

# 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.** 7

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

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

**Задача 11.2.** 7

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

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

**Задача 11.3.** 7

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

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

**Задача 11.4.** 7

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

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

**Задача 11.5.** 7

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

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

**Задача 11.6.** 7

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

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

**Задача 11.7.** 7

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

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

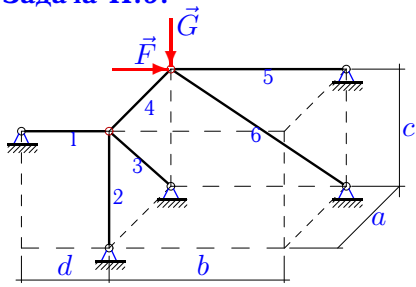
**Задача 11.8.** 7

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

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

**Задача 11.9.**

7

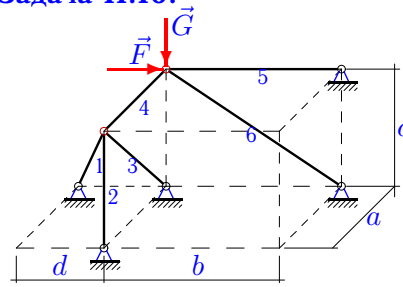


$G = 9 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.10.**

7

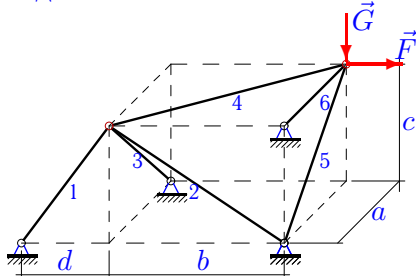


$G = 7 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.11.**

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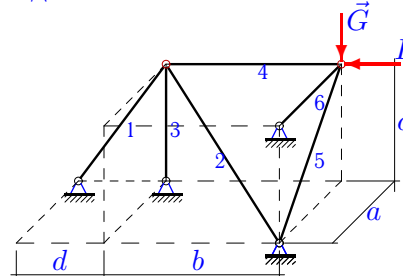


$G = 4 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.12.**

7

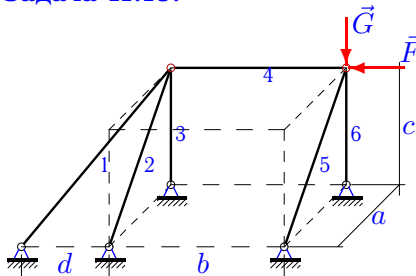


$G = 8 \text{ кН},$   
 $F = 8 \text{ кН}.$

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

**Задача 11.13.**

7

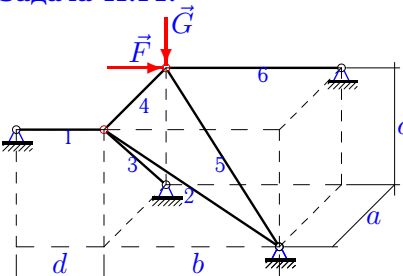


$G = 7 \text{ кН},$   
 $F = 4 \text{ кН}.$

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

**Задача 11.14.**

7

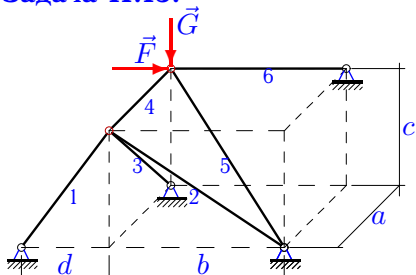


$G = 12 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.15.**

7

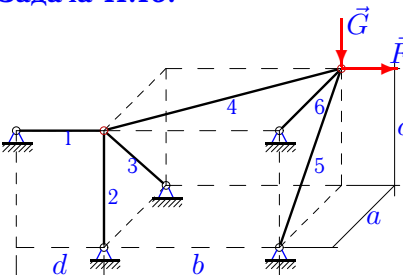


$G = 11 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.16.**

7

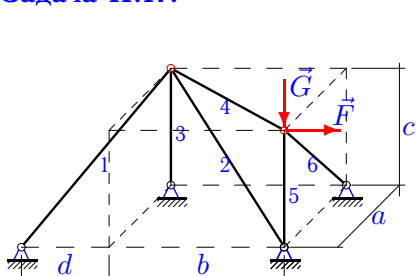


$G = 9 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.17.**

7

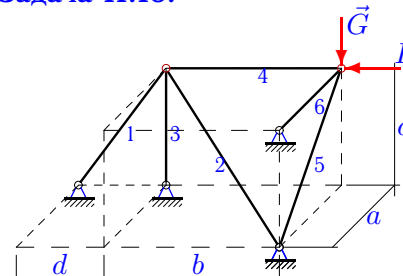


$G = 13 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.18.**

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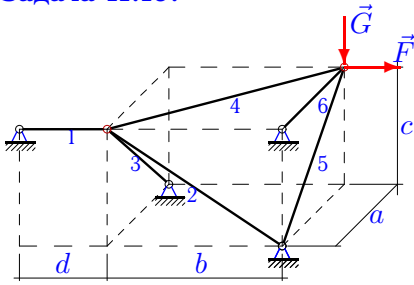


$G = 8 \text{ кН},$   
 $F = 8 \text{ кН}.$

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

**Задача 11.19.**

7

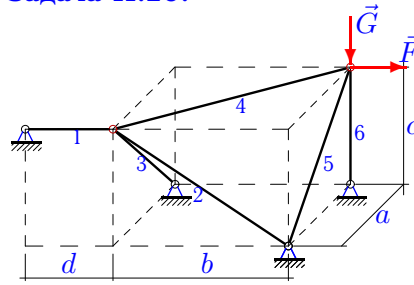


$G = 6 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.20.**

7

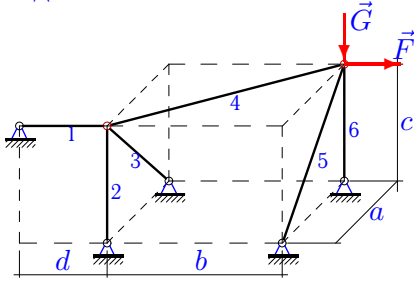


$G = 6 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.21.**

7

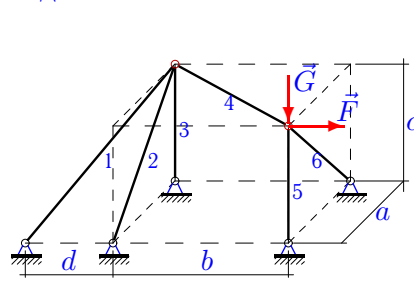


$G = 10 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.22.**

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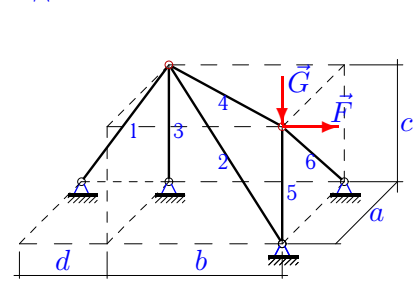


$G = 7 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.23.**

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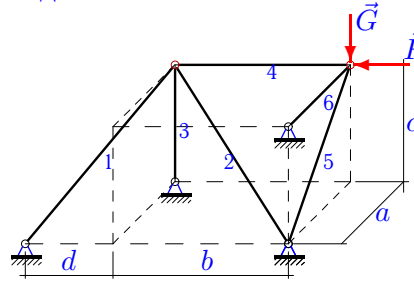


$G = 11 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.24.**

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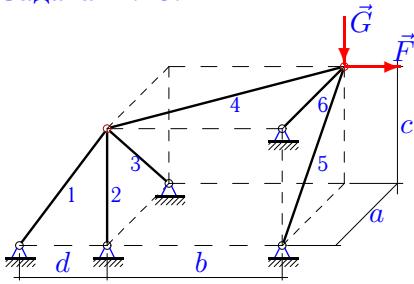


$G = 9 \text{ кН},$   
 $F = 8 \text{ кН}.$

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

**Задача 11.25.**

7

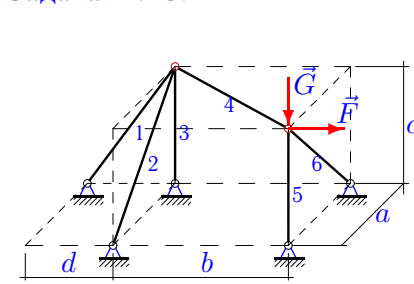


$G = 4 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.26.**

7

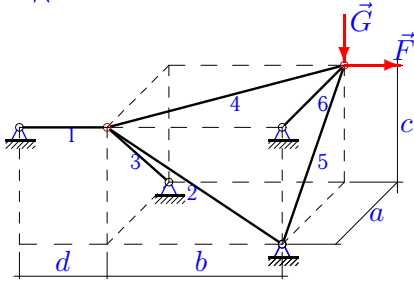


$G = 7 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.27.**

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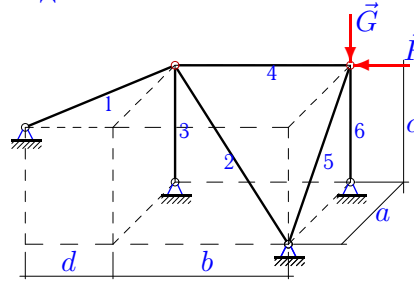


$G = 7 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.28.**

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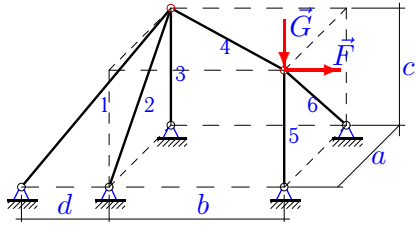


$G = 10 \text{ кН},$   
 $F = 8 \text{ кН}.$

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

**Задача 11.29.**

7

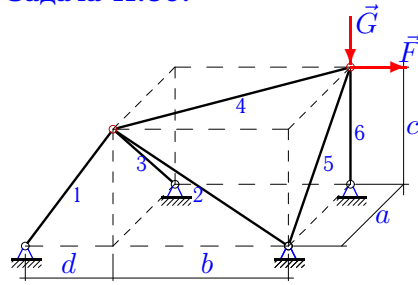


$G = 6 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.30.**

7

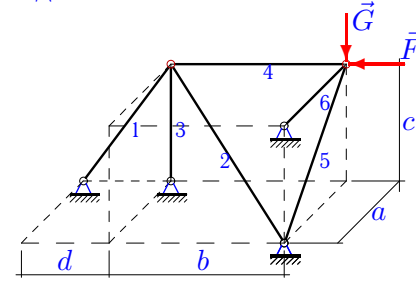


$G = 9 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.31.**

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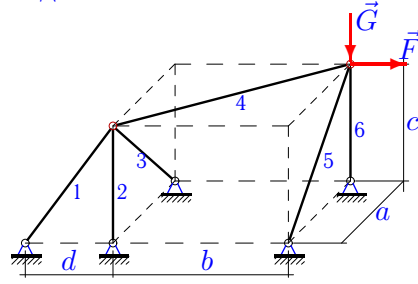


$G = 10 \text{ кН},$   
 $F = 8 \text{ кН}.$

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

**Задача 11.32.**

7

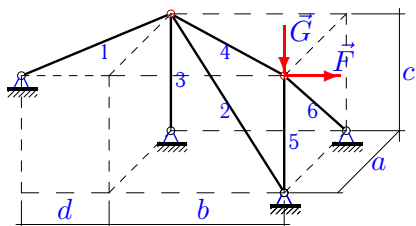


$G = 13 \text{ кН},$   
 $F = 1 \text{ кН}.$

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

**Задача 11.33.**

7

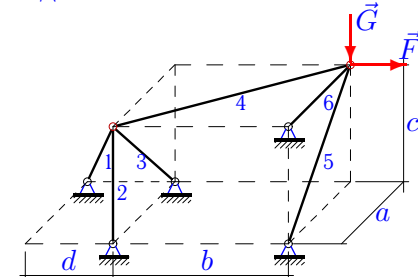


$G = 12 \text{ кН},$   
 $F = 2 \text{ кН}.$

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

**Задача 11.34.**

7



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

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

**Пространственная ферма**

	$S_1$	$S_2$	$S_3$	$S_4$	$S_5$	$S_6$
1	0.000	-3.536	1.500	3.202	-8.000	-2.500
2	2.236	-1.491	-0.667	1.202	-4.667	-1.491
3	0.000	-3.590	2.667	2.404	-5.000	-1.333
4	-25.298	-0.000	24.000	-8.000	-0.000	-9.000
5	11.486	14.951	-16.467	13.400	-23.074	13.200
6	-0.000	-0.000	-0.000	-0.000	13.400	-18.745
7	-4.444	7.800	-4.444	-8.000	-7.684	4.800
8	1.000	1.333	-1.491	1.202	-1.491	-5.667
9	-0.000	-0.000	-0.000	-0.000	11.000	-15.000
10	-0.000	-0.000	-0.000	-0.000	8.333	-11.667
11	3.333	-0.000	-2.981	2.404	-4.472	0.667
12	-17.889	-0.000	16.000	-8.000	-14.422	12.000
13	-17.436	16.971	-0.000	-4.000	-0.000	-7.000
14	14.400	18.745	-20.646	16.800	-25.171	12.400
15	8.452	6.873	-14.087	8.800	-19.305	11.200
16	1.000	0.833	-1.434	1.537	-15.484	11.433
17	-0.000	-3.510	1.600	3.124	-11.400	-2.884
18	-25.298	-0.000	24.000	-8.000	-15.549	13.333
19	4.000	2.603	-2.134	2.404	-7.684	3.467
20	4.000	3.333	-2.981	2.404	-2.981	-3.333
21	1.000	0.833	-1.434	1.537	-1.434	-9.167
22	2.449	-3.727	1.333	1.202	-5.667	-1.491
23	0.000	-2.925	1.667	2.404	-9.333	-2.134
24	-8.098	9.323	-0.000	-8.000	-15.484	12.600
25	1.803	-0.750	-1.061	1.250	-5.657	3.250
26	1.944	-1.067	-0.833	1.202	-6.167	-1.067
27	4.000	2.603	-2.134	2.404	-8.964	4.267
28	-4.444	7.800	-4.444	-8.000	-0.000	-10.000
29	2.449	-3.727	1.333	1.202	-4.667	-1.491
30	2.561	-0.521	-2.134	2.404	-2.134	-7.333
31	-15.549	-0.000	13.333	-8.000	-17.205	14.000
32	1.601	-0.417	-1.434	1.537	-1.434	-12.167
33	0.000	-3.510	1.600	3.124	-10.400	-2.884
34	2.372	0.833	-3.584	1.537	-13.764	10.033