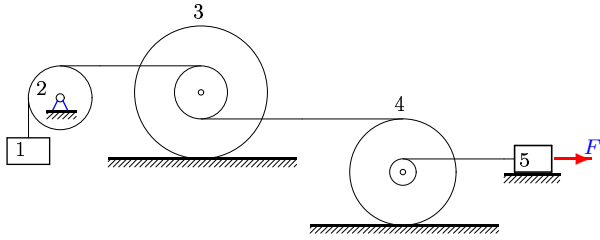
$$m_3 = 64, m_4 = 48,$$

$$m_5 = 2.$$

$$S = [6.3, 6.5, 6.7, 6.8] \text{ м.}$$

Задача L-24.10.

2



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 7, m_2 = 6,$$

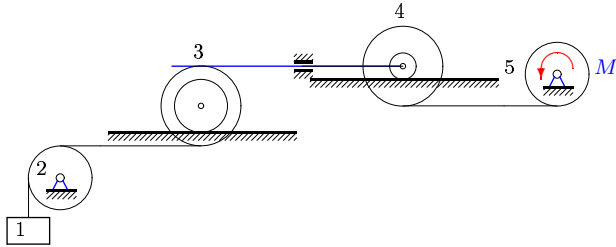
$$m_3 = 196, m_4 = 3136,$$

$$m_5 = 3136.$$

$$S = [1.3, 1.5, 1.7, 1.8] \text{ м.}$$

Задача L-24.11.

2



$$R_3 = 3, r_3 = 2, \rho_3 = 2,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 21, m_2 = 4,$$

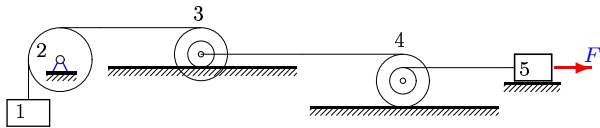
$$m_3 = 7, m_4 = 1,$$

$$m_5 = 10.$$

$$S = [9.2, 9.4, 9.7, 9.8] \text{ м.}$$

Задача L-24.12.

2



$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 9, m_2 = 2,$$

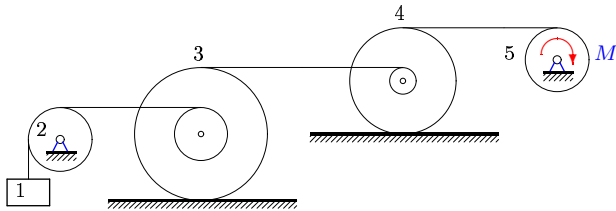
$$m_3 = 36, m_4 = 144,$$

$$m_5 = 32.$$

$$S = [1.2, 1.5, 1.7, 1.8] \text{ м.}$$

Задача L-24.13.

2



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 3, m_2 = 6,$$

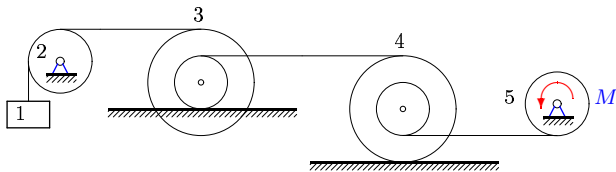
$$m_3 = 196, m_4 = 147,$$

$$m_5 = 98.$$

$$S = [1.3, 1.4, 1.6, 1.8] \text{ м.}$$

Задача L-24.14.

2



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

$$m_1 = 9, m_2 = 4,$$

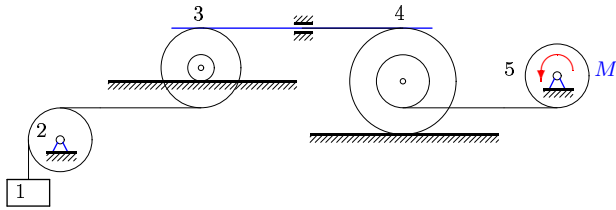
$$m_3 = 144, m_4 = 144,$$

$$m_5 = 144.$$

$$S = [2.2, 2.4, 2.7, 2.9] \text{ м.}$$

Задача L-24.15.

2



$$R_3 = 3, r_3 = 1, \rho_3 = 2,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

$$m_1 = 11, m_2 = 10,$$

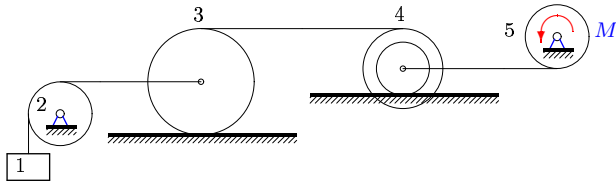
$$m_3 = 16, m_4 = 48,$$

$$m_5 = 16.$$

$$S = [2.2, 2.4, 2.6, 2.9] \text{ м.}$$

Задача L-24.16.

2



$$R_3 = 4,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 11, m_2 = 2,$$

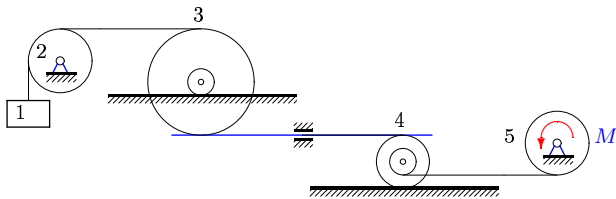
$$m_3 = 8, m_4 = 75,$$

$$m_5 = 100.$$

$$S = [7.3, 7.4, 7.6, 7.9] \text{ м.}$$

Задача L-24.17.

2



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 11, m_2 = 2,$$

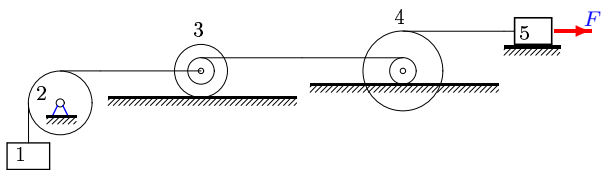
$$m_3 = 20, m_4 = 240,$$

$$m_5 = 800.$$

$$S = [2.2, 2.4, 2.6, 2.8] \text{ м.}$$

Задача L-24.18.

2



$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 3, r_4 = 1, \rho_4 = 2,$$

$$m_1 = 13, m_2 = 4,$$

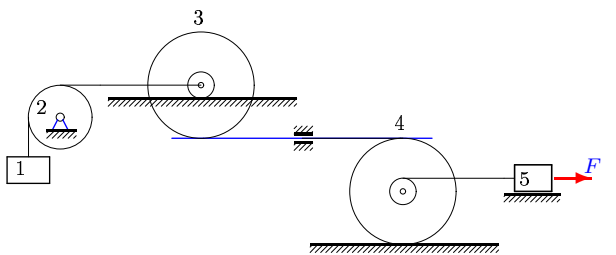
$$m_3 = 24, m_4 = 80,$$

$$m_5 = 4.$$

$$S = [6.3, 6.5, 6.6, 6.8] \text{ м.}$$

Задача L-24.19.

2



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 15, m_2 = 6,$$

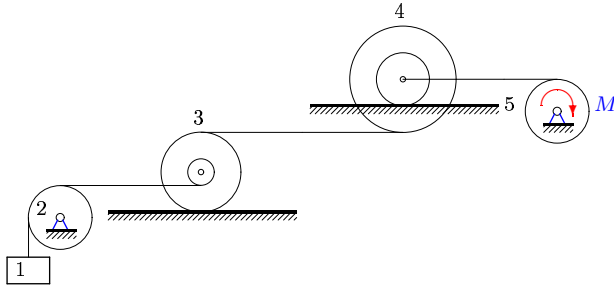
$$m_3 = 8, m_4 = 64,$$

$$m_5 = 64.$$

$$S = [1.3, 1.4, 1.7, 1.8] \text{ м.}$$

Задача L-24.20.

2



$$R_3 = 3, r_3 = 1, \rho_3 = 2,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

$$m_1 = 12, m_2 = 10,$$

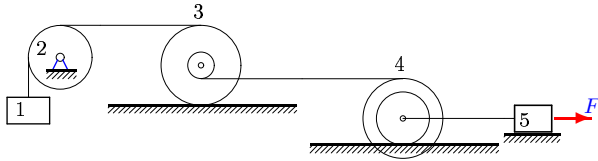
$$m_3 = 16, m_4 = 12,$$

$$m_5 = 4.$$

$$S = [9.2, 9.4, 9.6, 9.8] \text{ м.}$$

Задача L-24.21.

2



$$R_3 = 3, r_3 = 1, \rho_3 = 2,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 12, m_2 = 12,$$

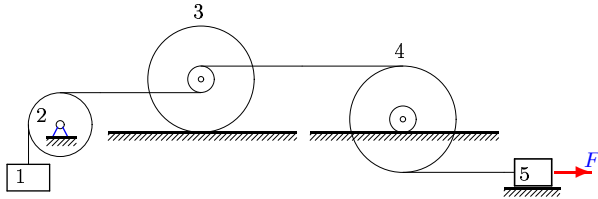
$$m_3 = 216, m_4 = 225,$$

$$m_5 = 225.$$

$$S = [7.3, 7.5, 7.6, 7.8] \text{ м.}$$

Задача L-24.22.

2



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 14, m_2 = 8,$$

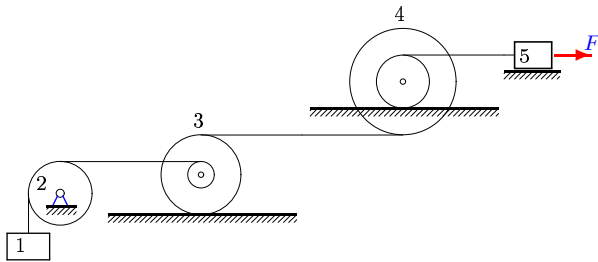
$$m_3 = 36, m_4 = 27,$$

$$m_5 = 2.$$

$$S = [8.3, 8.4, 8.7, 8.9] \text{ м.}$$

Задача L-24.23.

2



$$R_3 = 3, r_3 = 1, \rho_3 = 2,$$

$$R_4 = 4, r_4 = 2, \rho_4 = 3,$$

$$m_1 = 12, m_2 = 10,$$

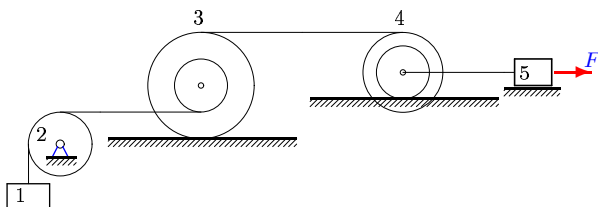
$$m_3 = 64, m_4 = 48,$$

$$m_5 = 2.$$

$$S = [10.3, 10.4, 10.7, 10.9] \text{ м.}$$

Задача L-24.24.

2



$$R_3 = 4, r_3 = 2, \rho_3 = 3,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 10, m_2 = 2,$$

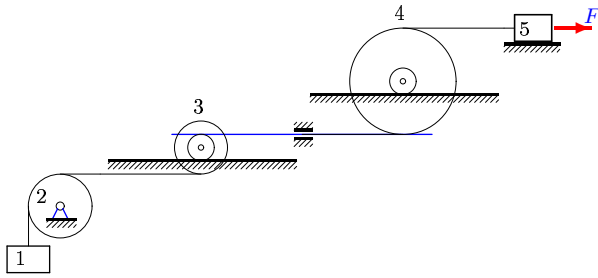
$$m_3 = 16, m_4 = 25,$$

$$m_5 = 50.$$

$$S = [7.3, 7.5, 7.7, 7.8] \text{ м.}$$

Задача L-24.25.

2



$$R_3 = 2, r_3 = 1, \rho_3 = 1,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 21, m_2 = 8,$$

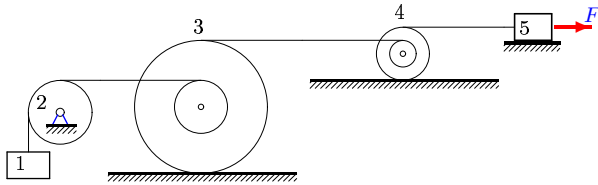
$$m_3 = 6, m_4 = 45,$$

$$m_5 = 36.$$

$$S = [8.3, 8.5, 8.6, 8.8] \text{ м.}$$

Задача L-24.26.

2



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 2, r_4 = 1, \rho_4 = 1,$$

$$m_1 = 3, m_2 = 12,$$

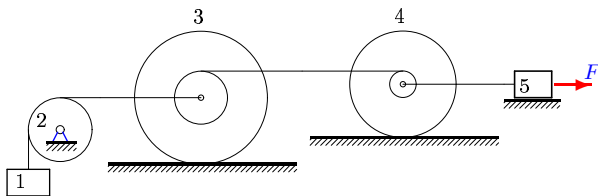
$$m_3 = 196, m_4 = 441,$$

$$m_5 = 441.$$

$$S = [1.3, 1.5, 1.7, 1.9] \text{ м.}$$

Задача L-24.27.

2



$$R_3 = 5, r_3 = 2, \rho_3 = 4,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 9, m_2 = 6,$$

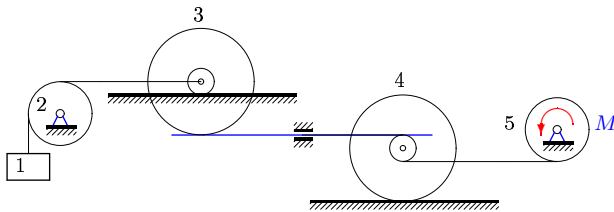
$$m_3 = 100, m_4 = 75,$$

$$m_5 = 625.$$

$$S = [4.3, 4.5, 4.7, 4.8] \text{ м.}$$

Задача L-24.28.

2



$$R_3 = 4, r_3 = 1, \rho_3 = 3,$$

$$R_4 = 4, r_4 = 1, \rho_4 = 3,$$

$$m_1 = 15, m_2 = 8,$$

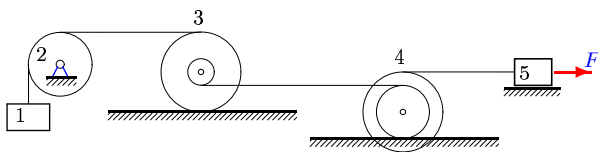
$$m_3 = 4, m_4 = 3,$$

$$m_5 = 100.$$

$$S = [5.2, 5.4, 5.6, 5.8] \text{ м.}$$

Задача L-24.29.

2



$$R_3 = 3, r_3 = 1, \rho_3 = 2,$$

$$R_4 = 3, r_4 = 2, \rho_4 = 2,$$

$$m_1 = 9, m_2 = 2,$$

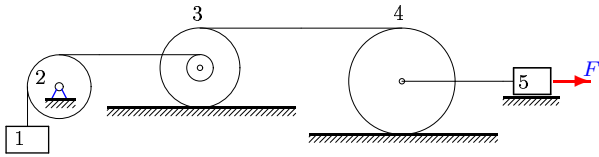
$$m_3 = 144, m_4 = 54,$$

$$m_5 = 144.$$

$$S = [6.3, 6.4, 6.7, 6.9] \text{ м.}$$

Задача L-24.30.

2



$$\begin{aligned}R_3 &= 3, r_3 = 1, \rho_3 = 2, \\R_4 &= 4, \\m_1 &= 5, m_2 = 10, \\m_3 &= 64, m_4 = 96, \\m_5 &= 32.\end{aligned}$$

$$S = [3.3, 3.4, 3.7, 3.9] \text{ м.}$$

L-24

**Ответы.****Теорема об изменении кинетической энергии**

22-Jan-16

№	$\mu_1$	$\mu_2$	$\mu_3$	$\mu_4$	$\mu_5$	$\sum \mu_k$	$M(v)$
1	8	1	20	125	200	354	0.838
2	8	3	80	25	25	141	1.324
3	14	2	140	117	405	678	1.016
4	5	6	100	75	50	236	1.221
5	5	4	12	75	50	146	1.038
6	15	3	80	8	4	110	4.500
7	11	4	12	3	1	31	7.235
8	15	5	20	245	98	383	2.566
9	11	2	100	39	2	154	3.041
10	7	3	164	225	225	624	0.593
11	21	2	56	125	500	704	2.364
12	9	1	8	5	2	25	3.346
13	3	3	164	300	256	726	0.352
14	9	2	52	25	2	90	2.243
15	11	5	20	75	2	113	2.201
16	11	1	12	96	32	152	3.274
17	11	1	8	27	9	56	3.114
18	13	2	30	225	36	306	2.340
19	15	3	80	225	225	548	0.914
20	12	5	52	351	18	438	2.262
21	12	6	78	8	4	108	4.062
22	14	4	100	30	2	150	3.963
23	12	5	52	351	18	438	2.385
24	10	1	100	128	128	367	2.016
25	21	4	12	200	400	637	2.354
26	3	6	164	500	1600	2273	0.204
27	9	3	164	147	784	1107	0.856
28	15	4	40	27	162	248	2.559
29	9	1	52	3	25	90	3.593
30	5	5	52	81	18	161	1.476

L-24 файл о24L2A