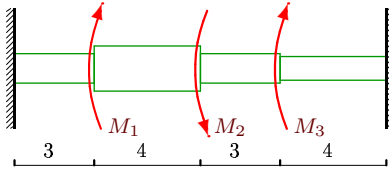


Кручение

К стержню кусочно-постоянного круглого сечения приложены моменты M_1 , M_2 , M_3 . Дан ряд $p = [0.2, 0.3, 0.4, 0.1]$ распределения дискретной случайной величины диаметра одного из участков стержня. Найти математическое ожидание момента левой заделки. Модуль сдвига материала $G = 80 \text{ ГПа}$. Длины участков даны в метрах.

Задача L-23.1.

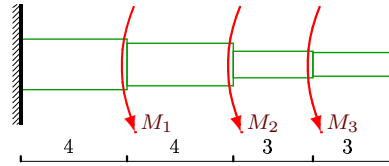
1



$M_1 = 33 \text{ кНм}$, $M_2 = 8 \text{ кНм}$,
 $M_3 = 12 \text{ кНм}$, $d_1 = 11 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [17, 18, 19, 20] \text{ см}$.

Задача L-23.2.

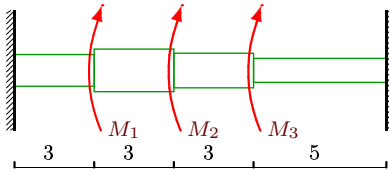
1



$M_1 = 75 \text{ кНм}$, $M_2 = 50 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_2 = 16 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [19, 20, 21, 22] \text{ см}$.

Задача L-23.3.

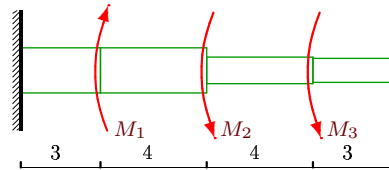
1



$M_1 = 21 \text{ кНм}$, $M_2 = 18 \text{ кНм}$,
 $M_3 = 24 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_2 = 16 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Задача L-23.4.

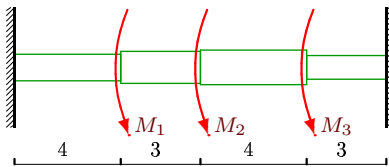
1



$M_1 = 39 \text{ кНм}$, $M_2 = 36 \text{ кНм}$,
 $M_3 = 22 \text{ кНм}$, $d_2 = 17 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [17, 18, 19, 20] \text{ см}$.

Задача L-23.5.

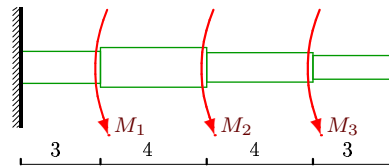
1



$M_1 = 20 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 40 \text{ кНм}$, $d_1 = 10 \text{ см}$, $d_2 = 12 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11.5, 12] \text{ см}$.

Задача L-23.6.

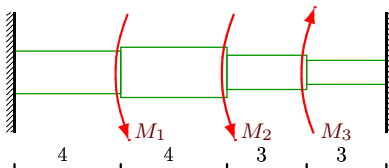
1



$M_1 = 7 \text{ кНм}$, $M_2 = 33 \text{ кНм}$,
 $M_3 = 15 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [15, 16, 17, 18] \text{ см}$.

Задача L-23.7.

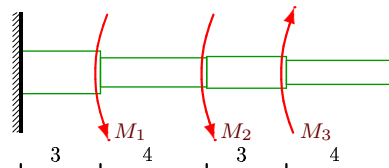
1



$M_1 = 12 \text{ кНм}$, $M_2 = 16 \text{ кНм}$,
 $M_3 = 30 \text{ кНм}$, $d_1 = 16 \text{ см}$, $d_2 = 19 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Задача L-23.8.

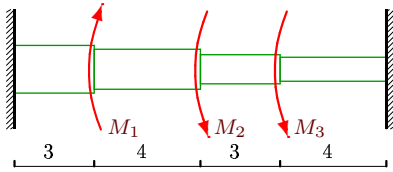
1



$M_1 = 7 \text{ кНм}$, $M_2 = 8 \text{ кНм}$,
 $M_3 = 28 \text{ кНм}$, $d_1 = 16 \text{ см}$, $d_2 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13.5, 14, 15] \text{ см}$.

Задача L-23.9.

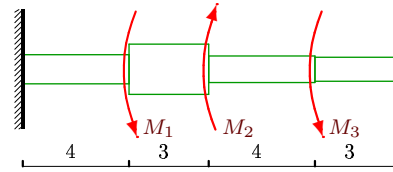
1



$M_1 = 26 \text{ кНм}$, $M_2 = 30 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_1 = 18 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [15, 16, 17, 18] \text{ см}$.

Задача L-23.10.

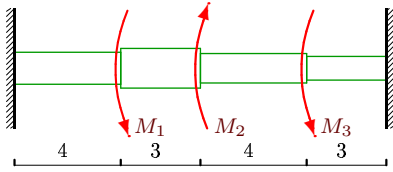
1



$M_1 = 30 \text{ кНм}$, $M_2 = 48 \text{ кНм}$,
 $M_3 = 30 \text{ кНм}$, $d_2 = 19 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [11, 12, 13, 14] \text{ см}$.

Задача L-23.11.

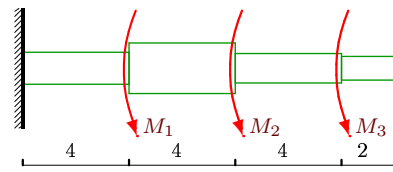
1



$M_1 = 27 \text{ кНм}$, $M_2 = 15 \text{ кНм}$,
 $M_3 = 70 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [15, 16, 17, 18] \text{ см}$.

Задача L-23.12.

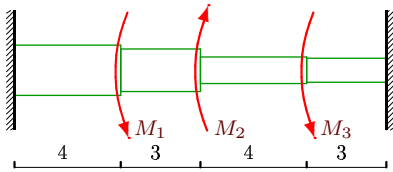
1



$M_1 = 22 \text{ кНм}$, $M_2 = 15 \text{ кНм}$,
 $M_3 = 50 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [19, 20, 21, 22] \text{ см}$.

Задача L-23.13.

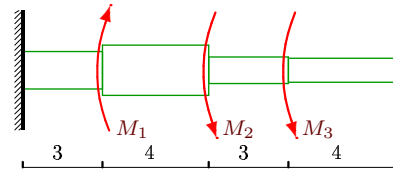
1



$M_1 = 14 \text{ кНм}$, $M_2 = 39 \text{ кНм}$,
 $M_3 = 39 \text{ кНм}$, $d_2 = 16 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [19, 20, 21, 22] \text{ см}$.

Задача L-23.14.

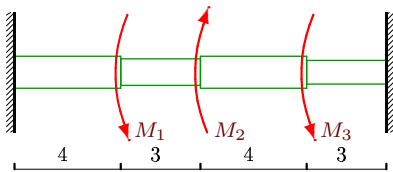
1



$M_1 = 13 \text{ кНм}$, $M_2 = 30 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_2 = 19 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [14, 15, 16, 17] \text{ см}$.

Задача L-23.15.

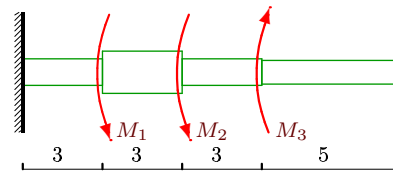
1



$M_1 = 40 \text{ кНм}$, $M_2 = 30 \text{ кНм}$,
 $M_3 = 35 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_2 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12.5, 13, 14, 15] \text{ см}$.

Задача L-23.16.

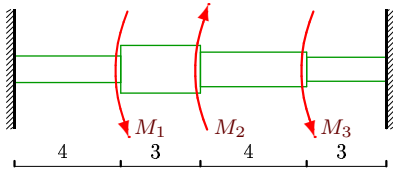
1



$M_1 = 7 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 11 \text{ кНм}$, $d_2 = 16 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [10, 11, 12, 13] \text{ см}$.

Задача L-23.17.

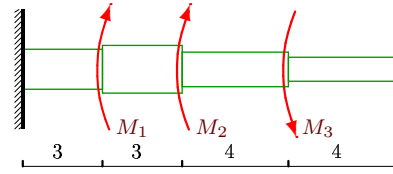
1



$M_1 = 18 \text{ кНм}$, $M_2 = 14 \text{ кНм}$,
 $M_3 = 40 \text{ кНм}$, $d_1 = 10 \text{ см}$, $d_2 = 18 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Задача L-23.18.

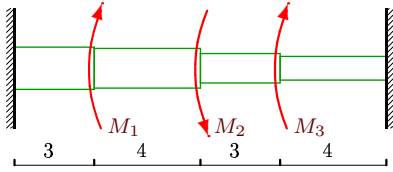
1



$M_1 = 6 \text{ кНм}$, $M_2 = 52 \text{ кНм}$,
 $M_3 = 21 \text{ кНм}$, $d_1 = 15 \text{ см}$, $d_2 = 18 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Задача L-23.19.

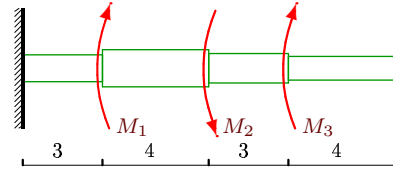
1



$M_1 = 45 \text{ кНм}$, $M_2 = 35 \text{ кНм}$,
 $M_3 = 33 \text{ кНм}$, $d_1 = 16 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [15, 16, 17, 18] \text{ см}$.

Задача L-23.20.

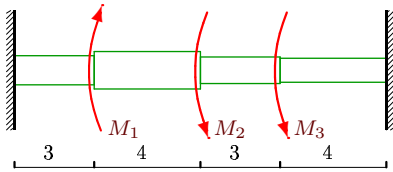
1



$M_1 = 12 \text{ кНм}$, $M_2 = 18 \text{ кНм}$,
 $M_3 = 12 \text{ кНм}$, $d_1 = 10 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [14, 15, 16, 17] \text{ см}$.

Задача L-23.21.

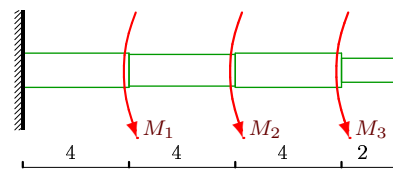
1



$M_1 = 11 \text{ кНм}$, $M_2 = 10 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_2 = 14 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [11, 12, 13, 14] \text{ см}$.

Задача L-23.22.

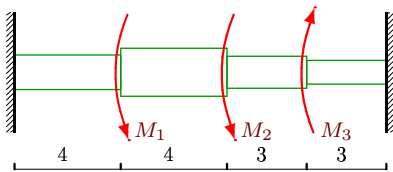
1



$M_1 = 22 \text{ кНм}$, $M_2 = 15 \text{ кНм}$,
 $M_3 = 45 \text{ кНм}$, $d_1 = 13 \text{ см}$, $d_2 = 12 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11.5, 12] \text{ см}$.

Задача L-23.23.

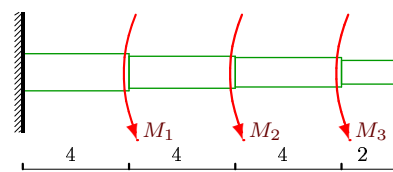
1



$M_1 = 26 \text{ кНм}$, $M_2 = 24 \text{ кНм}$,
 $M_3 = 30 \text{ кНм}$, $d_1 = 13 \text{ см}$, $d_2 = 18 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13, 14, 15] \text{ см}$.

Задача L-23.24.

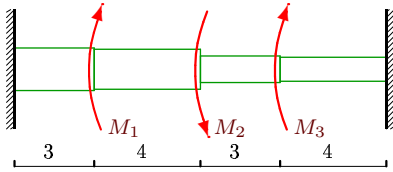
1



$M_1 = 33 \text{ кНм}$, $M_2 = 12 \text{ кНм}$,
 $M_3 = 18 \text{ кНм}$, $d_1 = 14 \text{ см}$, $d_3 = 11 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_2 = [12, 13, 14.5, 15] \text{ см}$.

Задача L-23.25.

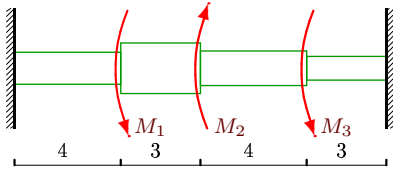
1



$M_1 = 60 \text{ кНм}$, $M_2 = 30 \text{ кНм}$,
 $M_3 = 56 \text{ кНм}$, $d_2 = 15 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [16, 17, 18, 19] \text{ см}$.

Задача L-23.27.

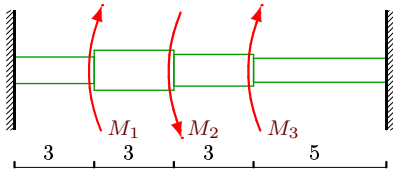
1



$M_1 = 24 \text{ кНм}$, $M_2 = 48 \text{ кНм}$,
 $M_3 = 18 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_2 = 19 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Задача L-23.29.

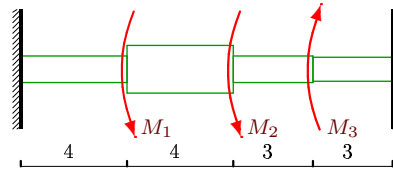
1



$M_1 = 30 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 24 \text{ кНм}$, $d_1 = 10 \text{ см}$, $d_2 = 15 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_3 = [12, 13, 14, 15] \text{ см}$.

Задача L-23.26.

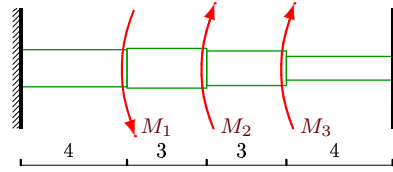
1



$M_1 = 33 \text{ кНм}$, $M_2 = 9 \text{ кНм}$,
 $M_3 = 9 \text{ кНм}$, $d_2 = 18 \text{ см}$, $d_3 = 10 \text{ см}$,
 $d_4 = 9 \text{ см}$.
 $d_1 = [10, 11, 12, 13] \text{ см}$.

Задача L-23.28.

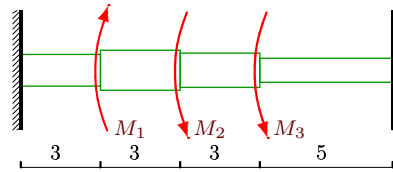
1



$M_1 = 30 \text{ кНм}$, $M_2 = 24 \text{ кНм}$,
 $M_3 = 32 \text{ кНм}$, $d_1 = 14 \text{ см}$, $d_2 = 15 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Задача L-23.30.

1



$M_1 = 20 \text{ кНм}$, $M_2 = 7 \text{ кНм}$,
 $M_3 = 7 \text{ кНм}$, $d_1 = 12 \text{ см}$, $d_2 = 15 \text{ см}$,
 $d_3 = 13 \text{ см}$,
 $d_4 = [9, 10, 11, 12] \text{ см}$.

Отвeты.
Кручение

22-Jan-16

№	M_A
	кНм
1	-27.350
2	121.680
3	-44.283
4	6.030
5	25.152
6	39.135
7	6.141
8	-4.530
9	6.718
10	-0.968
11	43.399
12	46.756
13	-3.192
14	19.421
15	31.489
16	5.257
17	15.323
18	-36.759
19	-33.606
20	-2.786
21	1.930
22	36.212
23	20.445
24	44.167
25	-64.729
26	27.781
27	-7.088
28	-10.682
29	-32.689
30	-6.944

L-23 файл о23L1A