

Table Workforce

by Rudolf Volz

Up No.	The Up Number represents the specific level of the total pyramid counted from the bottom to the top (1 - 210).
Down No.	The Down Number represents specific the level of the step pyramid counted backwards from the bottom to the top (209 - 1). Up_No. = 210 – Down_No.
Total lanes	Number of lanes that reach the corresponding level.
Delivery lanes	The blocks are transported on the delivery lanes up to the corresponding level. Since the way back was a separate lane, the following condition must hold: $Delivery_lanes \leq Total_lanes - 1$
Max. rate	The maximal rate represents the number of produced and installed blocks per day for 3 months during the Nile flood. First the maximal rate of the transportation system must be determined: $Maximal_rate = Delivery_lanes * 180$ Then the numbers <i>Delivery_lanes</i> and <i>Maximal_rate</i> have to be reduced so that the corresponding number <i>Workers_maximum</i> do not exceed 20,000.
Min. rate	The minimal rate represents the number of installed blocks per day during the other 9 months of the year. There were about 10,000 workers available during this time. In the bottom half of the pyramid there is the relationship: $Minimal_rate = Maximal_rate / 2$
Workers tow	Number of workers during the Nile flood who towed the blocks on the ramps up to the corresponding level. This is calculated as follows: $W_1 = 2 * Delivery_lanes * (3 + 0.5 * Up_No. + Down_No./22) * 1.2 * 18$
Workers quarries	Workers which worked in the quarries or smoothed and installed blocks during the Nile flood. Each block required 6 days of work. $W_2 = 6 * Maximal_rate$
Workers others	Workers which neither towed blocks nor worked in the quarries during the Nile flood. Most of them were responsible to build ramps (factor 1.4). The rest were responsible to prepare food (factor 1.1) and to organize things (factor 1.06). $W_3 = (1.06 * 1.1 * 1.4 - 1) * (W_1 + W_2)$
Workers maximum	Total number of workers during the Nile flood. $W_4 = W_1 + W_2 + W_3 = 1.06 * 1.1 * 1.4 * (W_1 + W_2) = 1.632 (W_1 + W_2)$
Workers minimum	Total number of workers outside the Nile flood. $W_5 = W_4 * Minimal_rate / Maximal_rate$

Up No.	Down No.	Total lanes	Delivery lanes	Max. rate	Min. rate	Workers tow	Workers quarries	Workers others	Workers maximum	Workers minimum
1	209	10	8.46	1,523	711	3,015	9,137	7,685	19,837	9,262
2	208	10	8.33	1,499	750	3,141	8,996	7,675	19,812	9,906
3	207	10	8.23	1,481	741	3,273	8,888	7,691	19,852	9,926
4	206	10	8.11	1,460	730	3,392	8,759	7,684	19,835	9,918
5	205	9	7.99	1,438	719	3,507	8,629	7,675	19,810	9,905
6	204	9	7.87	1,417	708	3,616	8,500	7,662	19,778	9,889
7	203	9	7.76	1,397	698	3,726	8,381	7,656	19,763	9,881
8	202	9	7.65	1,377	689	3,831	8,262	7,647	19,740	9,870
9	201	9	7.55	1,359	680	3,936	8,154	7,646	19,736	9,868
10	200	9	7.46	1,343	671	4,043	8,057	7,652	19,752	9,876

Table Workforce /2

Up No.	Down No.	Total lanes	Delivery lanes	Max. rate	Min. rate	Workers tow	Workers quarries	Workers others	Workers maximum	Workers minimum
11	199	9	7.37	1,327	663	4,146	7,960	7,656	19,762	9,881
12	198	9	7.28	1,310	655	4,246	7,862	7,657	19,765	9,883
13	197	9	7.18	1,292	646	4,335	7,754	7,646	19,735	9,868
14	196	9	7.09	1,276	638	4,427	7,657	7,642	19,727	9,863
15	195	9	7.01	1,262	631	4,522	7,571	7,647	19,740	9,870
16	194	9	6.94	1,249	625	4,620	7,495	7,662	19,776	9,888
17	193	9	6.90	1,242	621	4,735	7,452	7,707	19,895	9,947
18	192	9	6.84	1,231	616	4,835	7,387	7,729	19,952	9,976
19	191	9	6.77	1,219	609	4,925	7,312	7,739	19,976	9,988
20	190	9	6.69	1,204	602	5,005	7,225	7,734	19,965	9,982
21	189	9	6.60	1,188	594	5,074	7,128	7,716	19,918	9,959
22	188	9	6.51	1,172	586	5,139	7,031	7,696	19,866	9,933
23	187	9	6.42	1,156	578	5,200	6,934	7,673	19,807	9,904
24	186	9	6.34	1,141	571	5,266	6,847	7,660	19,774	9,887
25	185	9	6.26	1,127	563	5,329	6,761	7,645	19,735	9,867
26	184	9	6.19	1,114	557	5,397	6,685	7,641	19,723	9,861
27	183	9	6.13	1,103	552	5,471	6,620	7,647	19,738	9,869
28	182	9	6.08	1,094	547	5,552	6,566	7,663	19,781	9,891
29	181	9	6.02	1,084	542	5,621	6,502	7,666	19,789	9,894
30	180	9	5.97	1,075	537	5,697	6,448	7,680	19,825	9,913
31	179	9	5.91	1,064	532	5,762	6,383	7,680	19,825	9,913
32	178	9	5.86	1,055	527	5,834	6,329	7,692	19,855	9,927
33	177	8	5.78	1,040	520	5,874	6,242	7,662	19,778	9,889
34	176	8	5.73	1,031	516	5,941	6,188	7,671	19,800	9,900
35	175	8	5.68	1,022	511	6,006	6,134	7,678	19,818	9,909
36	174	7	5.62	1,012	506	6,059	6,070	7,670	19,798	9,899
37	173	7	5.57	1,003	501	6,120	6,016	7,674	19,809	9,905
38	172	7	5.51	992	496	6,167	5,951	7,663	19,781	9,891
39	171	7	5.46	983	491	6,224	5,897	7,665	19,786	9,893
40	170	7	5.40	972	486	6,267	5,832	7,651	19,750	9,875
41	169	7	5.37	967	483	6,343	5,800	7,679	19,821	9,911
42	168	7	5.34	961	481	6,417	5,767	7,705	19,890	9,945
43	(50%)	7	5.31	956	478	6,491	5,735	7,731	19,957	9,978
44	166	7	5.27	949	474	6,551	5,692	7,742	19,984	9,992
45	165	7	5.22	940	470	6,596	5,638	7,737	19,970	9,985
46	164	7	5.17	931	465	6,639	5,584	7,730	19,953	9,976
47	163	7	5.12	922	461	6,681	5,530	7,722	19,932	9,966
48	162	7	5.07	913	456	6,720	5,476	7,713	19,908	9,954
49	161	6	5.02	904	452	6,757	5,422	7,702	19,881	9,940
50	160	6	4.98	896	448	6,806	5,378	7,705	19,890	9,945
51	159	6	4.94	889	445	6,853	5,335	7,708	19,897	9,948
52	158	6	4.90	882	441	6,899	5,292	7,709	19,900	9,950
53	157	6	4.85	873	437	6,928	5,238	7,694	19,861	9,930
54	156	6	4.82	868	434	6,985	5,206	7,709	19,900	9,950
55	155	6	4.78	860	430	7,026	5,162	7,708	19,896	9,948
56	154	6	4.75	855	428	7,079	5,130	7,721	19,931	9,965
57	153	6	4.71	848	424	7,117	5,087	7,718	19,921	9,961
58	152	6	4.68	842	421	7,168	5,054	7,729	19,952	9,976
59	151	6	4.64	835	418	7,202	5,011	7,724	19,938	9,969
60	150	6	4.60	828	414	7,235	4,968	7,717	19,921	9,960

Table Workforce /3

Up No.	Down No.	Total lanes	Delivery lanes	Max. rate	Min. rate	Workers tow	Workers quarries	Workers others	Workers maximum	Workers minimum
61	149	6	4.56	821	410	7,266	4,925	7,710	19,901	9,950
62	148	6	4.52	814	407	7,296	4,882	7,701	19,878	9,939
63	147	6	4.49	808	404	7,340	4,849	7,708	19,898	9,949
64	(10 yrs)	6	4.45	801	401	7,366	4,806	7,698	19,870	9,935
65	145	6	4.41	794	397	7,391	4,763	7,686	19,840	9,920
66	144	6	4.37	787	393	7,414	4,720	7,673	19,807	9,903
67	143	6	4.34	781	391	7,453	4,687	7,677	19,817	9,909
68	142	6	4.31	776	388	7,490	4,655	7,680	19,825	9,913
69	141	6	4.28	770	385	7,526	4,622	7,683	19,831	9,916
70	140	6	4.25	765	383	7,561	4,590	7,684	19,835	9,918
71	139	6	4.22	760	380	7,595	4,558	7,685	19,837	9,919
72	138	6	4.20	756	378	7,645	4,536	7,703	19,885	9,942
73	137	6	4.17	751	375	7,677	4,504	7,703	19,883	9,941
74	136	6	4.14	745	373	7,707	4,471	7,701	19,879	9,940
75	135	6	4.11	740	370	7,736	4,439	7,699	19,874	9,937
76	134	6	4.08	734	367	7,763	4,406	7,696	19,866	9,933
77	133	6	4.05	729	365	7,790	4,374	7,692	19,856	9,928
78	132	6	4.03	725	363	7,834	4,352	7,707	19,894	9,947
79	131	6	4.01	722	361	7,878	4,331	7,721	19,930	9,965
80	130	6	3.98	716	358	7,901	4,298	7,715	19,915	9,957
81	129	6	3.95	711	356	7,923	4,266	7,708	19,898	9,949
82	128	6	3.92	706	353	7,944	4,234	7,701	19,878	9,939
83	127	6	3.89	700	350	7,963	4,201	7,693	19,857	9,929
84	126	6	3.86	695	347	7,981	4,169	7,684	19,834	9,917
85	125	6	3.83	689	345	7,998	4,136	7,674	19,809	9,904
86	124	6	3.81	686	343	8,035	4,115	7,684	19,833	9,917
87	123	6	3.79	682	341	8,071	4,093	7,693	19,857	9,928
88	122	6	3.77	679	339	8,106	4,072	7,701	19,879	9,940
89	121	5	3.75	675	338	8,141	4,050	7,709	19,900	9,950
90	120	5	3.72	670	335	8,152	4,018	7,696	19,866	9,933
91	119	5	3.70	666	333	8,185	3,996	7,703	19,884	9,942
92	118	5	3.67	661	330	8,194	3,964	7,688	19,846	9,923
93	117	5	3.65	657	329	8,224	3,942	7,694	19,861	9,930
94	116	5	3.63	653	327	8,254	3,920	7,699	19,874	9,937
95	115	5	3.61	650	325	8,283	3,899	7,704	19,886	9,943
96	114	5	3.58	644	322	8,288	3,866	7,687	19,841	9,921
97	113	5	3.56	641	320	8,315	3,845	7,690	19,850	9,925
98	112	5	3.54	637	319	8,342	3,823	7,693	19,858	9,929
99	111	5	3.52	634	317	8,367	3,802	7,695	19,864	9,932
100	110	5	3.50	630	315	8,392	3,780	7,697	19,869	9,934
101	109	5	3.48	626	313	8,415	3,758	7,699	19,873	9,936
102	108	5	3.45	621	311	8,414	3,726	7,677	19,817	9,909
103	107	5	3.42	616	308	8,411	3,694	7,655	19,760	9,880
104	106	5	3.40	612	306	8,432	3,672	7,655	19,759	9,879
105	(Median)	5	3.39	610	305	8,477	3,661	7,676	19,815	9,907
106	104	5	3.38	608	304	8,522	3,650	7,698	19,870	9,935
107	103	5	3.37	607	303	8,566	3,640	7,719	19,925	9,962
108	102	5	3.35	603	302	8,585	3,618	7,717	19,919	9,960
109	101	5	3.33	599	300	8,602	3,596	7,714	19,913	9,956
110	100	5	3.31	596	298	8,619	3,575	7,711	19,904	9,952

Table Workforce /4

Up No.	Down No.	Total lanes	Delivery lanes	Max. rate	Min. rate	Workers tow	Workers quarries	Workers others	Workers maximum	Workers minimum
111	99	5	3.29	592	296	8,634	3,553	7,707	19,895	9,947
112	(90%)	5	3.27	589	294	8,649	3,532	7,703	19,884	9,942
113	97	5	3.25	585	293	8,663	3,510	7,698	19,872	9,936
114	96	5	3.23	581	291	8,677	3,488	7,693	19,858	9,929
115	95	5	3.22	580	290	8,716	3,478	7,711	19,905	9,953
116	94	4	3.20	576	286	8,728	3,456	7,705	19,889	9,875
117	93	4	3.00	540	284	8,244	3,240	7,263	18,747	9,860
118	92	4	3.00	540	283	8,306	3,240	7,302	18,848	9,878
119	91	4	3.00	540	282	8,368	3,240	7,341	18,949	9,896
120	90	4	3.00	540	280	8,430	3,240	7,380	19,050	9,878
121	89	4	3.00	540	279	8,492	3,240	7,419	19,151	9,895
122	88	4	3.00	540	278	8,554	3,240	7,458	19,252	9,911
123	87	4	3.00	540	276	8,615	3,240	7,497	19,353	9,891
124	86	4	3.00	540	275	8,677	3,240	7,537	19,454	9,907
125	85	4	3.00	540	273	8,739	3,240	7,576	19,555	9,886
126	84	4	3.00	540	272	8,801	3,240	7,615	19,656	9,901
127	83	3	3.00	540	271	8,863	3,240	7,654	19,757	9,915
128	82	3	2.20	396	270	6,545	2,376	5,642	14,562	9,929
129	81	3	2.19	394	269	6,560	2,365	5,644	14,570	9,942
130	80	3	2.18	392	268	6,575	2,354	5,647	14,577	9,956
131	79	3	2.17	391	267	6,590	2,344	5,649	14,583	9,968
132	78	3	2.16	389	266	6,604	2,333	5,652	14,588	9,981
133	77	3	2.15	387	262	6,618	2,322	5,653	14,593	9,880
134	76	3	2.14	385	261	6,631	2,311	5,655	14,597	9,891
135	75	3	2.13	383	260	6,644	2,300	5,656	14,601	9,901
136	74	3	2.12	382	259	6,656	2,290	5,658	14,604	9,912
137	73	3	2.11	380	258	6,669	2,279	5,658	14,606	9,922
138	72	3	2.10	378	257	6,680	2,268	5,659	14,607	9,931
139	71	3	2.11	380	257	6,756	2,279	5,713	14,748	9,979
140	70	3	2.09	376	256	6,735	2,257	5,686	14,678	9,988
141	69	3	2.08	374	252	6,745	2,246	5,686	14,678	9,879
142	68	3	2.07	373	250	6,756	2,236	5,686	14,677	9,848
143	67	3	2.06	371	250	6,765	2,225	5,685	14,676	9,895
144	66	3	2.05	369	249	6,775	2,214	5,685	14,673	9,902
145	65	3	2.04	367	248	6,784	2,203	5,683	14,670	9,908
146	64	3	2.03	365	246	6,792	2,192	5,682	14,667	9,874
147	63	3	2.02	364	245	6,801	2,182	5,680	14,663	9,880
148	62	3	2.01	362	244	6,808	2,171	5,678	14,658	9,885
149	61	3	2.00	360	243	6,816	2,160	5,676	14,652	9,890
150	60	3	1.99	358	242	6,823	2,149	5,674	14,646	9,895
151	59	3	1.98	356	241	6,829	2,138	5,671	14,639	9,899
152	58	3	1.97	355	240	6,835	2,128	5,668	14,631	9,903
153	57	3	1.96	353	238	6,841	2,117	5,665	14,623	9,865
154	56	3	1.95	351	237	6,846	2,106	5,662	14,614	9,868
155	55	3	1.94	349	235	6,851	2,095	5,658	14,604	9,828
156	54	3	1.93	347	233	6,856	2,084	5,654	14,594	9,788
157	53	3	1.92	346	231	6,860	2,074	5,650	14,583	9,747
158	52	3	1.91	344	229	6,863	2,063	5,645	14,571	9,706
159	51	3	1.90	342	228	6,867	2,052	5,640	14,559	9,706
160	50	3	1.89	340	227	6,870	2,041	5,635	14,546	9,706

