

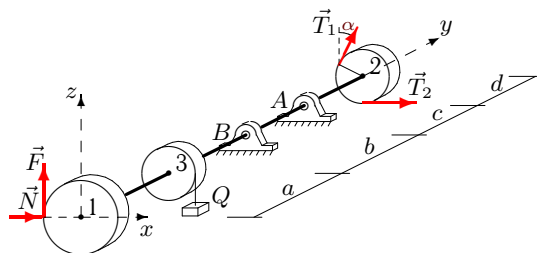
## Равновесие вала

Горизонтальный вал весом  $G$  может вращаться в цилиндрических шарнирах  $A$  и  $B$ . К шкиву 1 приложено нормальное давление  $N$  и касательная сила сопротивления  $F$ , пропорциональная  $N$ . На шкив 2 действуют силы натяжения ремней  $T_1$  и  $T_2$ . Груз  $Q$  висит на нити, навитой на шкив 3. Определить силу давления  $N$  и реакции шарниров в условии равновесия вала (в Н). Учесть веса шкивов  $P_1, P_2, P_3$ . Все нагрузки действуют в вертикальной плоскости. Силы даны в Н, размеры — в см.

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### Вариант 1

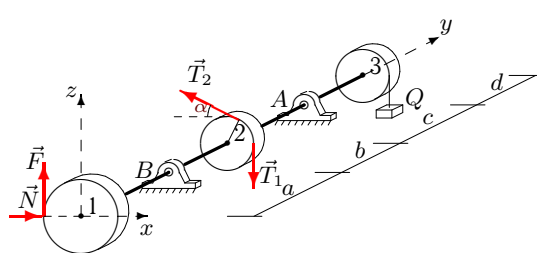
C19.



$$F = 0.2N, T_1 = 60, \\ T_2 = 116, P_1 = 32, \\ P_2 = 20, P_3 = 24, \\ Q = 22, G = 30, \\ \alpha = 45^\circ, R_1 = 28, \\ R_2 = 10, R_3 = 11, \\ a = 22, b = 26, \\ c = 28, d = 26.$$

### Вариант 2

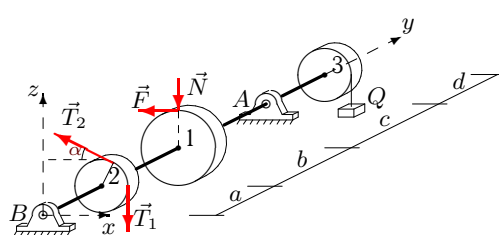
C19.



$$F = 0.1N, T_1 = 60, \\ T_2 = 118, P_1 = 28, \\ P_2 = 20, P_3 = 24, \\ Q = 14, G = 30, \\ \alpha = 45^\circ, R_1 = 20, \\ R_2 = 10, R_3 = 11, \\ a = 22, b = 24, \\ c = 26, d = 24.$$

### Вариант 3

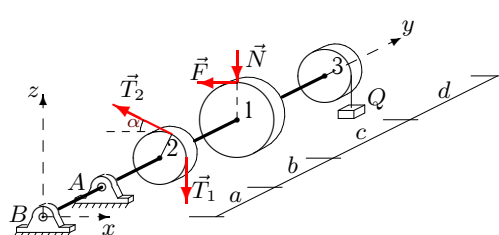
C19.



$$F = 0.1N, T_1 = 40, \\ T_2 = 21, P_1 = 38, \\ P_2 = 30, P_3 = 34, \\ Q = 26, G = 20, \\ \alpha = 60^\circ, R_1 = 22, \\ R_2 = 12, R_3 = 13, \\ a = 22, b = 27, \\ c = 30, d = 24.$$

### Вариант 4

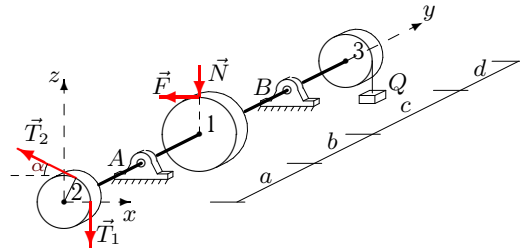
C19.



$$F = 0.2N, T_1 = 40, \\ T_2 = 22, P_1 = 36, \\ P_2 = 30, P_3 = 34, \\ Q = 10, G = 20, \\ \alpha = 60^\circ, R_1 = 18, \\ R_2 = 12, R_3 = 13, \\ a = 22, b = 23, \\ c = 26, d = 23.$$

**Вариант 5**

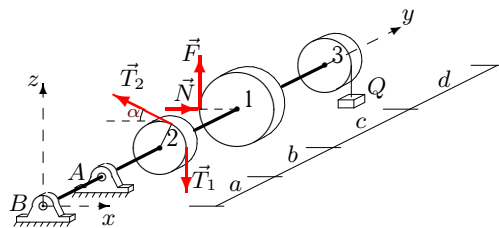
C19.



$$\begin{aligned}
 F &= 0.2N, T_1 = 50, \\
 T_2 &= 27, P_1 = 36, \\
 P_2 &= 30, P_3 = 34, \\
 Q &= 26, G = 25, \\
 \alpha &= 60^\circ, R_1 = 18, \\
 R_2 &= 12, R_3 = 13, \\
 a &= 22, b = 27, \\
 c &= 30, d = 23.
 \end{aligned}$$

**Вариант 6**

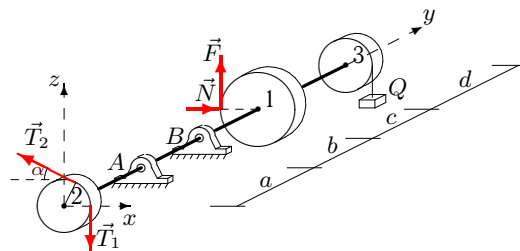
C19.



$$\begin{aligned}
 F &= 0.3N, T_1 = 40, \\
 T_2 &= 77, P_1 = 20, \\
 P_2 &= 10, P_3 = 18, \\
 Q &= 18, G = 20, \\
 \alpha &= 30^\circ, R_1 = 14, \\
 R_2 &= 8, R_3 = 10, \\
 a &= 24, b = 27, \\
 c &= 28, d = 25.
 \end{aligned}$$

**Вариант 7**

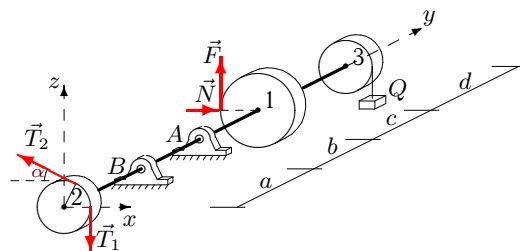
C19.



$$\begin{aligned}
 F &= 0.1N, T_1 = 50, \\
 T_2 &= 96, P_1 = 16, \\
 P_2 &= 10, P_3 = 14, \\
 Q &= 22, G = 25, \\
 \alpha &= 30^\circ, R_1 = 14, \\
 R_2 &= 8, R_3 = 9, \\
 a &= 22, b = 26, \\
 c &= 27, d = 23.
 \end{aligned}$$

**Вариант 8**

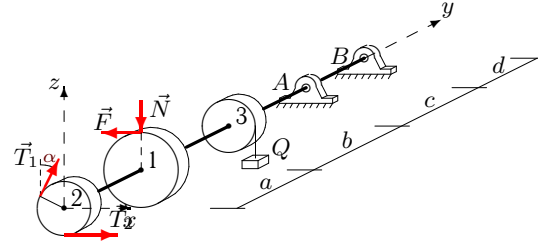
C19.



$$\begin{aligned}
 F &= 0.3N, T_1 = 50, \\
 T_2 &= 98, P_1 = 22, \\
 P_2 &= 10, P_3 = 18, \\
 Q &= 14, G = 25, \\
 \alpha &= 30^\circ, R_1 = 18, \\
 R_2 &= 8, R_3 = 10, \\
 a &= 24, b = 26, \\
 c &= 27, d = 26.
 \end{aligned}$$

**Вариант 9**

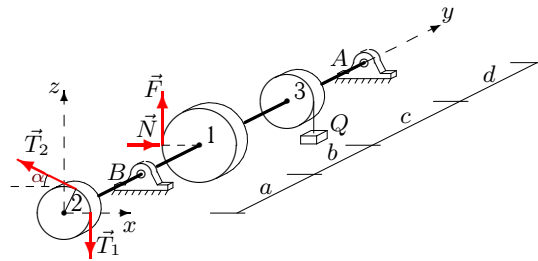
C19.



$$\begin{aligned}
 F &= 0.1N, T_1 = 50, \\
 T_2 &= 26, P_1 = 42, \\
 P_2 &= 30, P_3 = 34, \\
 Q &= 26, G = 25, \\
 \alpha &= 60^\circ, R_1 = 30, \\
 R_2 &= 12, R_3 = 13, \\
 a &= 22, b = 27, \\
 c &= 30, d = 26.
 \end{aligned}$$

**Вариант 10**

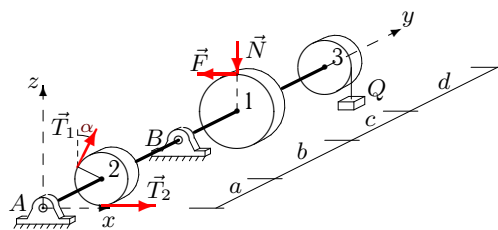
C19.



$$F = 0.4N, T_1 = 50, \\ T_2 = 96, P_1 = 42, \\ P_2 = 30, P_3 = 38, \\ Q = 22, G = 25, \\ \alpha = 60^\circ, R_1 = 22, \\ R_2 = 12, R_3 = 14, \\ a = 24, b = 28, \\ c = 31, d = 26.$$

**Вариант 11**

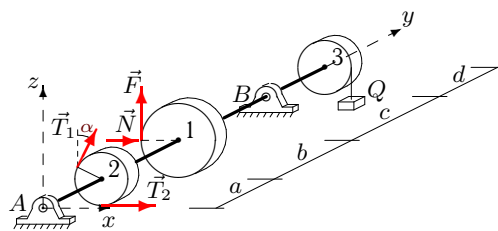
C19.



$$F = 0.4N, T_1 = 30, \\ T_2 = 19, P_1 = 34, \\ P_2 = 20, P_3 = 28, \\ Q = 10, G = 15, \\ \alpha = 45^\circ, R_1 = 24, \\ R_2 = 10, R_3 = 12, \\ a = 24, b = 25, \\ c = 27, d = 27.$$

**Вариант 12**

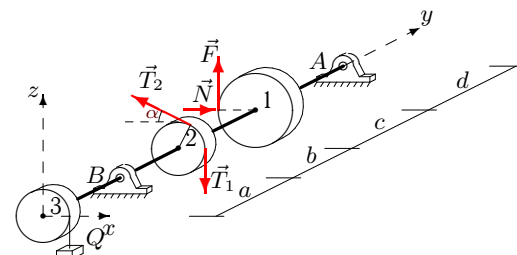
C19.



$$F = 0.3N, T_1 = 30, \\ T_2 = 56, P_1 = 44, \\ P_2 = 30, P_3 = 38, \\ Q = 22, G = 15, \\ \alpha = 60^\circ, R_1 = 26, \\ R_2 = 12, R_3 = 14, \\ a = 24, b = 28, \\ c = 31, d = 27.$$

**Вариант 13**

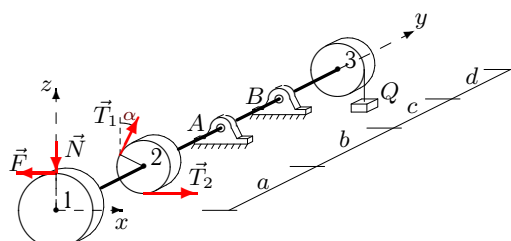
C19.



$$F = 0.4N, T_1 = 70, \\ T_2 = 137, P_1 = 42, \\ P_2 = 30, P_3 = 38, \\ Q = 18, G = 35, \\ \alpha = 60^\circ, R_1 = 22, \\ R_2 = 12, R_3 = 14, \\ a = 24, b = 27, \\ c = 30, d = 26.$$

**Вариант 14**

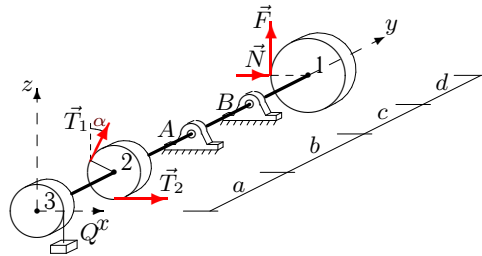
C19.



$$F = 0.1N, T_1 = 60, \\ T_2 = 31, P_1 = 20, \\ P_2 = 10, P_3 = 14, \\ Q = 10, G = 30, \\ \alpha = 30^\circ, R_1 = 22, \\ R_2 = 8, R_3 = 9, \\ a = 22, b = 23, \\ c = 24, d = 25.$$

**Вариант 15**

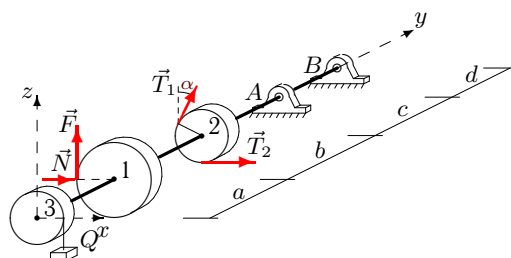
C19.



$$F = 0.1N, T_1 = 70, \\ T_2 = 137, P_1 = 20, \\ P_2 = 10, P_3 = 14, \\ Q = 18, G = 35, \\ \alpha = 30^\circ, R_1 = 22, \\ R_2 = 8, R_3 = 9, \\ a = 22, b = 25, \\ c = 26, d = 25.$$

**Вариант 16**

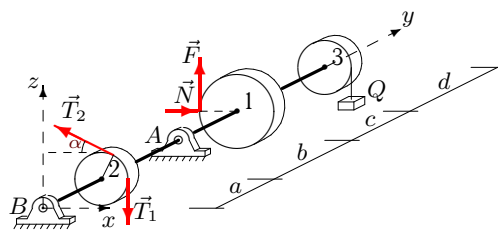
C19.



$$F = 0.1N, T_1 = 70, \\ T_2 = 137, P_1 = 42, \\ P_2 = 30, P_3 = 34, \\ Q = 18, G = 35, \\ \alpha = 60^\circ, R_1 = 30, \\ R_2 = 12, R_3 = 13, \\ a = 22, b = 25, \\ c = 28, d = 26.$$

**Вариант 17**

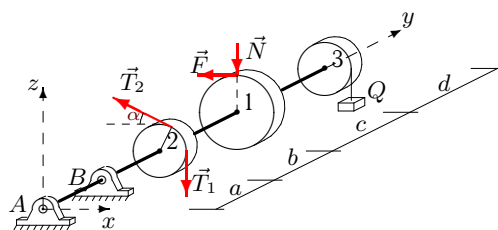
C19.



$$F = 0.3N, T_1 = 40, \\ T_2 = 76, P_1 = 22, \\ P_2 = 10, P_3 = 18, \\ Q = 22, G = 20, \\ \alpha = 30^\circ, R_1 = 18, \\ R_2 = 8, R_3 = 10, \\ a = 24, b = 28, \\ c = 29, d = 26.$$

**Вариант 18**

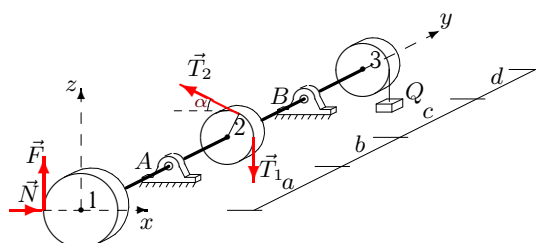
C19.



$$F = 0.4N, T_1 = 30, \\ T_2 = 19, P_1 = 40, \\ P_2 = 30, P_3 = 38, \\ Q = 26, G = 15, \\ \alpha = 60^\circ, R_1 = 18, \\ R_2 = 12, R_3 = 14, \\ a = 24, b = 29, \\ c = 32, d = 25.$$

**Вариант 19**

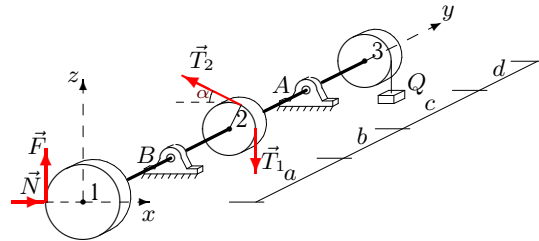
C19.



$$F = 0.4N, T_1 = 60, \\ T_2 = 118, P_1 = 40, \\ P_2 = 30, P_3 = 38, \\ Q = 14, G = 30, \\ \alpha = 60^\circ, R_1 = 18, \\ R_2 = 12, R_3 = 14, \\ a = 24, b = 26, \\ c = 29, d = 25.$$

**Вариант 20**

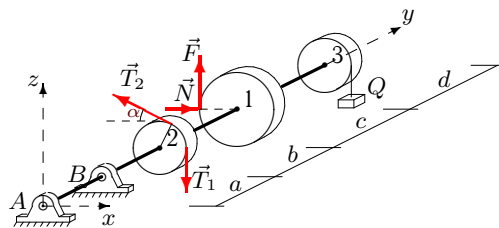
C19.



$F = 0.1N, T_1 = 60,$   
 $T_2 = 116, P_1 = 38,$   
 $P_2 = 30, P_3 = 34,$   
 $Q = 22, G = 30,$   
 $\alpha = 60^\circ, R_1 = 22,$   
 $R_2 = 12, R_3 = 13,$   
 $a = 22, b = 26,$   
 $c = 29, d = 24.$

**Вариант 21**

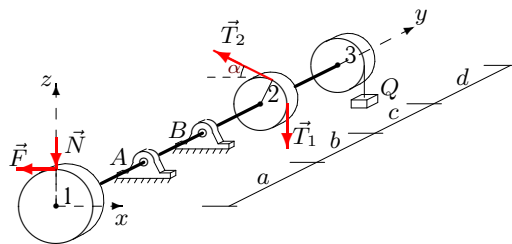
C19.



$F = 0.4N, T_1 = 30,$   
 $T_2 = 58, P_1 = 42,$   
 $P_2 = 30, P_3 = 38,$   
 $Q = 14, G = 15,$   
 $\alpha = 60^\circ, R_1 = 22,$   
 $R_2 = 12, R_3 = 14,$   
 $a = 24, b = 26,$   
 $c = 29, d = 26.$

**Вариант 22**

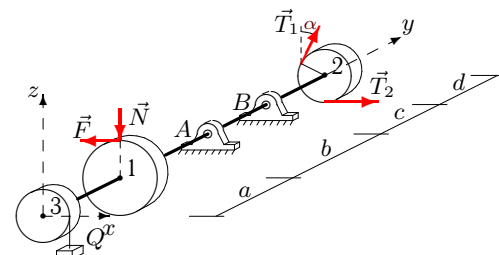
C19.



$F = 0.2N, T_1 = 60,$   
 $T_2 = 32, P_1 = 16,$   
 $P_2 = 10, P_3 = 14,$   
 $Q = 26, G = 30,$   
 $\alpha = 30^\circ, R_1 = 14,$   
 $R_2 = 8, R_3 = 9,$   
 $a = 22, b = 27,$   
 $c = 28, d = 23.$

**Вариант 23**

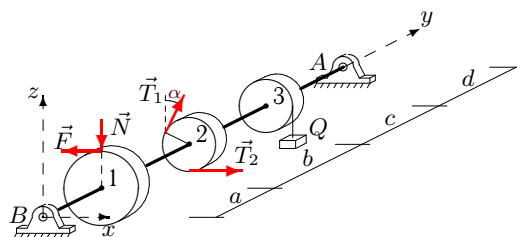
C19.



$F = 0.2N, T_1 = 70,$   
 $T_2 = 37, P_1 = 22,$   
 $P_2 = 10, P_3 = 14,$   
 $Q = 10, G = 35,$   
 $\alpha = 30^\circ, R_1 = 26,$   
 $R_2 = 8, R_3 = 9,$   
 $a = 22, b = 23,$   
 $c = 24, d = 26.$

**Вариант 24**

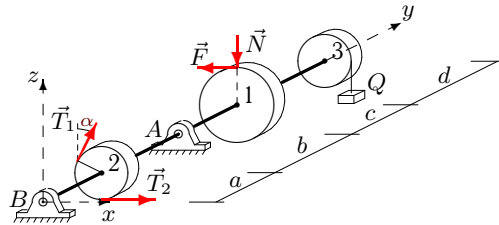
C19.



$F = 0.3N, T_1 = 40,$   
 $T_2 = 23, P_1 = 36,$   
 $P_2 = 20, P_3 = 28,$   
 $Q = 10, G = 20,$   
 $\alpha = 45^\circ, R_1 = 28,$   
 $R_2 = 10, R_3 = 12,$   
 $a = 24, b = 25,$   
 $c = 27, d = 28.$

**Вариант 25**

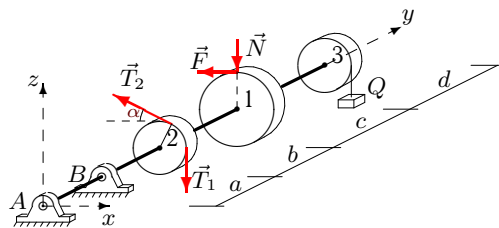
C19.



$F = 0.4N, T_1 = 40,$   
 $T_2 = 24, P_1 = 24,$   
 $P_2 = 10, P_3 = 18,$   
 $Q = 10, G = 20,$   
 $\alpha = 30^\circ, R_1 = 22,$   
 $R_2 = 8, R_3 = 10,$   
 $a = 24, b = 25,$   
 $c = 26, d = 27.$

**Вариант 26**

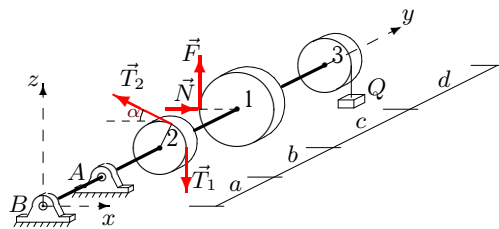
C19.



$F = 0.1N, T_1 = 30,$   
 $T_2 = 16, P_1 = 26,$   
 $P_2 = 20, P_3 = 24,$   
 $Q = 26, G = 15,$   
 $\alpha = 45^\circ, R_1 = 16,$   
 $R_2 = 10, R_3 = 11,$   
 $a = 22, b = 27,$   
 $c = 29, d = 23.$

**Вариант 27**

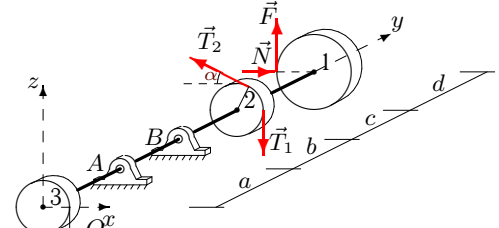
C19.



$F = 0.3N, T_1 = 40,$   
 $T_2 = 76, P_1 = 30,$   
 $P_2 = 20, P_3 = 28,$   
 $Q = 22, G = 20,$   
 $\alpha = 45^\circ, R_1 = 16,$   
 $R_2 = 10, R_3 = 12,$   
 $a = 24, b = 28,$   
 $c = 30, d = 25.$

**Вариант 28**

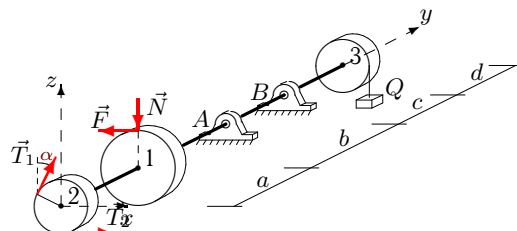
C19.



$F = 0.2N, T_1 = 70,$   
 $T_2 = 138, P_1 = 16,$   
 $P_2 = 10, P_3 = 14,$   
 $Q = 14, G = 35,$   
 $\alpha = 30^\circ, R_1 = 14,$   
 $R_2 = 8, R_3 = 9,$   
 $a = 22, b = 24,$   
 $c = 25, d = 23.$

**Вариант 29**

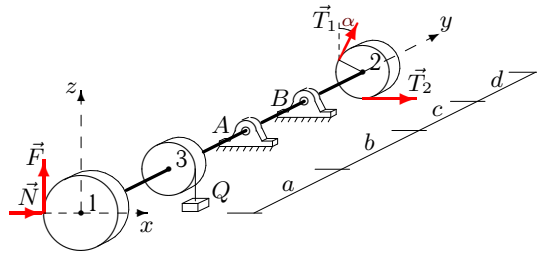
C19.



$F = 0.1N, T_1 = 50,$   
 $T_2 = 26, P_1 = 20,$   
 $P_2 = 10, P_3 = 14,$   
 $Q = 10, G = 25,$   
 $\alpha = 30^\circ, R_1 = 22,$   
 $R_2 = 8, R_3 = 9,$   
 $a = 22, b = 23,$   
 $c = 24, d = 25.$

**Вариант 30**

**C19.**



$F = 0.2N$ ,  $T_1 = 60$ ,  
 $T_2 = 117$ ,  $P_1 = 22$ ,  
 $P_2 = 10$ ,  $P_3 = 14$ ,  
 $Q = 18$ ,  $G = 30$ ,  
 $\alpha = 30^\circ$ ,  $R_1 = 26$ ,  
 $R_2 = 8$ ,  $R_3 = 9$ ,  
 $a = 22$ ,  $b = 25$ ,  
 $c = 26$ ,  $d = 26$ .

Отвeты

	$N$	$X_A$	$Z_A$	$X_B$	$Z_B$
1	56.786	-208.190	-118.139	-7.022	192.355
2	213.000	133.771	67.241	-263.332	4.020
3	257.273	18.881	288.839	17.346	138.247
4	96.111	84.535	761.297	-54.313	-514.238
5	170.556	36.664	175.253	10.947	172.920
6	27.619	50.791	262.330	-11.726	-183.116
7	121.429	279.585	-52.044	-317.875	128.901
8	45.185	-170.450	130.733	210.136	-54.288
9	208.667	-213.258	1000.109	164.823	-659.442
10	27.727	-22.687	61.686	42.959	51.085
11	23.958	-25.798	-75.198	-4.832	184.943
12	0.513	-58.467	12.581	-24.027	121.265
13	62.727	-20.795	1.794	26.567	87.470
14	146.364	-77.379	398.621	31.015	-220.219
15	170.000	-173.923	19.973	-168.077	-0.594
16	190.000	-987.753	329.481	600.131	-224.481
17	12.593	10.762	136.808	42.463	-46.585
18	68.889	-81.516	-578.085	118.572	809.519
19	69.444	-68.638	2.218	58.194	79.813
20	175.455	97.600	82.856	-215.055	13.140
21	15.909	5.042	-285.564	8.049	397.971
22	163.571	30.631	193.222	29.796	110.349
23	68.077	104.663	331.595	-163.048	-233.140
24	34.524	-21.773	50.141	-19.154	70.099
25	25.909	-5.688	143.424	-27.948	-70.156
26	266.250	-81.658	-990.365	119.596	1386.301
27	20.000	48.104	363.063	-14.363	-262.803
28	149.286	174.080	68.464	-203.854	-8.321
29	128.182	-121.523	192.365	83.341	-28.484
30	56.538	-11.743	161.867	-191.796	-131.136