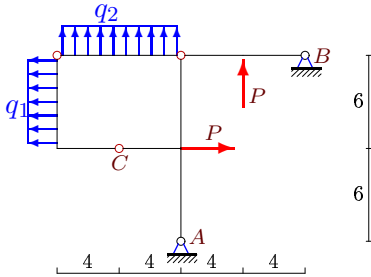


## Статически определимая рама

Построить эпюры  $M$ ,  $Q$ ,  $N$  в раме. Найти горизонтальное ( $\Delta x_C$ ) или вертикальное ( $\Delta y_C$ ) смещение шарнира  $C$ . Все стержни имеют одинаковую жесткость  $EJ$ .

**Задача М21.1.**

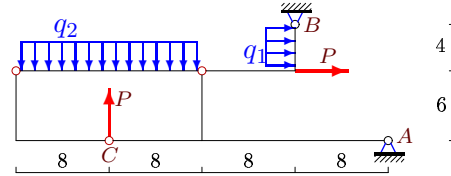
*Михайлов Леонид*



$q_1 = 15 \text{ кН/м}$ ,  $q_2 = 21 \text{ кН/м}$ ,  $P = 27 \text{ кН}$ .  $\Delta y_C - ?$

**Задача М21.2.**

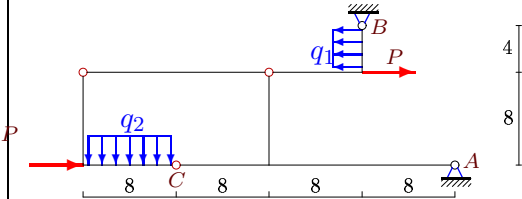
*Зайцев Антон*



$q_1 = 3 \text{ кН/м}$ ,  $q_2 = 9 \text{ кН/м}$ ,  $P = 15 \text{ кН}$ .  $\Delta y_C - ?$

**Задача М21.3.**

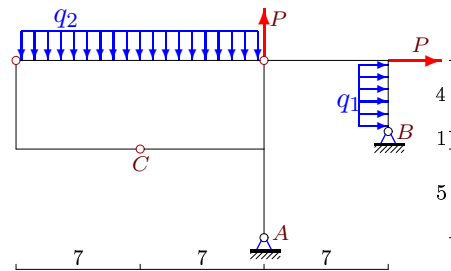
*Чазов Никита*



$q_1 = 15 \text{ кН/м}$ ,  $q_2 = 3 \text{ кН/м}$ ,  $P = 39 \text{ кН}$ .  $\Delta y_C - ?$

**Задача М21.4.**

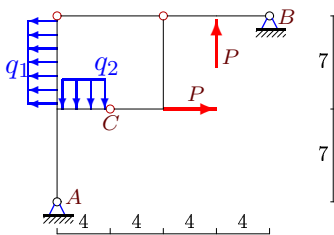
*Лукач Даниил*



$q_1 = 9 \text{ кН/м}$ ,  $q_2 = 15 \text{ кН/м}$ ,  $P = 36 \text{ кН}$ .  $\Delta y_C - ?$

**Задача М21.5.**

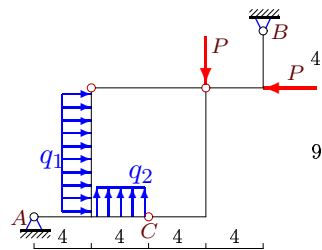
*Бондаренко Валерия*



$q_1 = 15 \text{ кН/м}$ ,  $q_2 = 3 \text{ кН/м}$ ,  $P = 27 \text{ кН}$ .  $\Delta y_C - ?$

**Задача М21.6.**

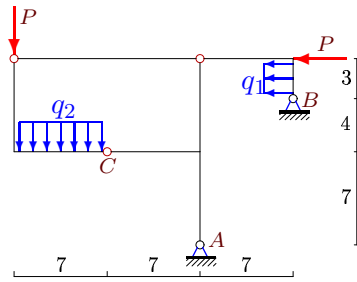
*Ялова Екатерина*



$q_1 = 9 \text{ кН/м}$ ,  $q_2 = 18 \text{ кН/м}$ ,  $P = 18 \text{ кН}$ .  $\Delta y_C - ?$

**Задача M21.7.**

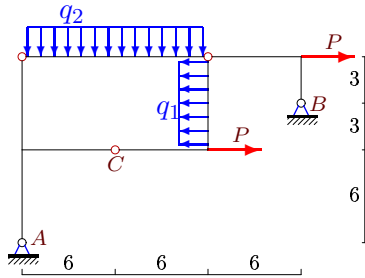
Чефранова Елена



$q_1 = 6 \text{ кН/м}, q_2 = 18 \text{ кН/м}, P = 18 \text{ кН}. \Delta x_C - ?$

**Задача M21.9.**

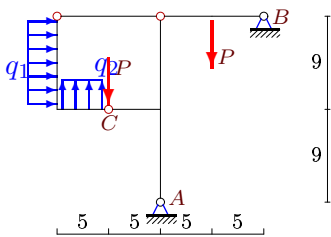
Дементьев Илья



$q_1 = 15 \text{ кН/м}, q_2 = 3 \text{ кН/м}, P = 9 \text{ кН}. \Delta y_C - ?$

**Задача M21.11.**

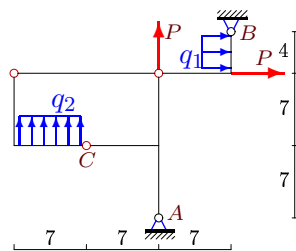
Чапанов Иса



$q_1 = 3 \text{ кН/м}, q_2 = 27 \text{ кН/м}, P = 6 \text{ кН}. \Delta y_C - ?$

**Задача M21.13.**

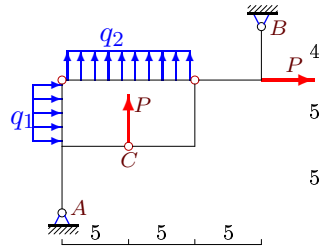
Зотова Мария



$q_1 = 6 \text{ кН/м}, q_2 = 18 \text{ кН/м}, P = 21 \text{ кН}. \Delta y_C - ?$

**Задача M21.8.**

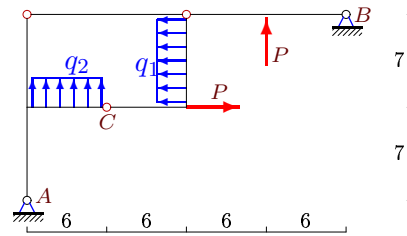
Селянина Софья



$q_1 = 3 \text{ кН/м}, q_2 = 12 \text{ кН/м}, P = 15 \text{ кН}. \Delta y_C - ?$

**Задача M21.10.**

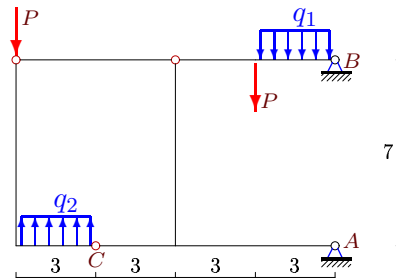
Иванова Анастасия



$q_1 = 12 \text{ кН/м}, q_2 = 21 \text{ кН/м}, P = 3 \text{ кН}. \Delta y_C - ?$

**Задача M21.12.**

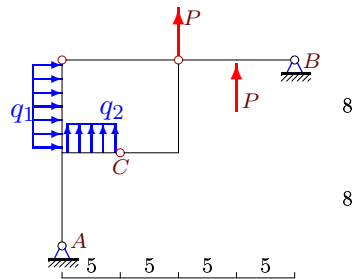
Петрова Марина



$q_1 = 3 \text{ кН/м}, q_2 = 33 \text{ кН/м}, P = 6 \text{ кН}. \Delta y_C - ?$

**Задача M21.14.**

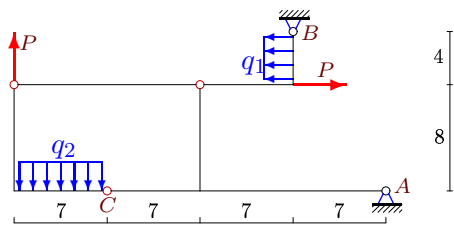
Филеев Александр



$q_1 = 6 \text{ кН/м}, q_2 = 36 \text{ кН/м}, P = 6 \text{ кН}. \Delta y_C - ?$

**Задача М21.15.**

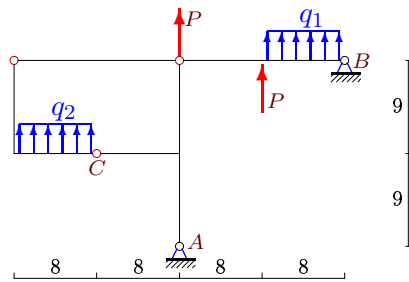
*Закеева Юлия*



$q_1 = 9 \text{ кН/м}, q_2 = 12 \text{ кН/м}, P = 18 \text{ кН}. \Delta y_C - ?$

**Задача М21.17.**

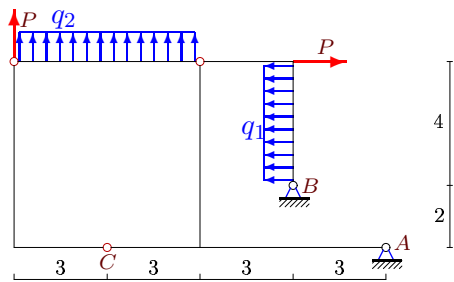
*Егорова Дарья*



$q_1 = 6 \text{ кН/м}, q_2 = 18 \text{ кН/м}, P = 15 \text{ кН}. \Delta y_C - ?$

**Задача М21.19.**

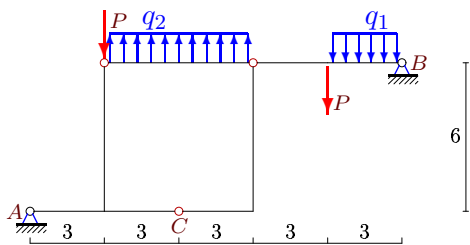
*Симаков Дмитрий*



$q_1 = 3 \text{ кН/м}, q_2 = 33 \text{ кН/м}, P = 30 \text{ кН}. \Delta y_C - ?$

**Задача М21.21.**

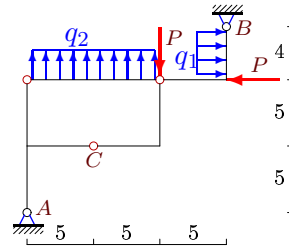
*Марченко Дмитрий*



$q_1 = 3 \text{ кН/м}, q_2 = 30 \text{ кН/м}, P = 15 \text{ кН}. \Delta y_C - ?$

**Задача М21.16.**

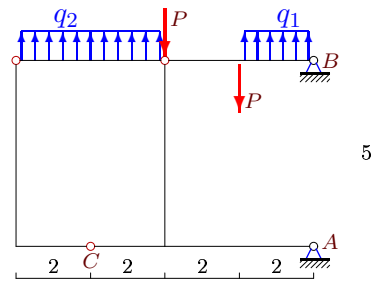
*Мирзаева Валерия*



$q_1 = 11 \text{ кН/м}, q_2 = 6 \text{ кН/м}, P = 9 \text{ кН}. \Delta x_C - ?$

**Задача М21.18.**

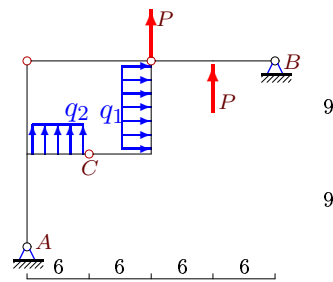
*Старостин Герман*



$q_1 = 5 \text{ кН/м}, q_2 = 9 \text{ кН/м}, P = 3 \text{ кН}. \Delta y_C - ?$

**Задача М21.20.**

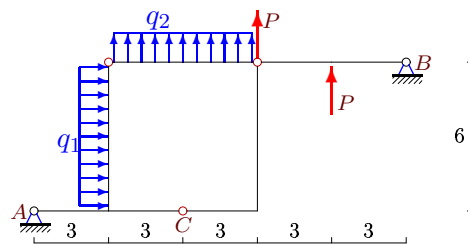
*Мельникова Анастасия*



$q_1 = 9 \text{ кН/м}, q_2 = 21 \text{ кН/м}, P = 9 \text{ кН}. \Delta y_C - ?$

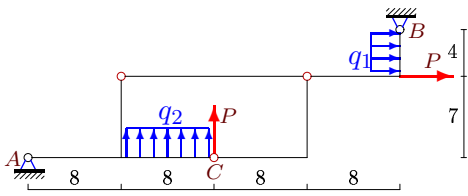
**Задача М21.22.**

*Леонтьев Михаил*



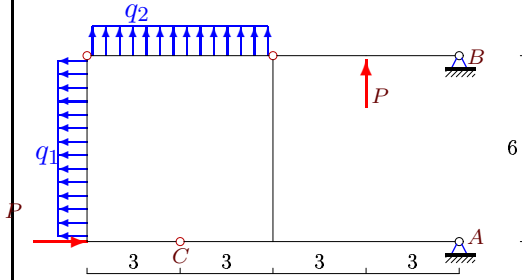
$q_1 = 9 \text{ кН/м}, q_2 = 39 \text{ кН/м}, P = 24 \text{ кН}. \Delta y_C - ?$

Задача M21.23.



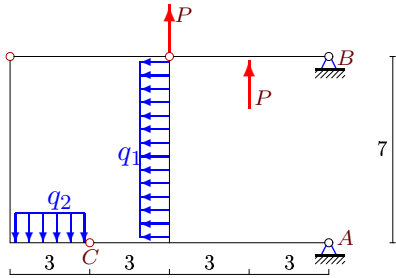
$q_1 = 3\text{кН/м}$ ,  $q_2 = 12\text{кН/м}$ ,  $P = 27\text{кН}$ .  $\Delta y_C - ?$

Задача M21.24.



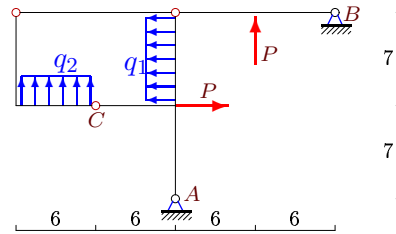
$q_1 = 15\text{кН/м}$ ,  $q_2 = 7\text{кН/м}$ ,  $P = 3\text{кН}$ .  $\Delta y_C - ?$

Задача M21.25.



$q_1 = 13\text{кН/м}$ ,  $q_2 = 6\text{кН/м}$ ,  $P = 9\text{кН}$ .  $\Delta y_C - ?$

Задача M21.26.



$q_1 = 15\text{кН/м}$ ,  $q_2 = 6\text{кН/м}$ ,  $P = 21\text{кН}$ .  $\Delta y_C - ?$

M21

Ответы.  
Статически определимая рама

18-Mar-19

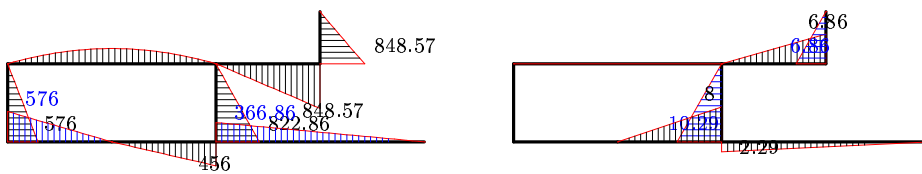
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Михайлов Леонид



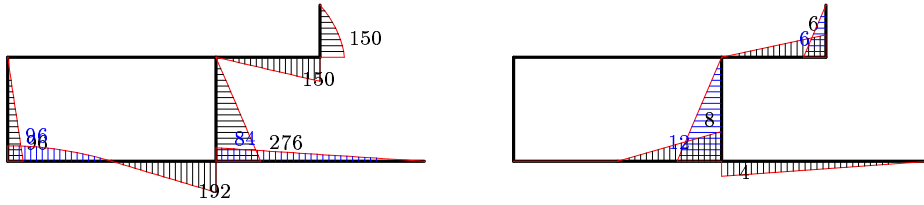
2.

Зайцев Антон



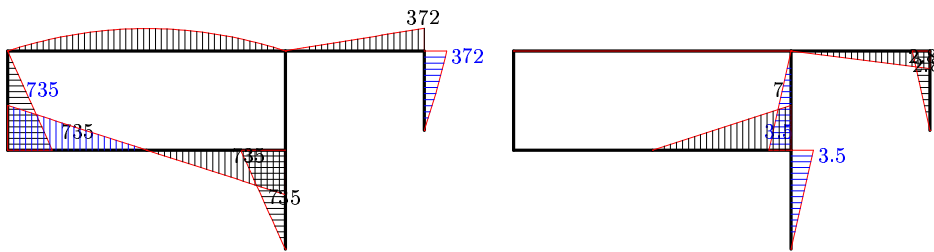
3.

Чазов Никита



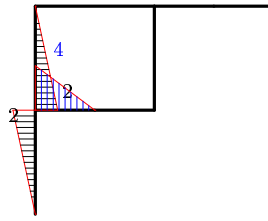
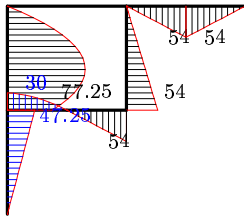
4.

Лукач Даниил



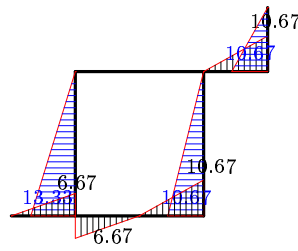
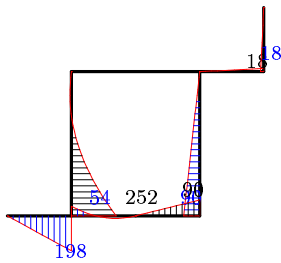
5.

Бондаренко Валерия



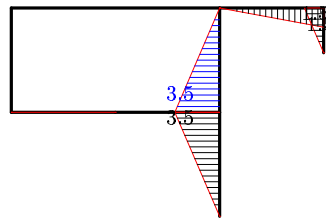
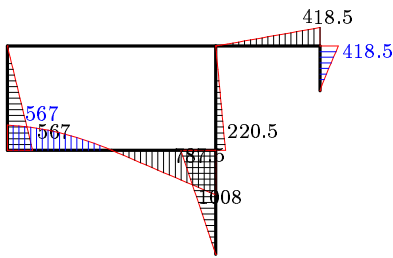
6.

Ялова Екатерина



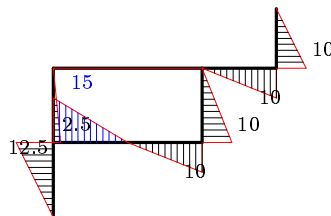
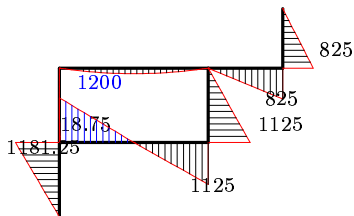
7.

Чефранова Елена



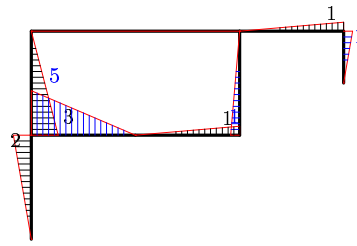
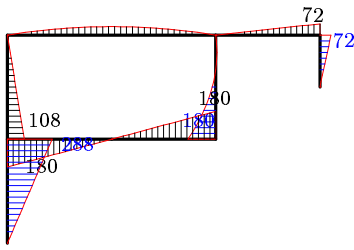
8.

Селянина Софья



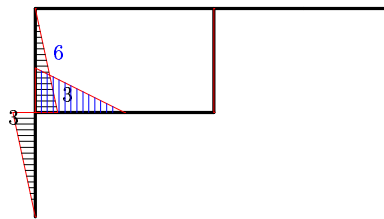
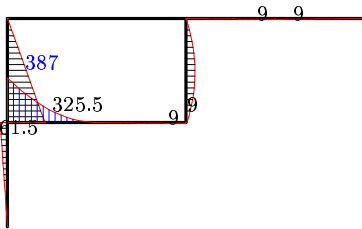
9.

Дементьев Илья



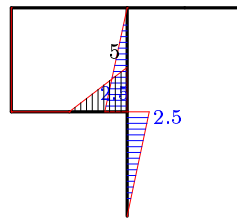
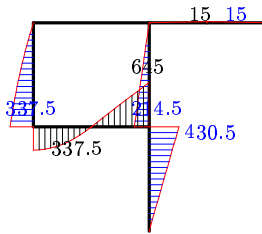
10.

Иванова Анастасия



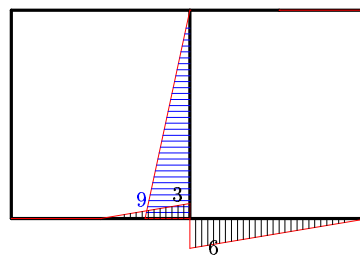
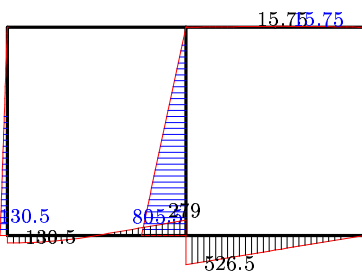
11.

Чепанов Иса



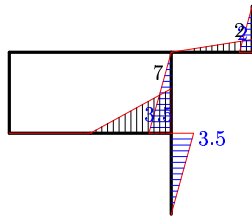
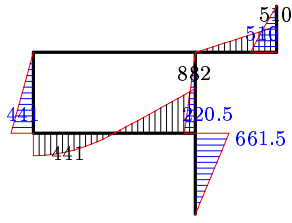
12.

Петрова Марина



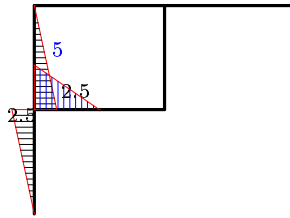
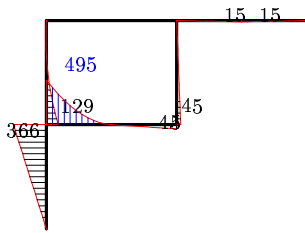
13.

Зотова Мария



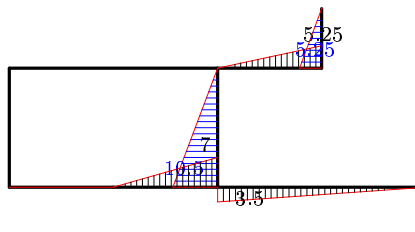
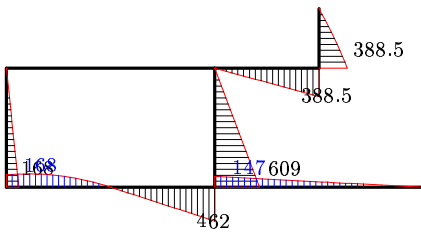
14.

Филеев Александр



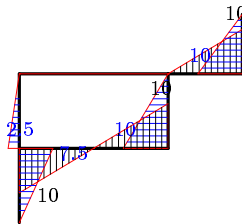
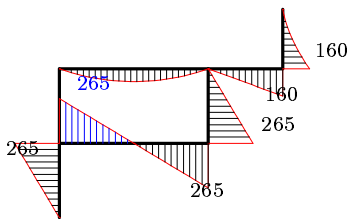
15.

Закиева Юлия



16.

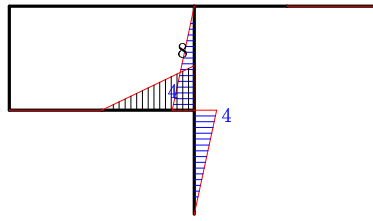
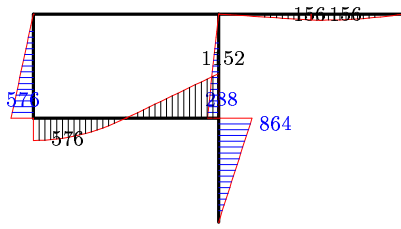
Мирзаева Валерия





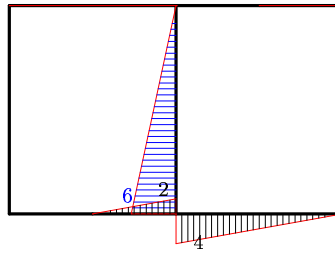
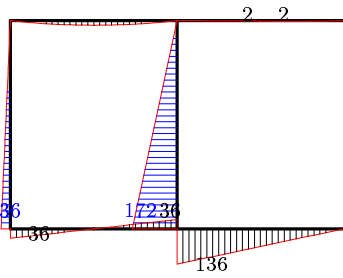
17.

Егорова Дарья



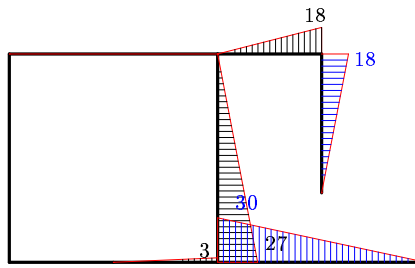
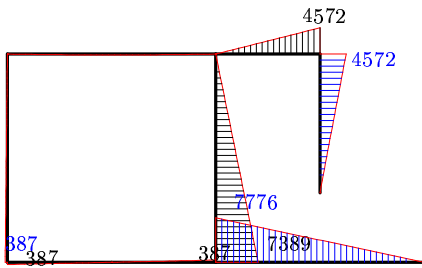
18.

Старостин Герман



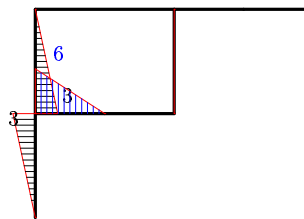
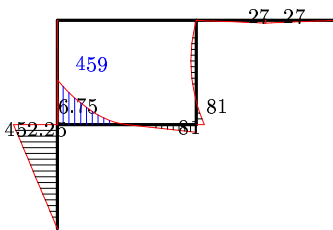
19.

Симаков Дмитрий



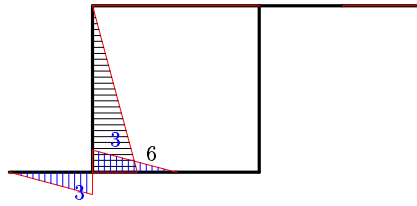
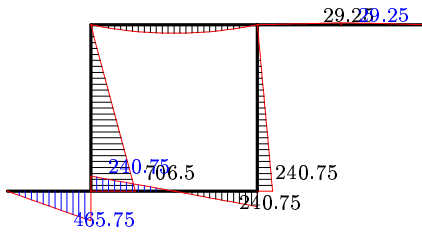
20.

Мельникова Анастасия



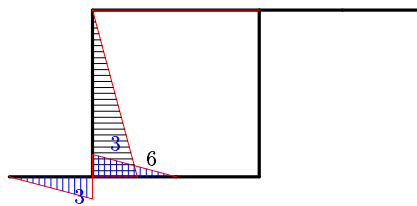
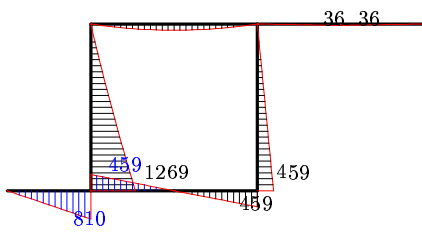
21.

Марченко Дмитрий

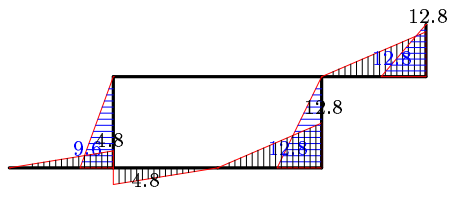
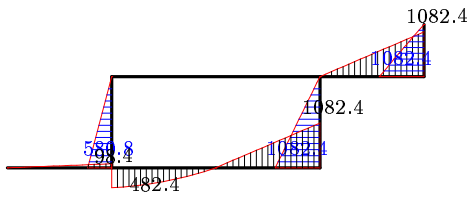


22.

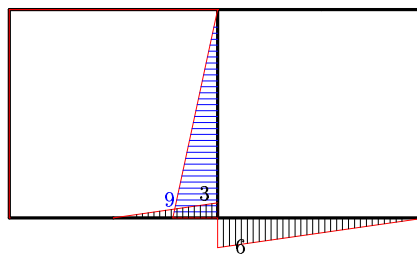
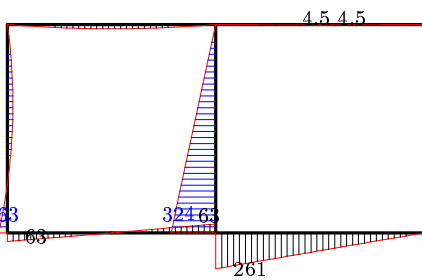
Леонтьев Михаил



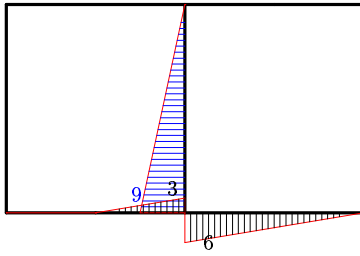
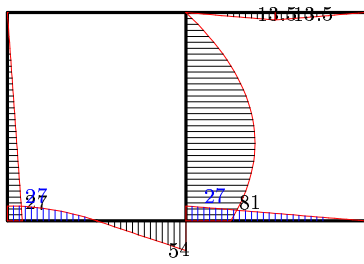
23.



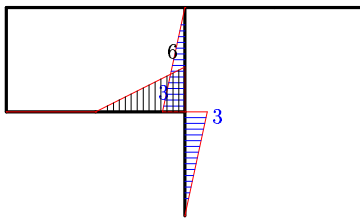
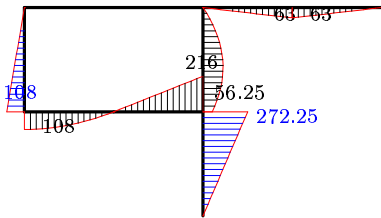
24.



25.



26.



M21 файл 21mdo-AnsA

$N^{\circ}$	$X_A$	$X_B$	$Y_A$	$Y_B$	$x_A$	$x_B$	$y_A$	$y_B$	$EJ\Delta \cdot 10^{-3}$
1	65.000	-2.000	-181.500	-13.500	0.333	-0.333	-1.000	0.000	
				-0.22 + 1.8 + 1.56 =					3.136
2	-233.143	206.143	22.929	106.071	1.714	-1.714	-0.143	-0.857	
				-15.52 - 7.76 - 16.93 - 9.73 - 4.47 =					-54.457
3	-85.500	67.500	5.250	18.750	1.500	-1.500	-0.250	-0.750	
				-2.4 - 1.2 - 8.83 - 4.1 - 1.8 =					-18.080
4	-147.000	75.000	227.143	-53.143	0.700	-0.700	-1.400	0.400	
				-2.43 - 1.39 - 0 - 0 - 12 - 4.29 =					-20.045
5	6.750	71.250	-1.500	-13.500	-0.286	0.286	-1.000	0.000	
				+0.36 + 0.16 - 0.22 =					-0.097
6	-58.500	-4.500	-49.500	-4.500	2.667	-2.667	1.667	-2.667	
				+0.26 + 0.26 - 10.08 + 2.88 - 0.48 + 1.28 - 1.76 =					-10.973
7	-112.500	148.500	203.786	-59.786	-0.500	-0.500	-0.214	0.214	
				-1.46 - 0.63 - 1.8 + 6.43 =					2.528
8	-236.250	206.250	-300.000	165.000	-2.500	2.500	-3.000	2.000	
				+13.75 + 11 + 0.08 + 18.75 + 30 + 18.75 + 24.61 =					116.977
9	48.000	24.000	48.000	-12.000	-0.333	0.333	-0.833	-0.167	
				+0.14 + 0.07 + 0.65 + 0.36 - 1.8 + 0.36 - 1.15 =					-1.233
10	-8.786	89.786	-127.500	-1.500	-0.429	0.429	-1.000	0.000	
				+2.28 + 0 + 4.64 + 0 + 0.43 =					6.219
11	47.833	-74.833	-126.000	3.000	0.278	-0.278	-1.000	0.000	
				+1.6 + 5.38 + 3.23 =					10.213
12	133.714	-133.714	-87.750	9.750	1.286	-1.286	-1.000	0.000	
				+16.92 + 0.84 + 6.32 =					24.071
13	94.500	-139.500	-74.143	-72.857	0.500	-0.500	-0.714	-0.286	
				+2.38 + 1.36 + 1.8 + 14.4 + 5.4 =					25.317
14	-45.750	-2.250	-189.000	-3.000	-0.313	0.313	-1.000	0.000	
				+0.86 + 4.13 + 2.44 =					6.808
15	-97.125	115.125	10.500	55.500	1.313	-1.313	-0.250	-0.750	
				-4.76 - 2.72 - 17.05 - 7.55 - 2.4 =					-34.352
16	-53.000	18.000	-83.000	32.000	1.500	-2.500	2.000	-2.000	
				-2.67 - 2.13 - 4.42 - 4.42 - 4.42 - 3.31 =					-21.656
17	96.000	-96.000	-178.500	-43.500	0.444	-0.444	-1.000	0.000	
				+3.46 + 24.58 + 10.37 =					38.400
18	41.600	-41.600	-34.000	-6.000	1.200	-1.200	-1.000	0.000	
				+1.72 + 0.05 + 0.73 =					2.493
19	-1167.000	1149.000	1296.000	-1524.000	-4.500	4.500	5.000	-6.000	
				+82.3 + 109.73 - 0 + 399 - 0 + 1.16 + 466.56 =					1058.895
20	-50.250	-30.750	-139.500	-4.500	-0.333	0.333	-1.000	0.000	
				+0.06 + 5.5 + 4.07 =					8.505
21	-157.875	157.875	-155.250	14.250	-1.000	1.000	-1.000	0.000	
				+8.48 + 0.72 + 1.4 =					10.598
22	-315.000	261.000	-270.000	-12.000	-1.000	1.000	-1.000	0.000	
				+15.23 + 1.38 + 2.43 =					19.521
23	237.600	-276.600	12.300	-135.300	3.200	-3.200	0.600	-1.600	
				+36.95 + 18.47 + 13 + 32.33 + 6.17 + 36.95 + 1.26 =					146.263
24	106.500	-19.500	-43.500	-1.500	1.500	-1.500	-1.000	0.000	
				+5.83 + 0.19 + 3.13 =					9.153
25	30.071	60.929	4.500	-4.500	1.286	-1.286	-1.000	0.000	
				-1.7 - 0.16 - 0.32 =					-0.515
26	38.893	45.107	-46.500	-10.500	0.429	-0.429	-1.000	0.000	
				-0.4 + 2.6 + 1.9 =					4.747