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Gainesite, sodium zirconium beryllophosphate: a new mineral and its crystal structure

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Abstract

Gainesite, hypothetical end-member $Na_2Zr_2[Be(PO_4)_4]$, $a = 6.567(3)$, $c = 17.119(5)$Å, $Z = 2$, tetragonal, space group $I4_1/amd$, is a new species from the Nevel (Twin Tunnels) pegmatite, Newry, Oxford County, Maine. Crystals occur as up to 1 mm simple tetragonal bipyramids with $p\{111\}$ dominant. The color is delicate pale bluish lavender, hardness = 4 on Mohs' scale, luster vitreous, conchoidal fracture, specific gravity 2.94. It is uniaxial (+), $\omega = 1.618(2)$, $\varepsilon = 1.630(2)$. The mineral occurs in small crevices in cleavelandite associated with monoclinic roscherite and minor eosphorite. It is named in honor of Richard V. Gaines.

$R = 0.055$ for 1072 independent reflections. Eight atoms occur in the asymmetric unit of structure and five of these are disordered. Be, P, and O(3) are half-occupied while Na(1) and Na(2) are each approximately one-eighth occupied. The structure is based on an open framework of composition $[^{[6]}Zr_2{}^{[4]}Be{}^{[4]}P_4O_{16}]^{2-}$. The $[BeP_4O_{16}]^{10-}$ pentameric cluster is reminiscent of the zunyite, $[Si_5O_{16}]^{12-}$ anionic fraction.

Bond distance averages are $^{[6]}Na(1)$–O = 2.49, $^{[12]}Na(2)$–O = 3.32, $^{[6]}Zr$–O = 2.062, $^{[4]}Be$–O = 1.621 and $^{[4]}P$–O = 1.512Å. Smaller alkalies (Li^+, Na^+) appear to partition in Na(1) and larger alkalies (Na^+, K^+, Rb^+, Cs^+) appear to partition in Na(2).

Introduction

In June, 1947, the late Mr. Neal Yedlin of New Haven, Connecticut, collected a tiny (5 mm × 5 mm × 5 mm) specimen of an unknown mineral from the Nevel (Twin Tunnels) Quarry on Plumbago Mountain, Newry, Oxford County, Maine. No further specimens were found until quite recently. Dr. Carl Francis of the Harvard Mineralogical Museum located two hand specimens in the museum's collection. One of these, generously provided by Dr. Francis, proved to be the same kind of material. The type specimen (U.S. National Museum 114848 TYPE), a micromount, constituted the basis of this study. Since limited material did not allow detailed wet chemical analysis and since elements of atomic number less than fluorine could not be detected on the electron microprobe, we elected to determine the crystal structure and utilize it as a chemical analytical tool as well.

The mineral *yedlinite* is a recently described hydrated oxychloride of lead and chromium from the Mammoth Mine, Tiger, Arizona and like our present mineral was first found by Mr. N. Yedlin (McLean *et al.*, 1974). Unfortunately the name "yedlinite" applied to the Newry mineral has crept into the popular literature, since New England micromounters were aware of the unusual properties of this mineral but were unaware of the pre-emption of the name for the Arizona mineral.

The mineral gainesite is named in honor of Dr. Richard V. Gaines of Pottstown, Pennsylvania. Long a fancier and collector of minerals, his professional interests have brought him around the globe appraising sources of beryllium in pegmatites. In addition, he has published numerous professional papers on mineral chemistry and mineral associations. Over the years, he has attempted to maintain a complete collection of beryllium mineral species and it is only fitting that a beryllium mineral be named after him.

The species and name were approved by the International Commission on New Minerals and New Mineral Names (IMA). The type specimen has been deposited in the U.S. National Museum (USNM 114848 TYPE).

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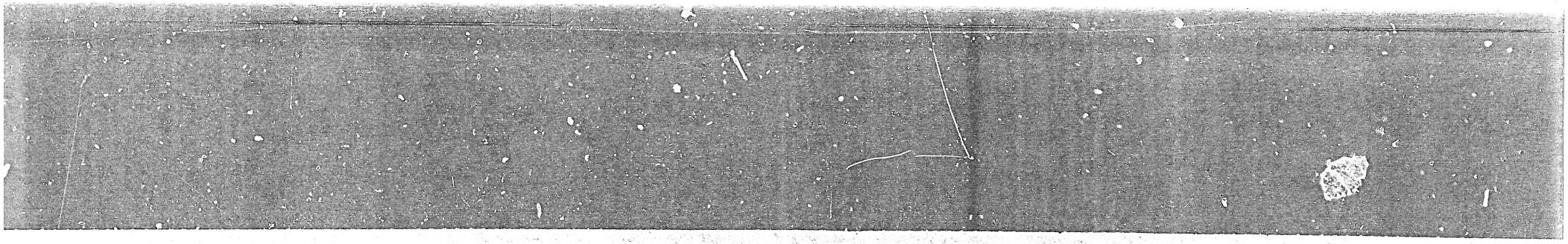
GAINESITE

SHEET NO. 1 PART 1

TABLE 8. |Fo|-|Fc| ta

H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC
0	0	4	168.3	188.1	8	0	4	37.6	36.6	4	1	33	9.3	8.1	3	2	3	43.9	41.1
0	0	8	132.9	127.5	8	0	6	30.8	33.7	4	1	35	10.5	9.4	3	2	5	65.9	61.8
0	0	12	59.8	61.2	8	0	8	44.1	45.9	5	1	2	56.9	57.8	3	2	7	58.7	60.8
0	0	16	119.7	120.9	8	0	10	3.2	2.9	5	1	4	54.4	54.1	3	2	9	67.6	69.4
0	0	20	99.8	101.9	8	0	12	31.0	29.9	5	1	6	41.4	41.8	3	2	11	53.6	52.1
0	0	24	64.8	62.9	8	0	14	33.6	31.5	5	1	8	22.0	21.4	3	2	13	27.3	25.8
0	0	28	16.8	16.5	8	0	16	33.7	35.3	5	1	10	44.6	45.5	3	2	15	62.9	64.8
0	0	32	21.3	16.6	8	0	18	11.4	14.5	5	1	12	19.5	18.4	3	2	17	32.1	32.8
0	0	36	17.6	18.5	8	0	20	25.0	24.2	5	1	14	40.3	42.1	3	2	19	39.4	39.9
1	0	1	104.6	113.2	8	0	22	5.7	6.3	5	1	16	23.9	24.5	3	2	21	18.0	20.0
1	0	3	19.4	23.3	8	0	24	22.8	23.1	5	1	18	38.3	38.4	3	2	23	18.1	19.1
1	0	5	152.3	161.4	8	0	26	9.1	7.4	5	1	20	3.5	0.4	3	2	25	27.8	25.4
1	0	7	71.2	79.6	8	0	28	13.6	12.6	5	1	22	19.1	19.2	3	2	27	18.5	18.0
1	0	9	133.6	135.0	8	0	30	2.7	2.4	5	1	24	18.2	17.7	3	2	29	14.6	14.1
1	0	11	72.5	74.3	9	0	1	21.0	23.1	5	1	26	23.8	22.3	3	2	31	18.1	17.6
1	0	13	9.9	12.0	9	0	3	21.1	18.9	5	1	28	8.2	8.4	3	2	33	14.5	12.0
1	0	15	82.7	84.0	9	0	5	42.0	40.4	5	1	30	13.9	12.9	3	2	35	15.8	15.3
1	0	17	33.4	32.4	9	0	7	36.7	39.8	5	1	32	1.8	3.3	4	2	0	96.4	95.8
1	0	19	39.1	38.7	9	0	9	49.0	52.6	5	1	34	16.8	14.7	4	2	2	11.0	11.1
1	0	21	32.0	34.0	9	0	11	44.3	43.9	6	1	1	87.8	85.1	4	2	4	52.1	50.7
1	0	23	13.2	12.2	9	0	13	27.6	27.6	6	1	3	54.7	56.2	4	2	6	13.9	13.7
1	0	25	51.3	51.0	9	0	15	30.7	32.4	6	1	5	46.3	46.8	4	2	8	73.5	74.8
1	0	27	12.5	9.9	9	0	17	17.8	18.5	6	1	7	39.4	38.3	4	2	10	11.6	10.7
1	0	29	23.0	23.8	9	0	19	12.2	12.5	6	1	9	29.0	28.5	4	2	12	35.0	35.8
1	0	31	13.7	16.0	9	0	21	9.4	10.7	6	1	11	14.0	13.5	4	2	14	12.7	12.1
1	0	33	11.8	11.2	9	0	23	8.8	9.0	6	1	13	14.8	17.4	4	2	16	53.0	53.4
1	0	35	17.0	15.6	9	0	25	18.2	18.7	6	1	15	31.5	30.5	4	2	18	8.0	7.9
2	0	0	291.4	273.6	9	0	27	15.5	14.0	6	1	17	46.5	46.6	4	2	20	31.6	31.8
2	0	2	9.6	12.8	10	0	0	69.1	69.3	6	1	19	37.6	39.3	4	2	22	5.0	6.9
2	0	4	99.8	95.3	10	0	2	8.5	5.3	6	1	21	34.9	35.4	4	2	24	35.5	34.7
2	0	6	48.2	44.7	10	0	4	44.5	43.6	6	1	23	31.3	28.7	4	2	26	10.5	7.8
2	0	8	81.0	87.2	10	0	6	10.2	11.6	6	1	25	27.4	25.2	4	2	28	18.1	17.5
2	0	10	19.0	18.3	10	0	8	30.3	31.6	6	1	27	12.5	11.0	4	2	30	3.8	3.9
2	0	12	34.9	34.6	10	0	10	4.5	2.6	6	1	29	1.8	6.7	4	2	32	14.7	13.8
2	0	14	33.7	33.8	10	0	12	27.2	24.8	6	1	31	2.0	3.4	4	2	34	3.8	2.5
2	0	16	80.8	83.8	10	0	14	9.5	7.8	6	1	33	7.0	7.7	5	2	1	9.8	10.0
2	0	18	4.9	6.1	10	0	16	37.1	38.1	7	1	2	59.5	58.2	5	2	3	18.6	17.4
2	0	20	68.0	68.6	10	0	18	2.0	5.3	7	1	4	30.3	30.9	5	2	5	6.8	5.0
2	0	22	3.1	1.1	10	0	20	32.4	31.3	7	1	6	54.1	52.3	5	2	7	50.9	52.0
2	0	24	54.1	52.9	10	0	22	3.9	3.0	7	1	8	20.2	17.6	5	2	9	60.1	62.7
2	0	26	2.9	0.3	10	0	24	20.0	21.4	7	1	10	56.1	55.0	5	2	11	36.2	36.0
2	0	28	13.9	13.6	10	0	26	6.1	5.4	7	1	12	16.6	15.0	5	2	13	34.8	34.0
2	0	30	5.0	6.0	11	0	1	10.8	14.4	7	1	14	38.9	38.5	5	2	15	18.2	19.1
2	0	32	14.9	12.7	11	0	3	7.9	4.8	7	1	16	23.5	22.3	5	2	17	17.7	19.4
2	0	34	1.8	5.2	11	0	5	27.6	25.7	7	1	18	36.3	36.3	5	2	19	8.6	8.4
2	0	36	13.9	13.6	11	0	7	12.2	13.6	7	1	20	6.6	6.7	5	2	21	3.6	1.6

3	0	1	128.0	123.4	11	0	9	25.4	27.9	7	1	22	26.6	24.8	5	2	23	9.9	11.8
3	0	3	58.7	57.3	11	0	11	20.5	19.6	7	1	24	11.1	10.4	5	2	25	15.5	14.5
3	0	5	157.3	151.0	11	0	13	10.9	10.0	7	1	26	25.1	23.7	5	2	27	15.2	14.9
3	0	7	92.5	89.8	11	0	15	17.0	18.9	7	1	28	7.5	7.5	5	2	29	16.2	15.6
3	0	9	128.8	127.1	11	0	17	6.9	7.0	7	1	30	13.7	13.4	5	2	31	10.6	11.6
3	0	11	95.9	96.6	11	0	19	8.6	7.5	8	1	1	48.7	48.5	5	2	33	13.9	13.1
3	0	13	34.9	36.5	11	0	21	9.6	8.5	8	1	3	35.2	34.7	6	2	0	71.4	71.8
3	0	15	89.4	90.2	11	0	23	3.8	2.4	8	1	5	15.6	17.6	6	2	2	19.2	15.5
3	0	17	41.2	40.1	12	0	0	42.1	44.2	8	1	7	14.7	14.7	6	2	4	56.2	54.5
3	0	19	35.4	35.7	12	0	2	3.9	2.9	8	1	9	6.1	4.6	6	2	6	24.4	27.4
3	0	21	29.7	30.8	12	0	4	29.0	28.7	8	1	11	3.7	0.8	6	2	8	73.8	75.0
3	0	23	17.8	18.1	12	0	6	2.4	4.9	8	1	13	5.1	5.5	6	2	10	10.2	8.4
3	0	25	43.1	42.7	12	0	8	17.6	18.2	8	1	15	18.6	17.9	6	2	12	50.9	50.9
3	0	27	23.8	22.1	12	0	10	3.8	0.8	8	1	17	25.2	25.6	6	2	14	18.8	15.8
3	0	29	24.1	23.2	12	0	12	13.2	12.4	8	1	19	28.6	28.9	6	2	16	48.7	48.5
3	0	31	22.4	22.6	12	0	14	6.9	5.1	8	1	21	18.2	18.1	6	2	18	11.8	11.5
3	0	33	17.1	15.7	12	0	16	22.2	23.3	8	1	23	19.4	19.2	6	2	20	27.4	26.5
3	0	35	18.9	16.7	12	0	18	4.2	2.1	8	1	25	12.9	12.1	6	2	22	7.8	9.4
4	0	0	212.0	199.8	13	0	1	20.6	21.9	8	1	27	7.0	5.6	6	2	24	30.2	30.4
4	0	2	24.4	19.1	13	0	3	11.1	9.3	8	1	29	3.8	0.9	6	2	26	13.2	13.4
4	0	4	90.5	88.9	13	0	5	27.2	26.6	9	1	2	40.2	41.1	6	2	28	20.7	19.7
4	0	6	39.5	43.3	13	0	7	7.9	10.9	9	1	4	17.4	18.9	6	2	30	4.6	4.1
4	0	8	90.9	90.8	13	0	9	18.3	20.1	9	1	6	41.9	42.0	6	2	32	18.6	17.4
4	0	10	4.4	0.3	13	0	11	20.4	19.3	9	1	8	10.8	9.9	7	2	1	22.2	23.6
4	0	12	50.4	49.5	13	0	13	8.6	7.0	9	1	10	45.4	45.4	7	2	3	25.9	24.3
4	0	14	41.0	38.4	14	0	0	23.4	24.8	9	1	12	7.9	8.6	7	2	5	25.5	22.5
4	0	16	78.2	78.7	14	0	2	3.8	1.0	9	1	14	33.6	33.9	7	2	7	48.5	49.9
4	0	18	10.9	13.9	14	0	4	15.1	14.7	9	1	16	12.0	13.8	7	2	9	45.5	48.3
4	0	20	55.8	55.9	1	1	2	46.0	51.8	9	1	18	26.3	26.2	7	2	11	44.8	41.1
4	0	22	6.8	8.6	1	1	6	58.6	59.8	9	1	20	4.4	2.9	7	2	13	36.2	34.6
4	0	24	44.5	42.6	1	1	10	128.3	130.6	9	1	22	18.1	18.2	7	2	15	27.0	29.8
4	0	26	9.1	8.4	1	1	14	72.6	74.1	9	1	24	7.4	6.3	7	2	17	21.5	22.3
4	0	28	20.4	19.8	1	1	18	24.5	25.3	9	1	26	20.2	19.3	7	2	19	13.0	12.2
4	0	30	3.8	0.9	1	1	22	7.5	8.6	9	1	28	5.7	4.1	7	2	21	4.5	5.0
4	0	32	20.9	16.9	1	1	26	35.7	35.3	10	1	1	37.5	37.5	7	2	23	9.2	12.0
4	0	34	4.1	7.2	1	1	30	28.7	28.6	10	1	3	19.4	19.8	7	2	25	11.1	11.3
5	0	1	8.2	10.7	1	1	34	25.5	22.2	10	1	5	34.4	35.2	7	2	27	19.4	17.9
5	0	3	25.0	20.0	2	1	1	92.6	86.4	10	1	7	19.0	17.9	7	2	29	11.5	11.5
5	0	5	55.2	51.4	2	1	3	7.8	5.9	10	1	9	25.4	24.4	7	2	31	14.6	14.4
5	0	7	65.5	67.2	2	1	5	38.8	40.9	10	1	11	16.4	17.9	8	2	0	30.0	29.7
5	0	9	98.7	100.7	2	1	7	34.4	34.3	10	1	13	9.1	9.3	8	2	2	18.4	14.5
5	0	11	64.5	65.1	2	1	9	60.5	59.6	10	1	15	25.0	23.0	8	2	4	25.7	23.2
5	0	13	40.9	41.7	2	1	11	18.4	21.6	10	1	17	19.3	18.4	8	2	6	20.6	21.3
5	0	15	35.4	35.4	2	1	13	4.8	1.1	10	1	19	17.5	18.5	8	2	8	42.1	42.9
5	0	17	22.0	23.2	2	1	15	56.4	56.1	10	1	21	19.7	19.5	8	2	10	1.8	0.9
5	0	19	5.3	4.1	2	1	17	24.3	23.8	10	1	23	14.7	11.5	8	2	12	25.7	25.4
5	0	21	9.6	9.0	2	1	19	43.5	44.1	10	1	25	16.8	18.4	8	2	14	19.7	18.6
5	0	23	11.2	10.2	2	1	21	19.4	21.9	11	1	2	13.0	12.8	8	2	16	23.3	23.7
5	0	25	28.1	28.0	2	1	23	14.5	13.4	11	1	4	5.2	7.6	8	2	18	9.6	10.3
5	0	27	19.9	18.0	2	1	25	33.8	31.5	11	1	6	22.0	21.1	8	2	20	13.0	12.2
5	0	29	22.4	23.5	2	1	27	1.8	6.1	11	1	8	4.6	4.1	8	2	22	3.4	5.0



5	0	31	15.4	15.6	2	1	29	13.4	13.7	11	1	10	28.6	28.7	8	2	24	17.8	18.5
5	0	33	16.9	16.2	2	1	31	10.2	10.8	11	1	12	3.8	2.2	8	2	26	9.0	6.7
6	0	0	131.3	128.9	2	1	33	10.4	7.3	11	1	14	19.3	18.9	8	2	28	11.2	11.6
6	0	2	23.4	22.0	2	1	35	15.3	14.2	11	1	16	2.1	2.8	9	2	1	19.4	22.1
6	0	4	81.1	78.5	3	1	2	96.8	95.0	11	1	18	10.8	9.5	9	2	3	20.9	20.3
6	0	6	46.3	47.0	3	1	4	6.2	2.8	11	1	20	4.4	0.7	9	2	5	25.9	23.3
6	0	8	81.7	83.2	3	1	6	111.9	112.3	11	1	22	3.9	4.5	9	2	7	30.4	34.0
6	0	10	5.0	2.3	3	1	8	6.1	4.1	12	1	1	22.4	22.9	9	2	9	33.6	36.9
6	0	12	62.2	60.4	3	1	10	114.9	136.1	12	1	3	9.3	10.9	9	2	11	32.1	31.0
6	0	14	36.6	34.5	3	1	12	8.4	7.9	12	1	5	20.3	22.8	9	2	13	24.8	23.9
6	0	16	64.6	66.9	3	1	14	74.3	76.4	12	1	7	10.2	9.5	9	2	15	22.5	24.2
6	0	18	15.2	16.7	3	1	16	14.3	14.3	12	1	9	16.4	16.8	9	2	17	17.4	17.5
6	0	20	46.1	44.7	3	1	18	43.4	43.5	12	1	11	12.5	13.1	9	2	19	15.3	13.7
6	0	22	9.4	11.1	3	1	20	9.3	9.7	12	1	13	7.3	6.5	9	2	21	8.4	7.0
6	0	24	36.5	36.9	3	1	22	25.9	26.0	12	1	15	19.0	18.6	9	2	23	7.5	10.3
6	0	26	16.3	14.3	3	1	24	3.3	2.3	12	1	17	3.8	8.9	9	2	25	10.6	11.9
6	0	28	22.6	21.5	3	1	26	40.6	39.4	12	1	19	13.1	14.2	9	2	27	11.3	12.3
6	0	30	3.8	0.5	3	1	28	3.7	3.0	13	1	2	13.7	13.8	10	2	0	48.9	49.9
6	0	32	22.4	19.9	3	1	30	27.8	27.2	13	1	4	4.0	1.3	10	2	2	3.5	1.7
7	0	1	22.0	25.0	3	1	32	7.0	4.2	13	1	6	26.8	26.2	10	2	4	36.4	34.2
7	0	3	26.8	24.0	3	1	34	24.0	20.9	13	1	8	4.0	0.9	10	2	6	3.6	4.4
7	0	5	54.5	51.1	4	1	1	91.3	88.4	13	1	10	32.6	32.6	10	2	8	28.2	30.2
7	0	7	59.2	59.5	4	1	3	39.5	40.9	13	1	12	3.7	0.1	10	2	10	5.1	4.5
7	0	9	70.4	72.6	4	1	5	58.4	56.7	13	1	14	19.8	20.5	10	2	12	23.5	22.2
7	0	11	63.3	61.1	4	1	7	35.8	35.1	14	1	1	11.4	11.0	10	2	14	4.5	0.3
7	0	13	40.1	40.3	4	1	9	38.8	39.0	14	1	3	4.0	2.8	10	2	16	29.6	30.1
7	0	15	40.6	42.2	4	1	11	21.1	21.1	2	2	0	107.1	86.1	10	2	18	5.5	2.4
7	0	17	25.3	24.6	4	1	13	10.9	12.1	2	2	4	32.3	37.6	10	2	20	22.7	22.8
7	0	19	11.4	9.7	4	1	15	38.8	38.8	2	2	8	57.5	60.5	10	2	22	3.9	2.0
7	0	21	9.7	10.6	4	1	17	39.0	38.6	2	2	12	10.6	15.4	10	2	24	17.8	18.0
7	0	23	9.9	10.5	4	1	19	41.5	41.8	2	2	16	50.6	52.6	11	2	1	12.0	13.9
7	0	25	19.7	21.2	4	1	21	30.7	30.7	2	2	20	40.8	39.5	11	2	3	6.4	6.7
7	0	27	22.8	20.5	4	1	23	25.1	24.8	2	2	24	43.3	43.6	11	2	5	18.1	15.9
7	0	29	17.4	17.5	4	1	25	31.1	29.9	2	2	28	13.3	11.1	11	2	7	8.4	10.7
7	0	31	19.5	17.7	4	1	27	8.6	7.9	2	2	32	9.7	9.2	11	2	9	17.3	18.6
8	0	0	58.7	60.2	4	1	29	9.1	7.7	2	2	36	8.8	9.1	11	2	11	12.5	12.1
8	0	2	25.3	20.0	4	1	31	8.6	6.8	3	2	1	102.5	101.6	11	2	13	9.0	8.0

GAINESITE

SHEET NO. 1 PART 2

H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC	H	K	L	FO	FC
11	2	15	11.7	14.0	10	3	23	13.7	12.8	12	4	4	22.0	20.4	8	6	14	4.3	3.2
11	2	17	6.0	7.1	11	3	2	20.8	20.5	12	4	6	8.3	4.9	8	6	16	20.4	22.0
11	2	19	10.1	8.4	11	3	4	4.2	1.9	12	4	8	19.9	21.3	8	6	18	3.8	1.1
11	2	21	7.0	6.4	11	3	6	23.3	23.1	12	4	10	2.2	0.7	8	6	20	8.1	5.3
12	2	0	31.6	33.2	11	3	8	2.7	1.2	12	4	12	15.8	15.4	8	6	22	3.8	1.5
12	2	2	3.8	0.4	11	3	10	25.6	25.3	12	4	14	1.8	3.7	8	6	24	13.4	12.9
12	2	4	25.2	23.1	11	3	12	3.9	0.7	12	4	16	16.4	17.1	8	6	26	3.9	2.6
12	2	6	4.3	0.6	11	3	14	18.7	18.5	13	4	1	20.9	22.0	9	6	1	25.1	27.5
12	2	8	16.1	17.8	11	3	16	1.9	2.2	13	4	3	15.3	14.8	9	6	3	33.2	32.9
12	2	10	2.9	0.3	11	3	18	15.1	14.2	13	4	5	17.1	16.2	9	6	5	14.0	13.6
12	2	12	12.8	11.4	11	3	20	4.0	2.5	13	4	7	8.9	9.7	9	6	7	28.7	31.5
12	2	14	1.9	0.4	12	3	1	18.6	19.4	13	4	9	9.0	9.6	9	6	9	16.9	19.4
12	2	16	17.9	18.6	12	3	3	12.1	13.2	5	5	2	66.0	66.8	9	6	11	17.5	16.8
12	2	18	1.8	0.1	12	3	5	19.3	19.5	5	5	6	25.0	23.8	9	6	13	23.3	22.8
13	2	1	20.5	21.1	12	3	7	15.7	15.1	5	5	10	4.7	2.0	9	6	15	9.6	11.7
13	2	3	11.2	10.6	12	3	9	19.2	19.0	5	5	14	23.0	22.5	9	6	17	24.4	25.9
13	2	5	21.3	20.6	12	3	11	17.9	16.9	5	5	18	44.8	44.9	9	6	19	14.5	14.0
13	2	7	7.8	9.2	12	3	13	12.3	11.2	5	5	22	26.8	25.9	9	6	21	13.3	13.3
13	2	9	11.8	14.5	12	3	15	19.0	17.4	5	5	26	14.3	13.7	9	6	23	15.8	16.5
13	2	11	15.4	14.5	12	3	17	10.5	10.2	5	5	30	2.7	2.2	10	6	0	28.4	28.9
13	2	13	6.4	5.8	13	3	2	18.1	18.1	6	5	1	31.3	31.8	10	6	2	3.9	5.1
14	2	0	18.1	18.8	13	3	4	6.3	4.8	6	5	3	48.7	47.6	10	6	4	27.9	26.4
3	3	2	120.1	117.1	13	3	6	25.6	25.8	6	5	5	8.1	8.3	10	6	6	10.1	7.8
3	3	6	129.9	127.7	13	3	8	2.1	2.8	6	5	7	49.5	50.6	10	6	8	32.9	35.5
3	3	10	130.0	129.7	13	3	10	28.1	28.6	6	5	9	32.4	33.1	10	6	10	5.0	0.8
3	3	14	73.1	75.9	13	3	12	2.0	1.8	6	5	11	20.8	20.4	10	6	12	30.9	29.3
3	3	18	57.4	57.7	4	4	0	73.5	75.7	6	5	13	34.8	35.7	10	6	14	5.3	7.0
3	3	22	41.5	40.0	4	4	4	53.9	49.3	6	5	15	7.9	6.8	10	6	16	24.4	24.2
3	3	26	43.8	42.2	4	4	8	83.5	84.4	6	5	17	36.4	37.4	10	6	18	4.9	3.1
3	3	30	26.3	25.4	4	4	12	52.1	49.7	6	5	19	13.5	13.2	10	6	20	12.7	12.9
3	3	34	21.9	19.6	4	4	16	51.3	52.0	6	5	21	16.7	15.8	11	6	1	16.8	18.8
4	3	1	93.9	89.5	4	4	20	24.6	24.1	6	5	23	24.6	23.4	11	6	3	18.4	18.1
4	3	3	58.0	59.1	4	4	24	28.7	27.7	6	5	25	12.6	11.5	11	6	5	10.4	9.1
4	3	5	57.2	56.9	4	4	28	23.2	22.1	6	5	27	17.2	16.5	11	6	7	11.2	12.7
4	3	7	58.5	56.2	4	4	32	20.0	17.5	6	5	29	10.6	8.4	11	6	9	8.4	8.2
4	3	9	48.4	47.6	5	4	1	22.5	23.0	7	5	2	63.4	62.6	11	6	11	2.0	4.6
4	3	11	41.2	42.3	5	4	3	40.0	38.2	7	5	4	4.9	3.6	11	6	13	10.0	9.4
4	3	13	31.5	31.4	5	4	5	11.1	8.0	7	5	6	32.1	31.7	11	6	15	7.6	6.4
4	3	15	44.8	45.0	5	4	7	50.4	52.0	7	5	8	3.8	0.7	11	6	17	12.8	14.8
4	3	17	45.2	44.5	5	4	9	43.2	44.2	7	5	10	14.9	14.7	12	6	0	18.5	19.4
4	3	19	36.4	37.7	5	4	11	29.1	28.6	7	5	12	4.7	0.6	12	6	2	6.1	4.7
4	3	21	27.6	27.6	5	4	13	37.6	37.2	7	5	14	22.1	22.1	12	6	4	17.3	17.7
4	3	23	27.3	28.6	5	4	15	9.6	9.4	7	5	16	5.5	2.8	12	6	6	8.9	7.9
4	3	25	24.2	23.8	5	4	17	30.9	31.1	7	5	18	40.1	40.3	12	6	8	19.6	21.9
4	3	27	19.4	18.2	5	4	19	10.5	10.8	7	5	20	4.8	4.9	12	6	10	3.8	1.0
4	3	29	9.4	8.5	5	4	21	10.8	9.9	7	5	22	29.6	28.2	7	7	2	56.9	56.8

4	3	31	11.6	12.9	5	4	23	20.1	20.3	7	5	24	2.0	2.3	7	7	6	33.1	33.0
4	3	33	12.9	12.1	5	4	25	13.8	13.5	7	5	26	15.9	15.6	7	7	10	21.0	18.8
5	3	2	80.5	81.1	5	4	27	18.1	15.6	7	5	28	3.8	0.5	7	7	14	21.7	20.6
5	3	4	38.6	38.4	5	4	29	9.6	10.3	8	5	1	15.5	16.0	7	7	18	35.7	35.8
5	3	6	59.1	59.2	5	4	31	8.3	8.0	8	5	3	31.2	31.0	7	7	22	29.9	28.2
5	3	8	13.3	14.7	6	4	0	52.8	53.9	8	5	5	6.5	3.8	7	7	26	17.3	15.7
5	3	10	47.9	47.7	6	4	2	7.6	5.8	8	5	7	28.9	30.0	8	7	1	16.5	17.9
5	3	12	12.1	10.6	6	4	4	49.6	48.2	8	5	9	13.6	14.1	8	7	3	28.7	28.8
5	3	14	41.3	43.8	6	4	6	10.0	11.9	8	5	11	9.0	8.7	8	7	5	3.7	2.3
5	3	16	12.6	11.3	6	4	8	80.4	81.4	8	5	13	22.1	21.6	8	7	7	28.1	29.1
5	3	18	50.6	50.2	6	4	10	4.5	1.6	8	5	15	4.1	2.3	8	7	9	11.8	12.9
5	3	20	7.2	6.9	6	4	12	60.0	58.5	8	5	17	21.4	22.1	8	7	11	13.1	12.9
5	3	22	31.8	31.3	6	4	14	6.1	5.3	8	5	19	9.9	9.5	8	7	13	22.0	21.0
5	3	24	14.0	13.9	6	4	16	45.4	46.1	8	5	21	6.9	5.6	8	7	15	7.4	7.3
5	3	26	26.4	25.6	6	4	18	4.8	4.5	8	5	23	16.3	16.0	8	7	17	20.5	21.3
5	3	28	1.8	5.5	6	4	20	20.9	19.3	8	5	25	4.0	3.5	8	7	19	10.9	9.8
5	3	30	13.0	11.9	6	4	22	3.6	3.5	8	5	27	10.9	11.2	8	7	21	7.3	6.1
5	3	32	3.8	0.1	6	4	24	24.2	24.5	9	5	2	44.3	45.4	8	7	23	15.1	14.4
6	3	1	78.2	79.0	6	4	26	7.1	5.9	9	5	4	5.2	5.0	9	7	2	41.1	41.2
6	3	3	64.8	64.6	6	4	28	23.9	23.0	9	5	6	28.0	26.8	9	7	4	3.7	3.0
6	3	5	43.4	42.3	6	4	30	3.9	1.1	9	5	8	1.9	1.9	9	7	6	25.9	26.5
6	3	7	52.3	53.0	7	4	1	29.0	29.9	9	5	10	17.2	16.5	9	7	8	3.7	2.0
6	3	9	33.7	35.5	7	4	3	38.5	37.6	9	5	12	3.6	1.4	9	7	10	18.1	17.5
6	3	11	28.9	29.0	7	4	5	19.4	17.4	9	5	14	21.2	20.7	9	7	12	2.0	1.6
6	3	13	31.7	31.4	7	4	7	48.5	48.8	9	5	16	4.3	0.5	9	7	14	18.1	18.4
6	3	15	33.1	33.4	7	4	9	32.7	34.6	9	5	18	29.1	29.6	9	7	16	2.9	2.4
6	3	17	49.7	49.6	7	4	11	33.4	32.1	9	5	20	2.1	2.2	9	7	18	24.5	26.4
6	3	19	33.5	34.9	7	4	13	37.0	35.4	9	5	22	21.8	21.3	9	7	20	4.1	0.7
6	3	21	31.2	31.4	7	4	15	18.1	19.3	9	5	24	5.9	3.1	10	7	1	12.3	13.9
6	3	23	30.8	31.0	7	4	17	30.4	30.6	10	5	1	12.6	14.1	10	7	3	17.1	17.3
6	3	25	20.6	20.0	7	4	19	13.9	13.4	10	5	3	19.3	18.2	10	7	5	14.9	13.6
6	3	27	20.4	18.8	7	4	21	11.4	10.9	10	5	5	14.7	14.6	10	7	7	23.1	25.0
6	3	29	6.0	7.3	7	4	23	17.4	18.4	10	5	7	27.1	27.0	10	7	9	19.6	21.1
6	3	31	9.8	8.4	7	4	25	9.0	9.9	10	5	9	25.7	25.4	10	7	11	19.0	19.4
7	3	2	73.2	72.4	7	4	27	18.7	17.8	10	5	11	18.7	19.7	10	7	13	18.9	18.4
7	3	4	19.4	19.9	7	4	29	6.4	7.5	10	5	13	18.8	19.7	10	7	15	12.0	10.7
7	3	6	59.0	59.0	8	4	0	17.8	20.4	10	5	15	10.0	9.5	10	7	17	15.2	15.0
7	3	8	13.2	12.0	8	4	2	10.0	6.6	10	5	17	14.3	15.9	11	7	2	19.4	20.1
7	3	10	50.9	50.9	8	4	4	24.1	21.8	10	5	19	6.8	5.3	11	7	4	6.7	6.1
7	3	12	9.7	8.9	8	4	6	7.5	8.8	10	5	21	10.6	8.5	11	7	6	13.8	14.3
7	3	14	38.2	38.6	8	4	8	49.0	50.1	11	5	2	19.9	20.2	11	7	8	2.3	3.7
7	3	16	13.8	11.8	8	4	10	3.4	2.5	11	5	4	8.9	7.5	11	7	10	10.9	11.3
7	3	18	44.2	44.7	8	4	12	35.9	33.5	11	5	6	14.1	13.3	11	7	12	5.2	3.9
7	3	20	3.3	1.2	8	4	14	9.7	9.0	11	5	8	3.5	3.9	11	7	14	11.4	10.7
7	3	22	35.7	33.1	8	4	16	23.0	23.5	11	5	10	10.0	10.6	12	7	1	5.3	7.4
7	3	24	6.7	7.5	8	4	18	3.5	4.8	11	5	12	1.8	4.1	12	7	3	8.4	9.6
7	3	26	26.4	25.4	8	4	20	9.8	7.4	11	5	14	10.5	11.4	12	7	5	7.7	9.3
7	3	28	1.9	5.1	8	4	22	3.5	0.8	11	5	16	8.2	6.1	12	7	7	16.7	16.0
7	3	30	13.3	11.9	8	4	24	16.0	14.8	11	5	18	13.9	14.2	8	8	0	5.2	3.7
8	3	1	44.0	44.3	8	4	26	2.3	1.2	12	5	1	8.9	7.9	8	8	4	13.7	10.2
8	3	3	39.8	40.7	8	4	28	15.5	14.7	12	5	3	10.3	10.1	8	8	8	31.4	33.4

8	3	5	14.3	15.3	9	4	1	25.3	26.5	12	5	5	11.2	10.0	8	8	12	24.9	24.1
8	3	7	27.6	27.4	9	4	3	30.3	29.4	12	5	7	16.5	16.9	8	8	16	11.4	11.6
8	3	9	11.5	12.2	9	4	5	18.8	17.7	12	5	9	17.5	18.1	8	8	20	2.3	1.0
8	3	11	10.0	11.9	9	4	7	31.4	33.6	12	5	11	16.3	14.8	9	8	1	15.8	17.0
8	3	13	17.3	16.4	9	4	9	24.0	26.4	12	5	13	13.6	13.8	9	8	3	23.1	22.0
8	3	15	19.8	19.5	9	4	11	23.8	23.3	13	5	2	17.1	17.6	9	8	5	7.0	5.5
8	3	17	27.9	28.7	9	4	13	25.5	24.3	13	5	4	10.4	9.8	9	8	7	18.2	20.4
8	3	19	24.1	25.1	9	4	15	14.6	16.4	13	5	6	16.5	18.1	9	8	9	8.1	10.2
8	3	21	15.6	15.5	9	4	17	23.1	23.5	6	6	0	36.0	38.9	9	8	11	11.0	9.7
8	3	23	19.2	21.1	9	4	19	14.8	14.3	6	6	4	44.3	43.3	9	8	13	14.7	14.7
8	3	25	8.6	8.7	9	4	21	11.5	11.1	6	6	8	75.1	77.4	9	8	15	7.5	7.3
8	3	27	12.1	11.8	9	4	23	13.5	14.9	6	6	12	60.8	60.9	9	8	17	14.2	16.7
8	3	29	3.8	2.0	9	4	25	10.5	10.0	6	6	16	40.3	40.4	9	8	19	10.6	10.1
9	3	2	50.3	50.7	10	4	0	37.9	38.3	6	6	20	15.2	14.6	10	8	0	16.7	16.6
9	3	4	10.8	10.5	10	4	2	3.5	2.7	6	6	24	20.0	21.1	10	8	2	2.1	4.3
9	3	6	44.3	45.1	10	4	4	31.4	30.2	6	6	28	22.8	23.2	10	8	4	16.1	15.9
9	3	8	5.6	5.8	10	4	6	5.1	3.4	7	6	1	30.4	32.3	10	8	6	6.6	5.7
9	3	10	41.8	40.9	10	4	8	33.7	35.1	7	6	3	43.8	42.9	10	8	8	22.8	23.9
9	3	12	5.4	4.2	10	4	10	4.7	2.0	7	6	5	15.2	13.3	10	8	10	3.9	1.8
9	3	14	32.6	33.0	10	4	12	30.0	27.3	7	6	7	44.9	45.7	10	8	12	20.1	19.2
9	3	16	7.3	6.1	10	4	14	4.0	5.0	7	6	9	23.7	26.2	10	8	14	4.3	6.6
9	3	18	32.2	32.2	10	4	16	26.4	27.8	7	6	11	25.0	23.5	11	8	1	11.3	12.7
9	3	20	3.9	0.4	10	4	18	6.6	1.1	7	6	13	33.1	32.9	11	8	3	14.1	12.7
9	3	22	25.3	24.1	10	4	20	18.5	17.1	7	6	15	12.8	13.5	11	8	5	5.0	4.6
9	3	24	6.0	3.8	10	4	22	1.9	0.9	7	6	17	32.5	34.1	11	8	7	6.4	7.8
9	3	26	20.9	20.1	11	4	1	15.8	17.5	7	6	19	15.4	14.1	11	8	9	3.8	3.8
10	3	1	32.1	33.0	11	4	3	15.8	14.1	7	6	21	14.8	14.5	9	9	2	28.1	29.9
10	3	3	23.5	23.7	11	4	5	13.2	11.8	7	6	23	20.3	20.6	9	9	6	20.7	21.4
10	3	5	31.0	30.5	11	4	7	11.2	12.1	7	6	25	9.8	8.2	9	9	10	16.5	16.0
10	3	7	26.0	25.8	11	4	9	10.7	12.1	7	6	27	18.5	17.4	9	9	14	15.6	15.8
10	3	9	27.2	27.5	11	4	11	9.6	7.5	8	6	0	14.5	15.1	10	9	1	11.1	12.9
10	3	11	23.2	24.1	11	4	13	9.2	9.1	8	6	2	1.8	1.2	10	9	3	13.0	13.6
10	3	13	16.7	16.4	11	4	15	8.6	9.1	8	6	4	22.2	21.6	10	9	5	13.0	12.3
10	3	15	21.9	22.3	11	4	17	10.6	12.2	8	6	6	3.6	0.1	10	9	7	14.4	17.3
10	3	17	19.7	20.2	11	4	19	10.9	9.5	8	6	8	48.6	50.3	10	9	9	14.3	15.6
10	3	19	14.4	15.6	12	4	0	24.3	25.5	8	6	10	4.2	2.8	10	9	11	13.2	14.1
10	3	21	16.8	16.5	12	4	2	3.9	2.9	8	6	12	39.0	37.9	10	10	0	20.0	20.9