



Фиксация санитарных выходов:

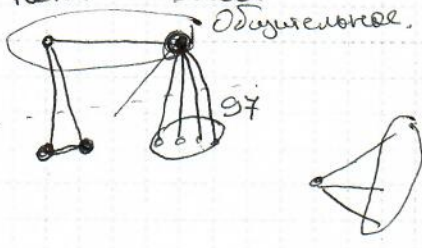
1 выход:	13:50	возвращение:	13:52
2 выход:	15:23	возвращение:	15:25
3 выход:		возвращение:	
4 выход:		возвращение:	
5 выход:		возвращение:	

Время окончания:

Всего листов:

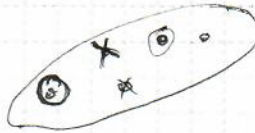
Large grid area for writing the oral answer.

Петя Вася
Общительные.



Другой скелет - ровно 1 из A или >

Петя Вася.



k ребрышек

A не дружат

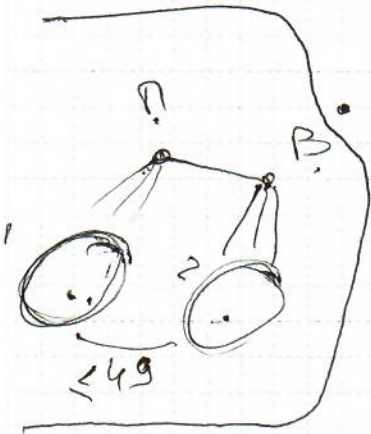
49 -

$$n S = 2^7 = 4$$

$$S(A) \leq 2$$

$$\frac{S}{S(A)} = \frac{4}{2}$$

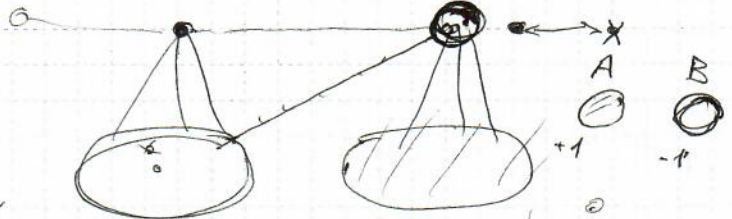
(2)



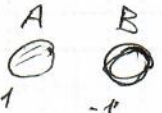
50 >



Петя Вася



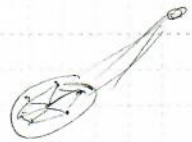
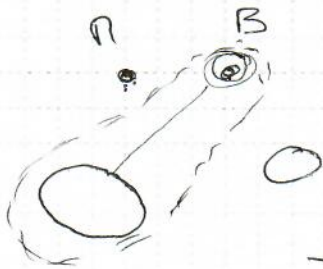
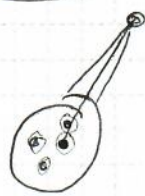
n n n n



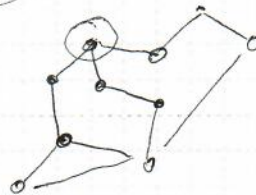
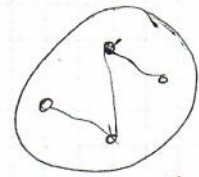
50

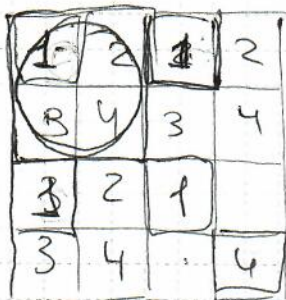
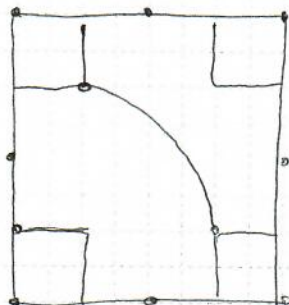


< 49



n



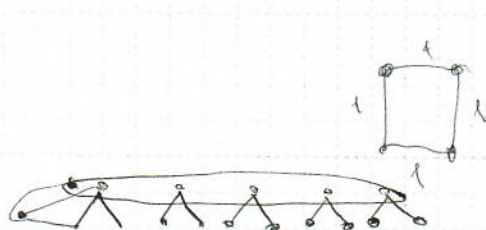


$$4 \cdot \frac{1}{3} = \frac{4}{3}$$

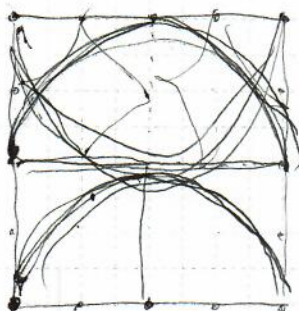
$$S(A) = \frac{4}{3}$$

A B

n - 2n



$$3 \cdot 3 \cdot 2 - 1 = 65$$



$$\frac{3,14 \cdot 4}{4} = 1,57$$

$$0,76$$

$$1,65$$

$$0,65 \cdot 2$$

$$3,3$$

$$1,3$$

$$3,14$$

$$0,35$$

$$2,6$$

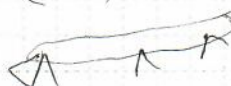
$$n! - k^n \leq kn$$

$$n! \leq k^n + kn$$

$$n! \cdot n + n! \leq k^n \cdot k + kn + k$$

$$n! \leq kn$$

$$(n-1)! \leq k$$



n!	1
	2
	6
	24
	120
	720
7	5040
8	40320
9	362880
10	3628800

4^n	4
	16
	64
	256
	1024
	4096
	16384
	42836 65536
	198144

(3.1)

$$-464 \cdot 4 = 1600 \cdot 240 \cdot 16$$

$$1856$$

$$4 \cdot 16 \cdot 384$$

$$\begin{array}{r} 4 \\ 65536 \\ 4 \\ \hline 262144 \end{array}$$

n $+4$ $\cdot 4$

$n-4 \geq 6$

$n! - 4^n \uparrow$ $4^n \rightarrow$

$+60$ $+4$

$10k' - 4k$ (6k)

2.1

$S_{\square} = 4$

A B

n $n+k$
 \nearrow
 незав.

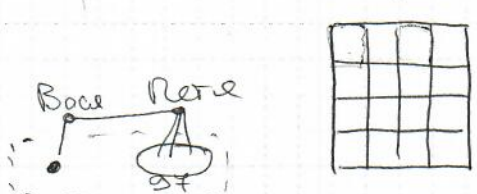
$S < 2$

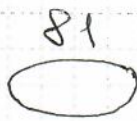
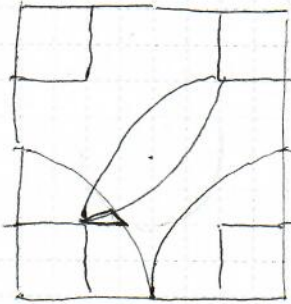
x
 $A = \text{ар. прогр.}$

$(2 - \frac{1}{\sqrt{2}})^2 \cdot 2$

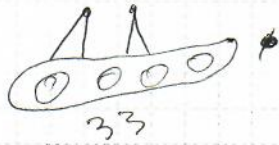
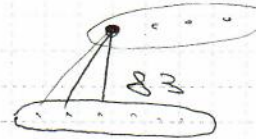
$(\frac{2 - \sqrt{2}}{2})^2 \cdot 2$

$\frac{4 - 2 + 4\sqrt{2}}{2} = (1 + 2\sqrt{2})$





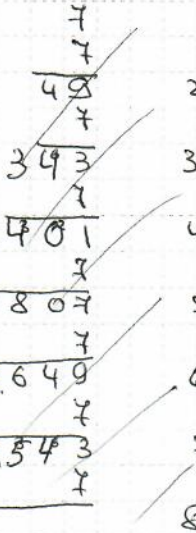
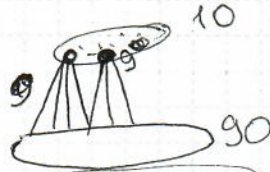
19



33.2

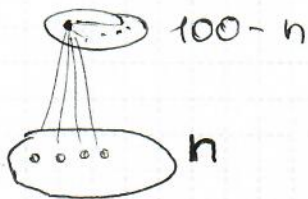
14 2

1
3
4
5
6



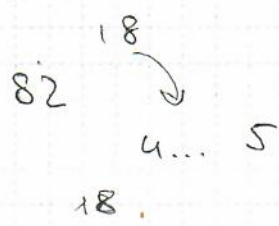
83

18 4 5
83 - 4

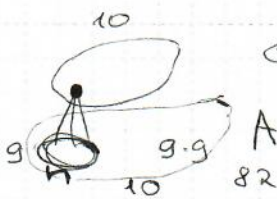


$n \geq 8$

$100 - n \leq 14$



82



90 10
9

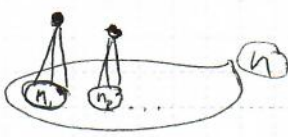
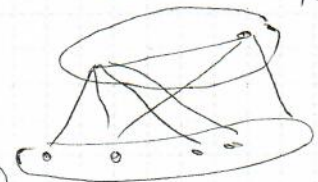


n ← -a

83	17
84	16
85	15
86	14
87	13
88	12
89	11
90	10
91	9
92	8

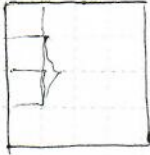
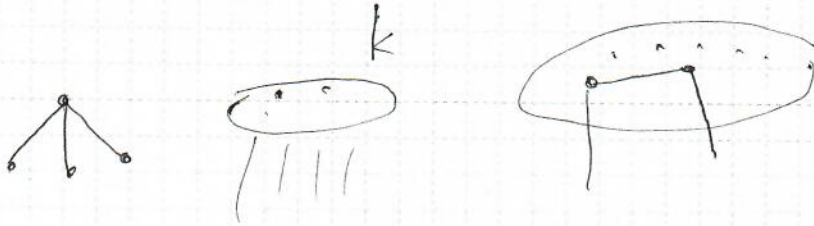
5 6 7 8 9 10 11 12

82

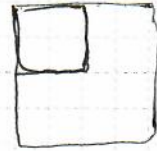


$n - n_i + 1$

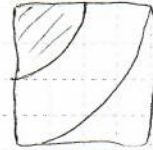
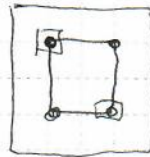
93	7	14
94	6	16
95	5	19
96	4	24
97	3	33
98	2	49
99	1	



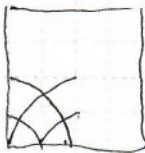
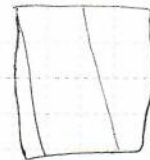
$$n! - k^n$$



1 → 2.



- 1
- 2
- 6
- 24
- 120
- 720
- 5040
- 40320
- 362880
- 362880.



$$n! - k^n \leq kn$$

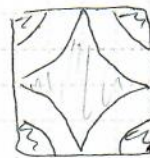
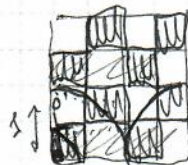
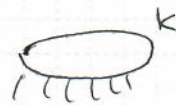
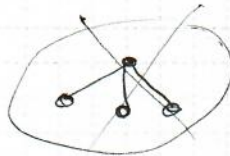
$$n! - kn \leq k^n$$

$$n(n-1)!k \leq k^n$$

$$(n-1)!k \leq \frac{k^n}{n}$$

$$n! \leq kn + k^n$$

$$\leq k^{n-1}$$



$$n \leq n! - 4^n$$

$$n - n! \leq -4^n$$

$$n+1 \leq (n+1)! - 4^{n+1}$$

$$1 - (n-1)! \leq -\frac{4^n}{n} \cdot 4$$

$$n+1 \leq n! (n+1) - 4^n \cdot 4$$

$$n \geq 10$$

$$0 \leq (n! - 1)(n+1) - 4^n \cdot 4$$

$$S(4^n) = 4$$



$$(n+1) \leq n! \cdot n + (n! - 4^n \cdot 4)$$

2.1

$$n+1 \leq n! \cdot n + n! - 4^n \cdot 4 = 3 \cdot 4^n$$

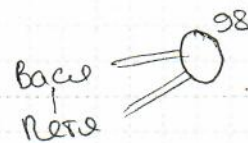
$$1 \leq n! \cdot n - 3 \cdot 4^n$$

3.1

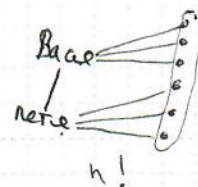
n!	1	1	4^n	1	4
2	2		2	2	16
3	6		3	64	
4	24		4	256	
5	120		5	1024	
6	720		6	4096	
7	5040		7	16384	
8	40320		8	65536	4
9	362880		9	262144	16
	3,628...				≤ 200
					≤ 800
					2, 4, ...

10!

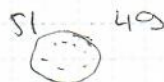
1	2	3	4	5	6	7	8	9	10
2	6	24	120	720	5040	40320	362880	3628800	36288000



51 чел.



≤ 44

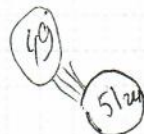


3628800

4^n
3628840

51 чел не обходятся

2n - 40
1n - 582



4.

$$n \leq n! - 4^n \leq 4n$$

$$n! - 4n - 4^n \leq 0$$

$$n! - 4(n + 4^{n-1}) \leq 0$$

$$n!(n+1) - 4n - 4 - 4^n \cdot 4 \leq 0.$$

$$n!(n+1) - (4n + 4) = 4^n \cdot 4 \leq 0.$$

$$n!(n+1) - 4(n+1) - 4^n \cdot 4 \leq 0.$$

~~н! - 4n - 4~~

$$\frac{n!}{n} + \frac{n! \cdot n}{n} - 4n - 4 - \frac{4^n}{n} - 3 \cdot 4^n \leq 0.$$

$$n! \cdot n - 4 - 3 \cdot 4^n \leq 0$$

$$n \leq n! - 4^n$$

$$n \leq n! - 4^n$$

$$4^n \leq n! - n$$

$$4^n \leq n((n-1)! - 1)$$

$$\frac{4^n}{n} \leq (n-1)! - 1.$$

$$4^n \cdot 4 \leq 4n! - 4n.$$

$$4^n \cdot 4 \leq n! \cdot n + n! - n - 1.$$

$$4n! - 4n \leq n \cdot n! + n! - n - 1.$$

$$4n! - 3n \leq n! \cdot n + n! - 1.$$

$$-3n - n! \leq -1.$$

$$n! + 3n \geq 1$$

$$n! - 4^n \leq 4n$$

$$n! - 4n \leq 4^n$$

$$4 \cdot n! - 16n \leq 4^n \cdot 4 + 4n$$

$$\frac{n! \cdot n + n!}{n! \cdot n + n!} - \frac{4^n \cdot 4}{n! \cdot n + n!} \leq \frac{4n + 4}{n! \cdot n + n!}$$

$$\frac{4^n \cdot 4 + 4n + 4}{n! \cdot n + n!} \leq \frac{4^n \cdot 4 + 4n + 4}{n! \cdot n + n!}$$

$$n! - 12n \leq 4$$

$$n! - 4n \leq 4^n$$

$$n(n-1) - 4 \leq 4^n$$

$$(n-1)! - 4 \leq \frac{4^n}{n}$$

$$n \geq 10.$$

$$(n-1)! \leq \frac{4(4^{n-1} + n)}{n}$$

$$n \leq n! - 4^n$$

$$4^n \leq n! - n \quad \text{уменьш.}$$

$$\frac{4^n - 4}{n} \leq \frac{n! - 4}{n} - 4n$$

$$n+1 \leq n! \cdot n + n! - 4^n \cdot 4$$

$$\frac{4^n \cdot 4}{n} + n+1 \leq \frac{n! \cdot n}{n} + \frac{n!}{n}$$

$$n+1 \leq n!$$

$$y = n! \quad \nearrow$$

$$y = n \quad \nearrow$$

$$y = 1 \quad \rightarrow$$

///