

**Таблица 20-а. Азимуты видимого восхода или захода верхнего края Солнца при одноименных  $\varphi$  и  $\delta$**

Ши- рота	Склонение Солнца одноименно с широтой												Ши- рота	
	0°00'	0°30'	1°00'	1°30'	2°00'	2°30'	3°00'	3°30'	4°00'	4°30'	5°00'	5°30'		6°00'
0°	90°0	89°5	89°0	88°5	88°0	87°5	87°0	86°5	86°0	85°5	85°0	84°5	84°0	0°
5	89.9	89.4	88.9	88.4	87.9	87.4	86.9	86.4	85.9	85.4	84.9	84.4	83.9	5
10	89.8	89.3	88.8	88.3	87.8	87.3	86.8	86.3	85.8	85.3	84.8	84.2	83.7	10
15	89.7	89.2	88.7	88.2	87.7	87.2	86.6	86.1	85.6	85.1	84.6	84.0	83.5	15
20	89.6	89.1	88.6	88.1	87.5	87.0	86.5	85.9	85.4	84.9	84.3	83.8	83.3	20
22	89.6	89.1	88.5	88.0	87.5	86.9	86.4	85.8	85.3	84.8	84.2	83.7	83.1	22
24	89.6	89.0	88.5	87.9	87.4	86.8	86.3	85.7	85.2	84.6	84.1	83.5	83.0	24
26	89.5	89.0	88.4	87.9	87.3	86.7	86.2	85.6	85.1	84.5	84.0	83.4	82.8	26
28	89.5	88.9	88.4	87.8	87.2	86.7	86.1	85.5	85.0	84.4	83.8	83.3	82.7	28
30	89.4	88.9	88.3	87.7	87.1	86.6	86.0	85.4	84.8	84.2	83.7	83.1	82.5	30
31	89.4	88.8	88.3	87.7	87.1	86.5	85.9	85.3	84.8	84.2	83.6	83.0	82.4	31
32	89.4	88.8	88.2	87.6	87.0	86.4	85.9	85.3	84.7	84.1	83.5	82.9	82.3	32
33	89.4	88.8	88.2	87.6	87.0	86.4	85.8	85.2	84.6	84.0	83.4	82.8	82.2	33
34	89.4	88.7	88.1	87.5	86.9	86.3	85.7	85.1	84.5	83.9	83.3	82.7	82.1	34
35	89.3	88.7	88.1	87.5	86.9	86.3	85.7	85.0	84.4	83.8	83.2	82.6	82.0	35
36	89.3	88.7	88.1	87.4	86.8	86.2	85.6	85.0	84.4	83.7	83.1	82.5	81.9	36
37	89.3	88.6	88.0	87.4	86.8	86.1	85.5	84.9	84.3	83.6	83.0	82.4	81.7	37
38	89.2	88.6	88.0	87.3	86.7	86.1	85.4	84.8	84.2	83.5	82.9	82.3	81.6	38
39	89.2	88.6	87.9	87.3	86.6	86.0	85.4	84.7	84.1	83.4	82.8	82.1	81.5	39
40	89.2	88.5	87.9	87.2	86.6	85.9	85.3	84.6	84.0	83.3	82.7	82.0	81.3	40
41	89.2	88.5	87.8	87.2	86.5	85.8	85.2	84.5	83.9	83.2	82.5	81.9	81.2	41
42	89.1	88.5	87.8	87.1	86.4	85.8	85.1	84.4	83.7	83.1	82.4	81.7	81.0	42
43	89.1	88.4	87.7	87.0	86.4	85.7	85.0	84.3	83.6	82.9	82.2	81.6	80.9	43
44	89.1	88.4	87.7	87.0	86.3	85.6	84.9	84.2	83.5	82.8	82.1	81.4	80.7	44
45	89.0	88.3	87.6	86.9	86.2	85.5	84.8	84.1	83.4	82.7	81.9	81.2	80.5	45
46	89.0	88.3	87.6	86.8	86.1	85.4	84.7	84.0	83.2	82.5	81.8	81.1	80.3	46
47	89.0	88.2	87.5	86.8	86.0	85.3	84.6	83.8	83.1	82.4	81.6	80.9	80.1	47
48	88.9	88.2	87.4	86.7	85.9	85.2	84.4	83.7	82.9	82.2	81.4	80.7	79.9	48
49	88.9	88.1	87.4	86.6	85.8	85.1	84.3	83.5	82.8	82.0	81.2	80.5	79.7	49
50	88.9	88.1	87.3	86.5	85.7	85.0	84.2	83.4	82.6	81.8	81.0	80.3	79.5	50
51	88.8	88.0	87.2	86.4	85.6	84.8	84.0	83.2	82.4	81.6	80.8	80.0	79.2	51
52	88.8	88.0	87.1	86.3	85.5	84.7	83.9	83.1	82.3	81.4	80.6	79.8	79.0	52
53	88.7	87.9	87.1	86.2	85.4	84.6	83.7	82.9	82.1	81.2	80.4	79.5	78.7	53
54	88.7	87.8	87.0	86.1	85.3	84.4	83.6	82.7	81.8	81.0	80.1	79.3	78.4	54
55	88.6	87.8	86.9	86.0	85.1	84.3	83.4	82.5	81.6	80.7	79.9	79.0	78.1	55
56	88.6	87.7	86.8	85.9	85.0	84.1	83.2	82.3	81.4	80.5	79.6	78.7	77.8	56
57	88.5	87.6	86.7	85.8	84.8	83.9	83.0	82.1	81.1	80.2	79.3	78.4	77.4	57
58	88.5	87.5	86.6	85.6	84.7	83.7	82.8	81.8	80.9	79.9	79.0	78.0	77.0	58
59	88.4	87.4	86.5	85.5	84.5	83.5	82.6	81.6	80.6	79.6	78.6	77.6	76.6	59
60	88.3	87.3	86.3	85.3	84.3	83.3	82.3	81.3	80.3	79.3	78.3	77.2	76.2	60
61	88.3	87.2	86.2	85.2	84.1	83.1	82.1	81.0	80.0	78.9	77.9	76.8	75.8	61
62	88.2	87.1	86.1	85.0	83.9	82.8	81.8	80.7	79.6	78.5	77.5	76.4	75.3	62
62.5	88.1	87.1	86.0	84.9	83.8	82.7	81.6	80.5	79.4	78.3	77.2	76.1	75.0	62.5
63.0	88.1	87.0	85.9	84.8	83.7	82.6	81.5	80.4	79.2	78.1	77.0	75.9	74.7	63.0
63.5	88.1	86.9	85.8	84.7	83.6	82.4	81.3	80.2	79.0	77.9	76.8	75.6	74.5	63.5
64.0	88.0	86.9	85.7	84.6	83.4	82.3	81.1	80.0	78.8	77.7	76.5	75.3	74.2	64.0
64.5	88.0	86.8	85.7	84.5	83.3	82.1	81.0	79.8	78.6	77.4	76.2	75.1	73.9	64.5
65.0	87.9	86.7	85.6	84.4	83.2	82.0	80.8	79.6	78.4	77.2	76.0	74.8	73.5	65.0
65.5	87.9	86.7	85.5	84.3	83.0	81.8	80.6	79.4	78.2	76.9	75.7	74.5	73.2	65.5
66.0	87.8	86.6	85.4	84.1	82.9	81.7	80.4	79.2	77.9	76.7	75.4	74.1	72.9	66.0
66.5	87.8	86.5	85.3	84.0	82.7	81.5	80.2	78.9	77.7	76.4	75.1	73.8	72.5	66.5
67.0	87.7	86.4	85.2	83.9	82.6	81.3	80.0	78.7	77.4	76.1	74.8	73.4	72.1	67.0
67.5	87.7	86.4	85.1	83.7	82.4	81.1	79.8	78.5	77.1	75.8	74.4	73.1	71.7	67.5
68.0	87.6	86.3	84.9	83.6	82.3	80.9	79.6	78.2	76.8	75.5	74.1	72.7	71.3	68.0
68.5	87.6	86.2	84.8	83.4	82.1	80.7	79.3	77.9	76.5	75.1	73.7	72.3	70.9	68.5
69.0	87.5	86.1	84.7	83.3	81.9	80.5	79.1	77.6	76.2	74.8	73.3	71.9	70.4	69.0
69.5	87.4	86.0	84.6	83.1	81.7	80.2	78.8	77.3	75.9	74.8	72.9	71.4	69.9	69.5
70.0	87.4	85.9	84.4	82.9	81.5	80.0	78.5	77.0	75.5	74.0	72.5	70.9	69.4	70.0
70.5	87.3	85.8	84.3	82.8	81.3	79.7	78.2	76.7	75.1	73.6	72.0	70.4	68.9	70.5
71.0	87.2	85.7	84.1	82.6	81.0	79.5	77.9	76.3	74.7	73.2	71.5	69.9	68.3	71.0
71.5	87.1	85.5	84.0	82.4	80.8	79.2	77.6	76.0	74.3	72.7	71.0	69.4	67.7	71.5
72.0	87.0	85.4	83.8	82.2	80.5	78.9	77.2	75.6	73.9	72.2	70.5	68.8	67.0	72.0

**Таблица 20-а. Азимуты видимого восхода или захода верхнего края Солнца при одноименных  $\varphi$  и  $\delta$**

Ши- рота	Склонение Солнца одноименно с широтой													Ши- рота
	6°00'	6°30'	7°00'	7°30'	8°00'	8°30'	9°00'	9°30'	10°00'	10°30'	11°00'	11°30'	12°00'	
0°	84°0	83°5	83°0	82°5	82°0	81°5	81°0	80°5	80°0	79°5	79°0	78°5	78°0	0°
5	83.9	83.4	82.9	82.4	81.9	81.4	80.9	80.4	79.9	79.4	78.9	78.4	77.9	5
10	83.7	83.2	82.7	82.2	81.7	81.2	80.7	80.2	79.7	79.2	78.7	78.1	77.6	10
15	83.5	83.0	82.5	82.0	81.5	80.9	80.4	79.9	79.4	78.9	78.3	77.8	77.3	15
20	83.3	82.7	82.2	81.7	81.1	80.6	80.1	79.5	79.0	78.5	77.9	77.4	76.9	20
22	83.1	82.6	82.1	81.5	81.0	80.4	79.9	79.3	78.8	78.3	77.7	77.2	76.6	22
24	83.0	82.4	81.9	81.4	80.8	80.3	79.7	79.2	78.6	78.1	77.5	77.0	76.4	24
26	82.8	82.3	81.7	81.2	80.6	80.1	79.5	78.9	78.4	77.8	77.3	76.7	76.1	26
28	82.7	82.1	81.5	81.0	80.4	79.8	79.3	78.7	78.1	77.6	77.0	76.4	75.9	28
30	82.5	81.9	81.3	80.8	80.2	79.6	79.0	78.4	77.9	77.3	76.7	76.1	75.5	30
31	82.4	81.8	81.2	80.7	80.1	79.5	78.9	78.3	77.7	77.1	76.5	76.0	75.4	31
32	82.3	81.7	81.1	80.5	79.9	79.3	78.8	78.2	77.6	77.0	76.4	75.8	75.2	32
33	82.2	81.6	81.0	80.4	79.8	79.2	78.6	78.0	77.4	76.8	76.2	75.6	75.0	33
34	82.1	81.5	80.9	80.3	79.7	79.1	78.5	77.9	77.2	76.6	76.0	75.4	74.8	34
35	82.0	81.4	80.8	80.1	79.5	78.9	78.3	77.7	77.1	76.5	75.8	75.2	74.6	35
36	81.9	81.2	80.6	80.0	79.4	78.8	78.1	77.5	76.9	76.3	75.6	75.0	74.4	36
37	81.7	81.1	80.5	79.9	79.2	78.6	78.0	77.3	76.7	76.1	75.4	74.8	74.2	37
38	81.6	81.0	80.3	79.7	79.1	78.4	77.8	77.1	76.5	75.9	75.2	74.6	73.9	38
39	81.5	80.8	80.2	79.5	78.9	78.2	77.6	76.9	76.3	75.6	75.0	74.3	73.7	39
40	81.3	80.7	80.0	79.4	78.7	78.0	77.4	76.7	76.1	75.4	74.7	74.1	73.4	40
41	81.2	80.5	79.9	79.2	78.5	77.8	77.2	76.5	75.8	75.2	74.5	73.8	73.1	41
42	81.0	80.4	79.7	79.0	78.3	77.6	77.0	76.3	75.6	74.9	74.2	73.5	72.8	42
43	80.9	80.2	79.5	78.8	78.1	77.4	76.7	76.0	75.3	74.6	73.9	73.2	72.5	43
44	80.7	80.0	79.3	78.6	77.9	77.2	76.5	75.8	75.1	74.4	73.6	72.9	72.2	44
45	80.5	79.8	79.1	78.4	77.7	76.9	76.2	75.5	74.8	74.1	73.3	72.6	71.9	45
46	80.3	79.6	78.9	78.2	77.4	76.7	76.0	75.2	74.5	73.8	73.0	72.3	71.5	46
47	80.1	79.4	78.7	77.9	77.2	76.4	75.7	74.9	74.2	73.4	72.7	71.9	71.2	47
48	79.9	79.2	78.4	77.7	76.9	76.1	75.4	74.6	73.8	73.1	72.3	71.5	70.8	48
49	79.7	78.9	78.2	77.4	76.6	75.8	75.1	74.3	73.5	72.7	71.9	71.1	70.3	49
50	79.5	78.7	77.9	77.1	76.3	75.5	74.7	73.9	73.1	72.3	71.5	70.7	69.9	50
51	79.2	78.4	77.6	76.8	76.0	75.2	74.4	73.6	72.7	71.9	71.1	70.3	69.4	51
52	79.0	78.1	77.3	76.5	75.7	74.8	74.0	73.2	72.3	71.5	70.6	69.8	68.9	52
53	78.7	77.9	77.0	76.2	75.3	74.5	73.6	72.7	71.9	71.0	70.2	69.3	68.4	53
54	78.4	77.5	76.7	75.8	74.9	74.1	73.2	72.3	71.4	70.5	69.6	68.8	67.9	54
55	78.1	77.2	76.3	75.4	74.5	73.6	72.7	71.8	70.9	70.0	69.1	68.2	67.3	55
56	77.8	76.9	75.9	75.0	74.1	73.2	72.3	71.3	70.4	69.5	68.5	67.6	66.6	56
57	77.4	76.5	75.5	74.6	73.7	72.7	71.8	70.8	69.8	68.9	67.9	66.9	65.9	57
58	77.0	76.1	75.1	74.1	73.2	72.2	71.2	70.2	69.2	68.2	67.2	66.2	65.2	58
59	76.6	75.7	74.7	73.7	72.6	71.6	70.6	69.6	68.6	67.6	66.5	65.5	64.4	59
60	76.2	75.2	74.2	73.1	72.1	71.0	70.0	68.9	67.9	66.8	65.7	64.7	63.6	60
61	75.8	74.7	73.6	72.6	71.5	70.4	69.3	68.2	67.1	66.0	64.9	63.8	62.7	61
62	75.3	74.2	73.1	72.0	70.8	69.7	68.6	67.5	66.3	65.2	64.0	62.8	61.7	62
62.5	75.0	73.9	72.8	71.6	70.5	69.4	68.2	67.1	65.9	64.7	63.5	62.3	61.1	62.5
63.0	74.7	73.6	72.5	71.3	70.1	69.0	67.8	66.6	65.4	64.2	63.0	61.8	60.6	63.0
63.5	74.5	73.3	72.1	71.0	69.8	68.6	67.4	66.2	65.0	63.8	62.5	61.3	60.0	63.5
64.0	74.2	73.0	71.8	70.6	69.4	68.2	67.0	65.7	64.5	63.2	62.0	60.7	59.4	64.0
64.5	73.9	72.6	71.4	70.2	69.0	67.8	66.5	65.2	64.0	62.7	61.4	60.1	58.8	64.5
65.0	73.5	72.3	71.1	69.8	68.6	67.3	66.0	64.7	63.4	62.1	60.8	59.5	58.1	65.0
65.5	73.2	71.9	70.7	69.4	68.1	66.8	65.5	64.2	62.9	61.5	60.2	58.8	57.4	65.5
66.0	72.9	71.6	70.3	69.0	67.7	66.3	65.0	63.7	62.3	60.9	59.5	58.1	56.7	66.0
66.5	72.5	71.2	69.9	68.5	67.2	65.8	64.5	63.1	61.7	60.3	58.9	57.4	55.9	66.5
67.0	72.1	70.8	69.4	68.1	66.7	65.3	63.9	62.5	61.0	59.6	58.1	56.6	55.1	67.0
67.5	71.7	70.3	69.0	67.6	66.2	64.7	63.3	61.8	60.4	58.9	57.4	55.8	54.3	67.5
68.0	71.3	69.9	68.5	67.0	65.6	64.1	62.7	61.2	59.7	58.1	56.6	55.0	53.4	68.0
68.5	70.9	69.4	68.0	66.5	65.0	63.5	62.0	60.5	58.9	57.3	55.7	54.1	52.4	68.5
69.0	70.4	68.9	67.4	65.9	64.4	62.9	61.3	59.7	58.1	56.5	54.8	53.1	51.4	69.0
69.5	69.9	68.4	66.9	65.3	63.7	62.2	60.5	58.9	57.3	55.6	53.9	52.1	50.3	69.5
70.0	69.4	67.8	66.3	64.7	63.1	61.4	59.8	58.1	56.4	54.6	52.8	51.0	49.1	70.0
70.5	68.9	67.3	65.6	64.0	62.3	60.6	58.9	57.2	55.4	53.6	51.7	49.8	47.9	70.5
71.0	68.3	66.6	65.0	63.3	61.6	59.8	58.0	56.2	54.4	52.5	50.6	48.6	46.6	71.0
71.5	67.7	66.0	64.3	62.5	60.7	58.9	57.1	55.2	53.3	51.3	49.3	47.3	45.1	71.5
72.0	67.0	65.3	63.5	61.7	59.9	58.0	56.1	54.1	52.1	50.1	48.0	45.8	43.6	72.0

**Таблица 20-а. Азимуты видимого восхода или захода верхнего края Солнца при одноименных  $\varphi$  и  $\delta$**

Ши- рота	Склонение Солнца одноименно с широтой													Ши- рота
	12°00'	12°30'	13°00'	13°30'	14°00'	14°30'	15°00'	15°30'	16°00'	16°30'	17°00'	17°30'	18°00'	
0°	78°0	77°5	77°0	76°5	76°0	75°5	75°0	74°5	74°0	73°5	73°0	72°5	72°0	0°
5	77.9	77.4	76.9	76.4	75.9	75.4	74.9	74.3	73.8	73.3	72.8	72.3	71.8	5
10	77.6	77.1	76.6	76.1	75.6	75.1	74.6	74.1	73.6	73.1	72.5	72.0	71.5	10
15	77.3	76.8	76.3	75.7	75.2	74.7	74.2	73.7	73.1	72.6	72.1	71.6	71.1	15
20	76.9	76.3	75.8	75.3	74.7	74.2	73.6	73.1	72.6	72.0	71.5	71.0	70.4	20
22	76.6	76.1	75.6	75.0	74.5	73.9	73.4	72.8	72.3	71.8	71.2	70.7	70.1	22
24	76.4	75.9	75.3	74.7	74.2	73.6	73.1	72.5	72.0	71.4	70.9	70.3	69.8	24
26	76.1	75.6	75.0	74.5	73.9	73.3	72.8	72.2	71.6	71.1	70.5	69.9	69.4	26
28	75.9	75.3	74.7	74.1	73.6	73.0	72.4	71.8	71.3	70.7	70.1	69.5	69.0	28
30	75.5	74.9	74.4	73.8	73.2	72.6	72.0	71.4	70.9	70.3	69.7	69.1	68.5	30
31	75.4	74.8	74.2	73.6	73.0	72.4	71.8	71.2	70.6	70.0	69.4	68.8	68.2	31
32	75.2	74.6	74.0	73.4	72.8	72.2	71.6	71.0	70.4	69.8	69.2	68.6	68.0	32
33	75.0	74.4	73.8	73.2	72.6	72.0	71.4	70.8	70.1	69.5	68.9	68.3	67.7	33
34	74.8	74.2	73.6	73.0	72.4	71.7	71.1	70.5	69.9	69.3	68.7	68.0	67.4	34
35	74.6	74.0	73.4	72.7	72.1	71.5	70.9	70.2	69.6	69.0	68.4	67.7	67.1	35
36	74.4	73.8	73.1	72.5	71.9	71.2	70.6	70.0	69.3	68.7	68.1	67.4	66.8	36
37	74.2	73.5	72.9	72.2	71.6	71.0	70.3	69.7	69.0	68.4	67.7	67.1	66.4	37
38	73.9	73.3	72.6	72.0	71.3	70.7	70.0	69.4	68.7	68.1	67.4	66.7	66.1	38
39	73.7	73.0	72.4	71.7	71.0	70.4	69.7	69.1	68.4	67.7	67.1	66.4	65.7	39
40	73.4	72.7	72.1	71.4	70.7	70.1	69.4	68.7	68.0	67.4	66.7	66.0	65.3	40
41	73.1	72.5	71.8	71.1	70.4	69.7	69.0	68.4	67.7	67.0	66.3	65.6	64.9	41
42	72.8	72.2	71.5	70.8	70.1	69.4	68.7	68.0	67.3	66.6	65.9	65.2	64.5	42
43	72.5	71.8	71.1	70.4	69.7	69.0	68.3	67.6	66.9	66.2	65.4	64.7	64.0	43
44	72.2	71.5	70.8	70.1	69.4	68.6	67.9	67.2	66.5	65.7	65.0	64.3	63.5	44
45	71.9	71.2	70.4	69.7	69.0	68.2	67.5	66.7	66.0	65.3	64.5	63.8	63.0	45
46	71.5	70.8	70.0	69.3	68.5	67.8	67.0	66.3	65.5	64.8	64.0	63.2	62.5	46
47	71.2	70.4	69.6	68.9	68.1	67.3	66.6	65.8	65.0	64.2	63.5	62.7	61.9	47
48	70.8	70.0	69.2	68.4	67.6	66.9	66.1	65.3	64.5	63.7	62.9	62.1	61.3	48
49	70.3	69.6	68.8	68.0	67.2	66.4	65.5	64.7	63.9	63.1	62.3	61.5	60.6	49
50	69.9	69.1	68.3	67.5	66.6	65.8	65.0	64.2	63.3	62.5	61.6	60.8	59.9	50
51	69.4	68.6	67.8	66.9	66.1	65.2	64.4	63.5	62.7	61.8	61.0	60.1	59.2	51
52	68.9	68.1	67.2	66.4	65.5	64.6	63.8	62.9	62.0	61.1	60.2	59.3	58.4	52
53	68.4	67.5	66.7	65.8	64.9	64.0	63.1	62.2	61.3	60.4	59.5	58.5	57.6	53
54	67.9	67.0	66.1	65.1	64.2	63.3	62.4	61.5	60.5	59.6	58.6	57.7	56.7	54
55	67.3	66.3	65.4	64.5	63.5	62.6	61.6	60.7	59.7	58.7	57.7	56.7	55.7	55
56	66.6	65.7	64.7	63.7	62.8	61.8	60.8	59.8	58.8	57.8	56.8	55.8	54.7	56
57	65.9	65.0	64.0	63.0	62.0	60.9	59.9	58.9	57.9	56.8	55.8	54.7	53.6	57
58	65.2	64.2	63.2	62.1	61.1	60.0	59.0	57.9	56.8	55.7	54.6	53.5	52.4	58
59	64.4	63.4	62.3	61.2	60.1	59.1	58.0	56.8	55.7	54.6	53.4	52.3	51.1	59
60	63.6	62.5	61.4	60.3	59.1	58.0	56.9	55.7	54.5	53.3	52.1	50.9	49.7	60
61	62.7	61.5	60.4	59.2	58.0	56.8	55.6	54.4	53.2	52.0	50.7	49.4	48.1	61
62	61.7	60.5	59.3	58.1	56.8	55.6	54.3	53.1	51.8	50.5	49.1	47.8	46.4	62
62.5	61.1	59.9	58.7	57.5	56.2	54.9	53.6	52.3	51.0	49.6	48.3	46.9	45.4	62.5
63.0	60.6	59.3	58.1	56.8	55.5	54.2	52.9	51.6	50.2	48.8	47.4	45.9	44.5	63.0
63.5	60.0	58.7	57.5	56.2	54.8	53.5	52.1	50.7	49.3	47.9	46.4	44.9	43.4	63.5
64.0	59.4	58.1	56.8	55.5	54.1	52.7	51.3	49.9	48.4	47.0	45.5	43.9	42.3	64.0
64.5	58.8	57.4	56.1	54.7	53.3	51.9	50.5	49.0	47.5	46.0	44.4	42.8	41.1	64.5
65.0	58.1	56.8	55.4	53.9	52.5	51.1	49.6	48.0	46.5	44.9	43.3	41.6	39.9	65.0
65.5	57.4	56.0	54.6	53.1	51.7	50.2	48.6	47.0	45.4	43.8	42.1	40.3	38.5	65.5
66.0	56.7	55.3	53.8	52.3	50.8	49.2	47.6	46.0	44.3	42.6	40.8	39.0	37.1	66.0
66.5	55.9	54.4	52.9	51.4	49.8	48.2	46.5	44.9	43.1	41.3	39.5	37.5	35.5	66.5
67.0	55.1	53.6	52.0	50.4	48.8	47.1	45.4	43.6	41.8	40.0	38.0	36.0	33.8	67.0
67.5	54.3	52.7	51.1	49.4	47.7	46.0	44.2	42.4	40.5	38.5	36.4	34.3	32.0	67.5
68.0	53.4	51.7	50.0	48.3	46.6	44.8	42.9	41.0	39.0	36.9	34.7	32.4	29.9	68.0
68.5	52.4	50.7	49.0	47.2	45.3	43.5	41.5	39.5	37.4	35.1	32.8	30.3	27.6	68.5
69.0	51.4	49.6	47.8	45.9	44.0	42.0	40.0	37.9	35.6	33.2	30.7	28.0	25.0	69.0
69.5	50.3	48.5	46.6	44.6	42.6	40.5	38.4	36.1	33.7	31.1	28.4	25.3	22.0	69.5
70.0	49.1	47.2	45.3	43.2	41.1	38.9	36.6	34.1	31.5	28.8	25.7	22.3	18.2	70.0
70.5	47.9	45.9	43.8	41.7	39.4	37.1	34.6	32.0	29.2	26.0	22.6	18.5	13.3	70.5
71.0	46.6	44.5	42.3	40.0	37.6	35.1	32.4	29.6	26.4	22.9	18.7	13.4		71.0
71.5	45.1	42.9	40.6	38.2	35.6	32.9	30.0	26.8	23.2	19.0	13.6			71.5
72.0	43.6	41.2	38.8	36.2	33.4	30.4	27.2	23.6	19.3	13.8				72.0



Таблица 20-б. Азимуты видимого восхода или захода верхнего края Солнца при разноименных  $\varphi$  и  $\delta$

Ши- рота	Склонение Солнца разноименно с широтой												Ши- рота	
	0°00'	0°30'	1°00'	1°30'	2°00'	2°30'	3°00'	3°30'	4°00'	4°30'	5°00'	5°30'		6°00'
0°	90°0	90°5	91°0	91°5	92°0	92°5	93°0	93°5	94°0	94°5	95°0	95°5	96°0	0°
5	89.9	90.4	90.9	91.4	91.9	92.4	92.9	93.4	93.9	94.4	94.9	95.4	95.9	5
10	89.8	90.3	90.8	91.4	91.9	92.4	92.9	93.4	93.9	94.4	94.9	95.4	95.9	10
15	89.7	90.3	90.8	91.3	91.8	92.3	92.8	93.4	93.9	94.4	94.9	95.4	96.0	15
20	89.6	90.2	90.7	91.2	91.8	92.3	92.8	93.4	93.9	94.4	95.0	95.5	96.0	20
22	89.6	90.2	90.7	91.2	91.8	92.3	92.8	93.4	93.9	94.5	95.0	95.5	96.1	22
24	89.6	90.1	90.7	91.2	91.8	92.3	92.9	93.4	93.9	94.5	95.0	95.6	96.1	24
26	89.5	90.1	90.6	91.2	91.8	92.3	92.9	93.4	94.0	94.5	95.1	95.7	96.2	26
28	89.5	90.1	90.6	91.2	91.8	92.3	92.9	93.5	94.0	94.6	95.2	95.7	96.3	28
30	89.4	90.0	90.6	91.2	91.8	92.3	92.9	93.5	94.1	94.6	95.2	95.8	96.4	30
31	89.4	90.0	90.6	91.2	91.8	92.3	92.9	93.5	94.1	94.7	95.3	95.8	96.4	31
32	89.4	90.0	90.6	91.2	91.8	92.3	92.9	93.5	94.1	94.7	95.3	95.9	96.5	32
33	89.4	90.0	90.6	91.2	91.8	92.4	93.0	93.5	94.1	94.7	95.3	95.9	96.5	33
34	89.4	90.0	90.6	91.2	91.8	92.4	93.0	93.6	94.2	94.8	95.4	96.0	96.6	34
35	89.3	89.9	90.5	91.2	91.8	92.4	93.0	93.6	94.2	94.8	95.4	96.0	96.7	35
36	89.3	89.9	90.5	91.2	91.8	92.4	93.0	93.6	94.2	94.9	95.5	96.1	96.7	36
37	89.3	89.9	90.5	91.2	91.8	92.4	93.0	93.7	94.3	94.9	95.5	96.2	96.8	37
38	89.2	89.9	90.5	91.2	91.8	92.4	93.1	93.7	94.3	95.0	95.6	96.2	96.9	38
39	89.2	89.9	90.5	91.2	91.8	92.4	93.1	93.7	94.4	95.0	95.7	96.3	96.9	39
40	89.2	89.8	90.5	91.2	91.8	92.5	93.1	93.8	94.4	95.1	95.7	96.4	97.0	40
41	89.2	89.8	90.5	91.2	91.8	92.5	93.1	93.8	94.5	95.1	95.8	96.5	97.1	41
42	89.1	89.8	90.5	91.2	91.8	92.5	93.2	93.8	94.5	95.2	95.9	96.5	97.2	42
43	89.1	89.8	90.5	91.2	91.8	92.5	93.2	93.9	94.6	95.3	95.9	96.6	97.3	43
44	89.1	89.8	90.5	91.2	91.9	92.5	93.2	93.9	94.6	95.3	96.0	96.7	97.4	44
45	89.0	89.7	90.5	91.2	91.9	92.6	93.3	94.0	94.7	95.4	96.1	96.8	97.5	45
46	89.0	89.7	90.4	91.2	91.9	92.6	93.3	94.0	94.8	95.5	96.2	96.9	97.6	46
47	89.0	89.7	90.4	91.2	91.9	92.6	93.4	94.1	94.8	95.6	96.3	97.0	97.8	47
48	88.9	89.7	90.4	91.2	91.9	92.7	93.4	94.2	94.9	95.7	96.4	97.2	97.9	48
49	88.9	89.7	90.4	91.2	91.9	92.7	93.5	94.2	95.0	95.8	96.5	97.3	98.0	49
50	88.9	89.6	90.4	91.2	92.0	92.7	93.5	94.3	95.1	95.9	96.6	97.4	98.2	50
51	88.8	89.6	90.4	91.2	92.0	92.8	93.6	94.4	95.2	96.0	96.8	97.6	98.4	51
52	88.8	89.6	90.4	91.2	92.0	92.8	93.6	94.5	95.3	96.1	96.9	97.7	98.5	52
53	88.7	89.6	90.4	91.2	92.0	92.9	93.7	94.5	95.4	96.2	97.0	97.9	98.7	53
54	88.7	89.5	90.4	91.2	92.1	92.9	93.8	94.6	95.5	96.3	97.2	98.0	98.9	54
55	88.6	89.5	90.4	91.2	92.1	93.0	93.9	94.7	95.6	96.5	97.4	98.2	99.1	55
56	88.6	89.5	90.4	91.3	92.1	93.0	93.9	94.8	95.7	96.6	97.5	98.4	99.3	56
57	88.5	89.4	90.4	91.3	92.2	93.1	94.0	94.9	95.9	96.8	97.7	98.6	99.6	57
58	88.5	89.4	90.3	91.3	92.2	93.2	94.1	95.1	96.0	97.0	97.9	98.9	99.8	58
59	88.4	89.4	90.3	91.3	92.3	93.3	94.2	95.2	96.2	97.1	98.1	99.1	100.1	59
60	88.3	89.3	90.3	91.3	92.3	93.3	94.3	95.3	96.3	97.3	98.3	99.4	100.4	60
61	88.3	89.3	90.3	91.4	92.4	93.4	94.5	95.5	96.5	97.6	98.6	99.6	100.7	61
62	88.2	89.3	90.3	91.4	92.4	93.5	94.6	95.6	96.7	97.8	98.9	99.9	101.0	62
62.5	88.1	89.2	90.3	91.4	92.5	93.6	94.6	95.7	96.8	97.9	99.0	100.1	101.2	62.5
63.0	88.1	89.2	90.3	91.4	92.5	93.6	94.7	95.8	96.9	98.0	99.1	100.3	101.4	63.0
63.5	88.1	89.2	90.3	91.4	92.6	93.7	94.8	95.9	97.0	98.2	99.4	100.4	101.6	63.5
64.0	88.0	89.2	90.3	91.4	92.6	93.7	94.9	96.0	97.2	98.3	99.5	100.6	101.8	64.0
64.5	88.0	89.1	90.3	91.5	92.6	93.8	95.0	96.1	97.3	98.5	99.6	100.8	102.0	64.5
65.0	87.9	89.1	90.3	91.5	92.7	93.9	95.0	96.2	97.4	98.6	99.8	101.0	102.2	65.0
65.5	87.9	89.1	90.3	91.5	92.7	93.9	95.1	96.3	97.5	98.8	100.0	101.2	102.4	65.5
66.0	87.8	89.1	90.3	91.5	92.8	94.0	95.2	96.5	97.7	98.9	100.2	101.4	102.7	66.0
66.5	87.8	89.0	90.3	91.5	92.8	94.1	95.3	96.6	97.8	99.1	100.4	101.6	102.9	66.5
67.0	87.7	89.0	90.3	91.6	92.9	94.1	95.4	96.7	98.0	99.3	100.6	101.9	103.2	67.0
67.5	87.7	89.0	90.3	91.6	92.9	94.2	95.5	96.8	98.1	99.5	100.8	102.1	103.5	67.5
68.0	87.6	89.0	90.3	91.6	93.0	94.3	95.6	97.0	98.3	99.7	101.0	102.4	103.7	68.0
68.5	87.6	88.9	90.3	91.6	93.0	94.4	95.7	97.1	98.5	99.9	101.3	102.6	104.0	68.5
69.0	87.5	88.9	90.3	91.7	93.1	94.5	95.9	97.3	98.7	100.1	101.5	102.9	104.4	69.0
69.5	87.4	88.9	90.3	91.7	93.1	94.6	96.0	97.4	98.9	100.3	101.8	103.2	104.7	69.5
70.0	87.4	88.8	90.3	91.7	93.2	94.7	96.1	97.6	99.1	100.6	102.0	103.5	105.0	70.0
70.5	87.3	88.8	90.3	91.8	93.3	94.8	96.3	97.8	99.3	100.8	102.3	103.9	105.4	70.5
71.0	87.2	88.7	90.3	91.8	93.3	94.9	96.4	98.0	99.5	101.1	102.6	104.2	105.8	71.0
71.5	87.1	88.7	90.3	91.8	93.4	95.0	96.6	98.2	99.8	101.4	103.0	104.6	106.2	71.5
72.0	87.0	88.7	90.3	91.9	93.5	95.1	96.8	98.4	100.0	101.7	103.3	105.0	106.7	72.0

**Таблица 20-б. Азимуты видимого восхода или захода верхнего края Солнца при разноименных  $\varphi$  и  $\delta$** 

Ши- рота	Склонение Солнца разноименно с широтой												Ши- рота	
	6°00'	6°30'	7°00'	7°30'	8°00'	8°30'	9°00'	9°30'	10°00'	10°30'	11°00'	11°30'		12°00'
0°	96°0	96°5	97°0	97°5	98°0	98°5	99°0	99°5	100°0	100°5	101°0	101°5	102°0	0°
5	95.9	96.4	96.9	97.4	97.9	98.4	99.0	99.5	100.0	100.5	101.0	101.5	102.0	5
10	95.9	96.4	96.9	97.4	98.0	98.5	99.0	99.5	100.0	100.5	101.0	101.5	102.0	10
15	96.0	96.5	97.0	97.5	98.0	98.5	99.1	99.6	100.1	100.6	101.1	101.6	102.2	15
20	96.0	96.6	97.1	97.6	98.2	98.7	99.2	99.8	100.3	100.8	101.4	101.9	102.4	20
22	96.1	96.6	97.2	97.7	98.2	98.8	99.3	99.9	100.4	100.9	101.5	102.0	102.6	22
24	96.1	96.7	97.2	97.8	98.3	98.9	99.4	100.0	100.5	101.1	101.6	102.2	102.7	24
26	96.2	96.8	97.3	97.9	98.4	99.0	99.5	100.1	100.7	101.2	101.8	102.3	102.9	26
28	96.3	96.9	97.4	98.0	98.6	99.1	99.7	100.3	100.8	101.4	102.0	102.5	103.1	28
30	96.4	97.0	97.5	98.1	98.7	99.3	99.8	100.4	101.0	101.6	102.2	102.7	103.3	30
31	96.4	97.0	97.6	98.2	98.8	99.3	99.9	100.5	101.1	101.7	102.3	102.9	103.4	31
32	96.5	97.1	97.7	98.2	98.8	99.4	100.0	100.6	101.2	101.8	102.4	103.0	103.6	32
33	96.5	97.1	97.7	98.3	98.9	99.5	100.1	100.7	101.3	101.9	102.5	103.1	103.7	33
34	96.6	97.2	97.8	98.4	99.0	99.6	100.2	100.8	101.4	102.0	102.6	103.2	103.9	34
35	96.7	97.3	97.9	98.5	99.1	99.7	100.3	100.9	101.6	102.2	102.8	103.4	104.0	35
36	96.7	97.3	98.0	98.6	99.2	99.8	100.4	101.1	101.7	102.3	102.9	103.5	104.2	36
37	96.8	97.4	98.0	98.7	99.3	99.9	100.6	101.2	101.8	102.4	103.1	103.7	104.3	37
38	96.9	97.5	98.1	98.8	99.4	100.0	100.7	101.3	102.0	102.6	103.2	103.9	104.5	38
39	96.9	97.6	98.2	98.9	99.5	100.2	100.8	101.5	102.1	102.8	103.4	104.1	104.7	39
40	97.0	97.7	98.3	99.0	99.6	100.3	101.0	101.6	102.3	102.9	103.6	104.3	104.9	40
41	97.1	97.8	98.4	99.1	99.8	100.4	101.1	101.8	102.4	103.1	103.8	104.5	105.1	41
42	97.2	97.9	98.6	99.2	99.9	100.6	101.3	101.9	102.6	103.3	104.0	104.7	105.3	42
43	97.3	98.0	98.7	99.4	100.1	100.7	101.4	102.1	102.8	103.5	104.2	104.9	105.6	43
44	97.4	98.1	98.8	99.5	100.2	100.9	101.6	102.3	103.0	103.7	104.4	105.1	105.8	44
45	97.5	98.2	98.9	99.7	100.4	101.1	101.8	102.5	103.2	103.9	104.7	105.4	106.1	45
46	97.6	98.4	99.1	99.8	100.5	101.3	102.0	102.7	103.5	104.2	104.9	105.6	106.4	46
47	97.8	98.5	99.2	100.0	100.7	101.5	102.2	102.9	103.7	104.4	105.2	105.9	106.7	47
48	97.9	98.7	99.4	100.2	100.9	101.7	102.4	103.2	103.9	104.7	105.5	106.2	107.0	48
49	98.0	98.8	99.6	100.3	101.1	101.9	102.7	103.4	104.2	105.0	105.8	106.5	107.3	49
50	98.2	99.0	99.8	100.5	101.3	102.1	102.9	103.7	104.5	105.3	106.1	106.9	107.7	50
51	98.4	99.2	100.0	100.8	101.6	102.4	103.2	104.0	104.8	105.6	106.4	107.2	108.0	51
52	98.5	99.3	100.2	101.0	101.8	102.6	103.5	104.3	105.1	105.9	106.8	107.6	108.4	52
53	98.7	99.5	100.4	101.2	102.1	102.9	103.7	104.6	105.4	106.3	107.1	108.0	108.9	53
54	98.9	99.8	100.6	101.5	102.3	103.2	104.1	104.9	105.8	106.7	107.5	108.4	109.3	54
55	99.1	100.0	100.9	101.7	102.6	103.5	104.4	105.3	106.2	107.1	108.0	108.9	109.8	55
56	99.3	100.2	101.1	102.0	102.9	103.9	104.8	105.7	106.6	107.5	108.4	109.4	110.3	56
57	99.6	100.5	101.4	102.3	103.3	104.2	105.2	106.1	107.0	108.0	108.9	109.9	110.8	57
58	99.8	100.8	101.7	102.7	103.6	104.6	105.6	106.5	107.5	108.5	109.5	110.4	111.4	58
59	100.1	101.1	102.0	103.0	104.0	105.0	106.0	107.0	108.0	109.0	110.0	111.0	112.1	59
60	100.4	101.4	102.4	103.4	104.4	105.5	106.5	107.5	108.6	109.6	110.6	111.7	112.8	60
61	100.7	101.7	102.8	103.8	104.9	105.9	107.0	108.1	109.1	110.2	111.3	112.4	113.5	61
62	101.0	102.1	103.2	104.3	105.4	106.5	107.6	108.7	109.8	110.9	112.0	113.1	114.3	62
62.5	101.2	102.3	103.4	104.5	105.6	106.7	107.9	109.0	110.1	111.2	112.4	113.5	114.7	62.5
63.0	101.4	102.5	103.6	104.7	105.9	107.0	108.2	109.3	110.5	111.6	112.8	114.0	115.2	63.0
63.5	101.6	102.7	103.9	105.0	106.2	107.3	108.5	109.6	110.8	112.0	113.2	114.4	115.6	63.5
64.0	101.8	102.9	104.1	105.3	106.4	107.6	108.8	110.0	111.2	112.4	113.6	114.9	116.1	64.0
64.5	102.0	103.2	104.4	105.5	106.7	107.9	109.2	110.4	111.6	112.8	114.1	115.3	116.6	64.5
65.0	102.2	103.4	104.6	105.8	107.1	108.3	109.5	110.8	112.0	113.3	114.6	115.8	117.1	65.0
65.5	102.4	103.7	104.9	106.1	107.4	108.6	109.9	111.2	112.5	113.7	115.0	116.4	117.7	65.5
66.0	102.7	103.9	105.2	106.5	107.7	109.0	110.3	111.6	112.9	114.2	115.6	116.9	118.3	66.0
66.5	102.9	104.2	105.5	106.8	108.1	109.4	110.7	112.0	113.4	114.7	116.1	117.5	118.9	66.5
67.0	103.2	104.5	105.8	107.1	108.5	109.8	111.2	112.5	113.9	115.3	116.7	118.1	119.5	67.0
67.5	103.5	104.8	106.1	107.5	108.9	110.2	111.6	113.0	114.4	115.8	117.3	118.7	120.2	67.5
68.0	103.7	105.1	106.5	107.9	109.3	110.7	112.1	113.5	115.0	116.4	117.9	119.4	120.9	68.0
68.5	104.0	105.4	106.9	108.3	109.7	111.1	112.6	114.1	115.5	117.0	118.6	120.1	121.6	68.5
69.0	104.4	105.8	107.2	108.7	110.2	111.6	113.1	114.6	116.2	117.7	119.3	120.8	122.4	69.0
69.5	104.7	106.2	107.6	109.1	110.6	112.2	113.7	115.2	116.8	118.4	120.0	121.6	123.3	69.5
70.0	105.0	106.5	108.1	109.5	111.1	112.7	114.3	115.9	117.5	119.1	120.8	122.5	124.2	70.0
70.5	105.4	107.0	108.5	110.1	111.7	113.3	114.9	116.6	118.2	119.9	121.6	123.4	125.1	70.5
71.0	105.8	107.4	109.0	110.6	112.3	113.9	115.6	117.3	119.0	120.7	122.5	124.3	126.1	71.0
71.5	106.2	107.9	109.5	111.2	112.9	114.6	116.3	118.0	119.8	121.6	123.4	125.3	127.2	71.5
72.0	106.7	108.3	110.0	111.8	113.5	115.3	117.0	118.8	120.7	122.6	124.5	126.4	128.4	72.0



