

# Пространственная ферма

Найти усилия в стержнях 1–6 пространственной фермы, нагруженной в одном узле вертикальной силой  $\vec{G}$  и горизонтальной  $\vec{F}$ . Ответ выразить в кН.

Кирсанов М.Н. **Решебник. Теоретическая механика**/Под ред. А. И. Кириллова.– М.: ФИЗМАТЛИТ, 2002.– 384 с. (с.86.)

**Задача 11.1.**

$G = 13 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 7 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 4 \text{ м}.$

**Задача 11.2.**

$G = 5 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 2 \text{ м}.$

**Задача 11.3.**

$G = 6 \text{ кН},$   
 $F = 4 \text{ кН}.$

$a = 5 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 1 \text{ м}.$

**Задача 11.4.**

$G = 5 \text{ кН},$   
 $F = 8 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 2 \text{ м}.$

**Задача 11.5.**

$G = 5 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

**Задача 11.6.**

$G = 8 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 3 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 2 \text{ м}.$

**Задача 11.7.**

$G = 8 \text{ кН},$   
 $F = 4 \text{ кН}.$

$a = 3 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 1 \text{ м}.$

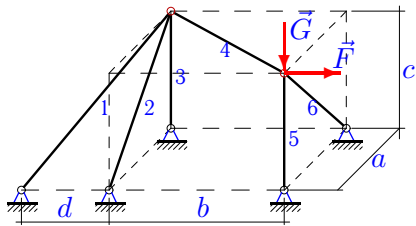
**Задача 11.8.**

$G = 7 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 6 \text{ м}, b = 5 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

**Задача 11.9.**

1

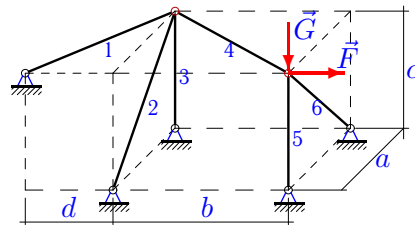


$G = 9 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 3 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 1 \text{ м}.$

**Задача 11.10.**

1

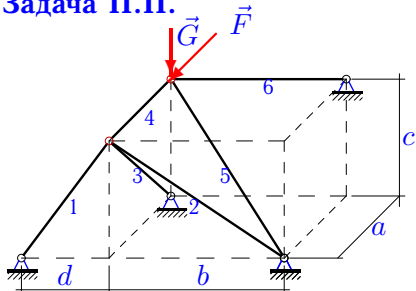


$G = 12 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 7 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 3 \text{ м}.$

**Задача 11.11.**

1

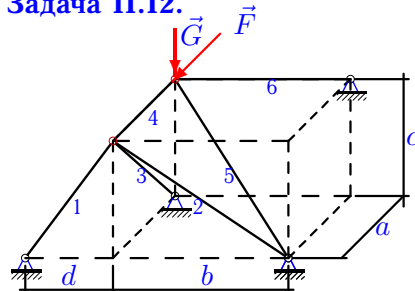


$G = 6 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 4 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 4 \text{ м}.$

**Задача 11.12.**

1

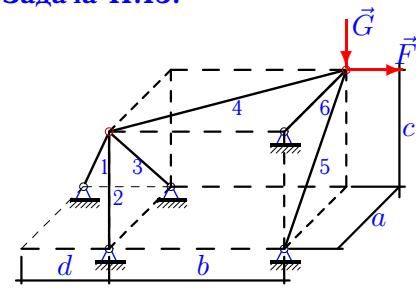


$G = 6 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

**Задача 11.13.**

1

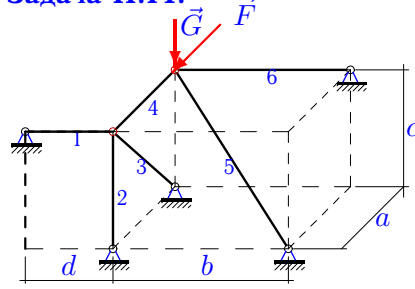


$G = 7 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 6 \text{ м}, b = 5 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

**Задача 11.14.**

1

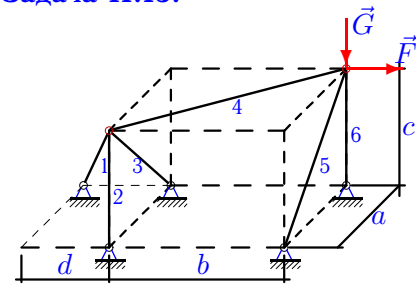


$G = 6 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 5 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 2 \text{ м}.$

**Задача 11.15.**

1

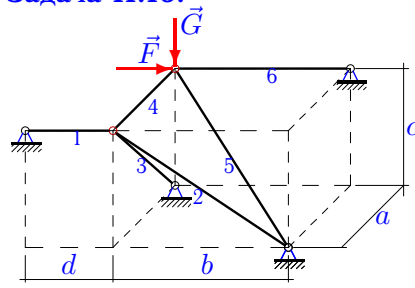


$G = 9 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 6 \text{ м}, b = 5 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

**Задача 11.16.**

1

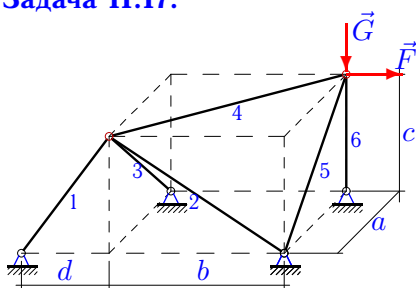


$G = 11 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 5 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 2 \text{ м}.$

**Задача 11.17.**

1

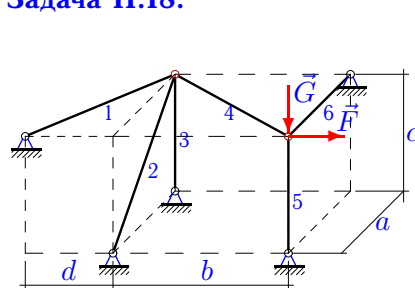


$G = 8 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

**Задача 11.18.**

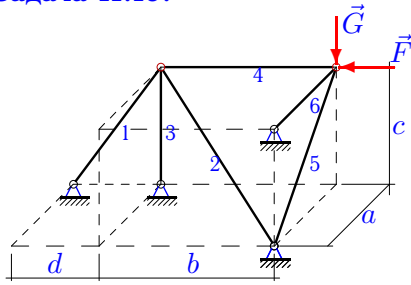
1



$G = 9 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 7 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 3 \text{ м}.$

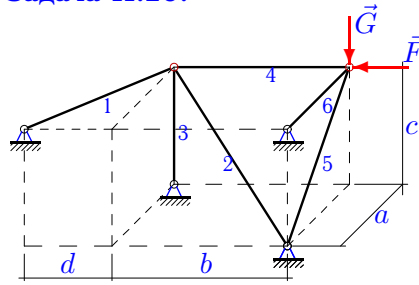
**Задача 11.19.**



$G = 7 \text{ кН},$   
 $F = 8 \text{ кН}.$

$a = 4 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 3 \text{ м}.$

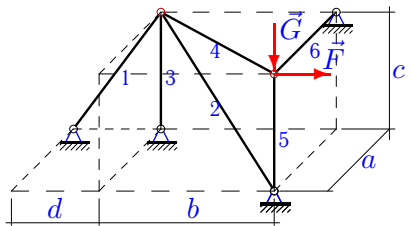
**Задача 11.20.**



$G = 4 \text{ кН},$   
 $F = 8 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 2 \text{ м}.$

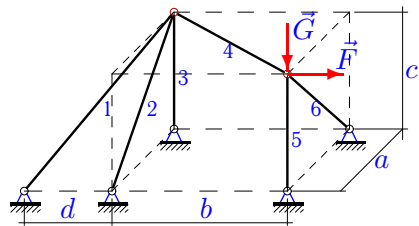
**Задача 11.21.**



$G = 5 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 3 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 1 \text{ м}.$

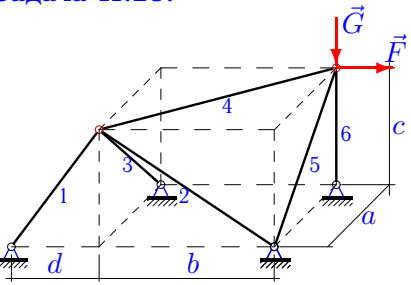
**Задача 11.22.**



$G = 9 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 5 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 1 \text{ м}.$

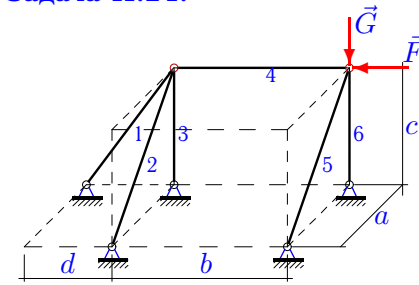
**Задача 11.23.**



$G = 11 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 5 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 2 \text{ м}.$

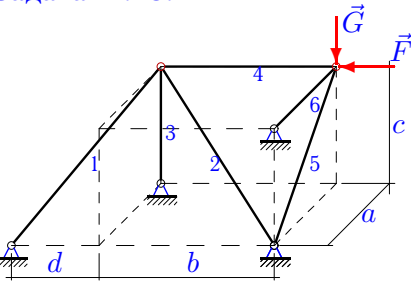
**Задача 11.24.**



$G = 6 \text{ кН},$   
 $F = 4 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 2 \text{ м}.$

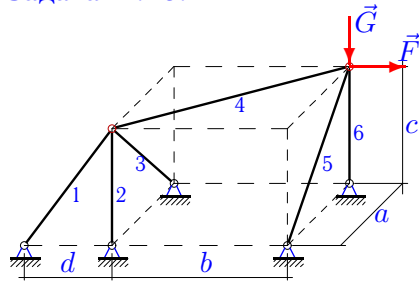
**Задача 11.25.**



$G = 6 \text{ кН},$   
 $F = 8 \text{ кН}.$

$a = 4 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 3 \text{ м}.$

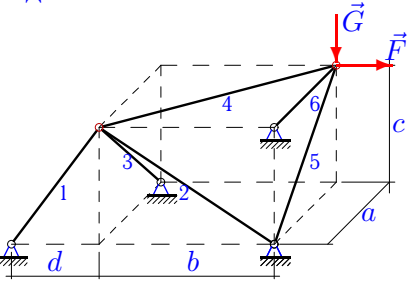
**Задача 11.26.**



$G = 11 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 7 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 4 \text{ м}.$

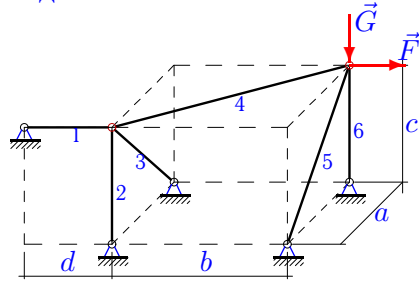
**Задача 11.27.**



$G = 9 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 6 \text{ м}, b = 5 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

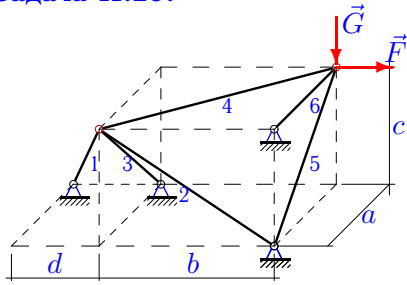
**Задача 11.28.**



$G = 11 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 5 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 2 \text{ м}.$

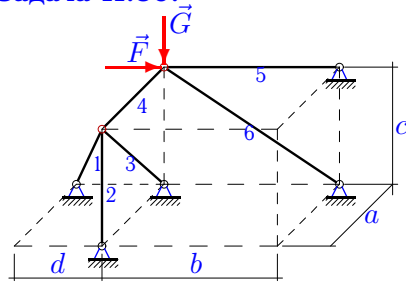
**Задача 11.29.**



$G = 5 \text{ кН},$   
 $F = 2 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 3 \text{ м}.$

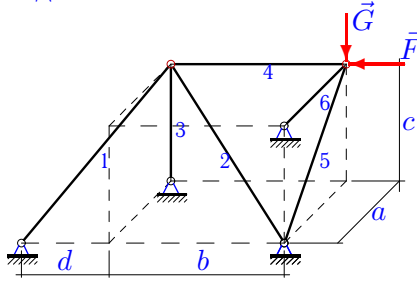
**Задача 11.30.**



$G = 8 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 3 \text{ м}, b = 4 \text{ м}, c = 3 \text{ м}, d = 2 \text{ м}.$

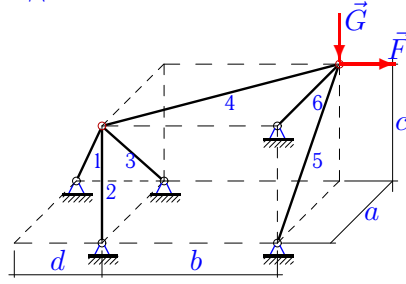
**Задача 11.31.**



$G = 4 \text{ кН},$   
 $F = 8 \text{ кН}.$

$a = 2 \text{ м}, b = 3 \text{ м}, c = 4 \text{ м}, d = 2 \text{ м}.$

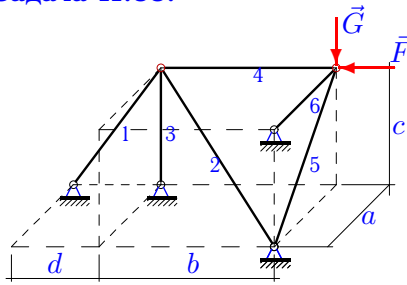
**Задача 11.32.**



$G = 5 \text{ кН},$   
 $F = 1 \text{ кН}.$

$a = 4 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 4 \text{ м}.$

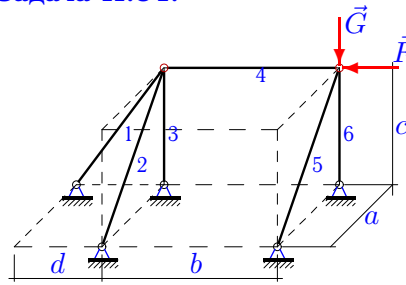
**Задача 11.33.**



$G = 9 \text{ кН},$   
 $F = 8 \text{ кН}.$

$a = 6 \text{ м}, b = 5 \text{ м}, c = 4 \text{ м}, d = 2 \text{ м}.$

**Задача 11.34.**



$G = 7 \text{ кН},$   
 $F = 4 \text{ кН}.$

$a = 4 \text{ м}, b = 6 \text{ м}, c = 5 \text{ м}, d = 3 \text{ м}.$

**Пространственная ферма**

	$S_1$	$S_2$	$S_3$	$S_4$	$S_5$	$S_6$
1	1.601	-0.417	-1.434	1.537	-1.434	-12.167
2	1.414	-3.727	3.333	1.202	-3.667	-1.491
3	-20.396	23.324	-12.000	-4.000	-11.662	10.000
4	-7.838	8.616	-0.000	-8.000	-5.590	2.500
5	-0.000	-2.000	2.236	-1.000	3.750	-6.250
6	10.667	13.333	-11.314	8.000	-15.549	8.667
7	-12.649	-0.000	12.000	-4.000	-0.000	-8.000
8	2.603	0.800	-3.846	1.562	-12.619	9.300
9	4.359	-5.303	0.750	1.250	-8.250	-1.061
10	2.539	-4.301	2.500	1.537	-11.167	-1.434
11	2.689	2.187	-4.482	2.800	-10.530	7.200
12	1.250	1.250	-2.236	1.000	-8.078	4.500
13	2.603	0.800	-3.846	1.562	-12.619	9.300
14	-0.000	5.400	-10.496	9.000	-14.142	8.000
15	2.603	0.800	-3.846	1.562	-1.442	-8.200
16	14.667	18.333	-21.380	18.333	-25.927	12.667
17	3.333	-0.000	-2.981	2.404	-2.981	-5.333
18	2.539	-4.301	2.500	1.537	-9.000	-1.167
19	-15.549	-0.000	13.333	-8.000	-8.964	5.600
20	-4.525	8.616	-6.400	-8.000	-4.472	2.000
21	0.000	-2.915	1.500	2.500	-5.000	-1.500
22	5.916	-7.289	0.750	1.601	-8.250	-1.458
23	2.404	-0.833	-2.915	3.202	-2.915	-9.500
24	-8.944	-0.000	8.000	-4.000	-0.000	-6.000
25	-6.285	7.800	-0.000	-8.000	-7.684	4.800
26	1.601	-0.417	-1.434	1.537	-1.434	-10.167
27	2.500	-0.640	-2.884	3.124	-16.225	11.100
28	1.000	0.750	-1.458	1.601	-1.458	-10.250
29	7.180	3.333	-8.944	2.404	-5.590	1.167
30	-0.000	-0.000	-0.000	-0.000	9.667	-13.333
31	-7.838	8.616	-0.000	-8.000	-4.472	2.000
32	1.887	0.833	-2.668	1.202	-6.403	3.333
33	-17.889	-0.000	16.000	-8.000	-16.225	13.500
34	-7.775	-0.000	6.667	-4.000	-0.000	-7.000