## 1. Is it greater?

Let R(n,m) be a relation on two integers n and m. We know that R(n,m) is true if n>m. If we want to DISPROVE the claim, "R for all integers n and m", then we need to prove that:

Pick ONE option

L	0	TI	
П	( )	There exists a pair of intege n>m so that R(n,m) is false.	
ш	-		

- There exists a pair of integers n<=m so that R(n,m) is false.
- There exists a pair of integers n>m so that R(n,m) is true.
- There exists a pair of integers n<=m so that R(n,m) is true.

6 17 38 = 36 se for every pair of integers n>m.

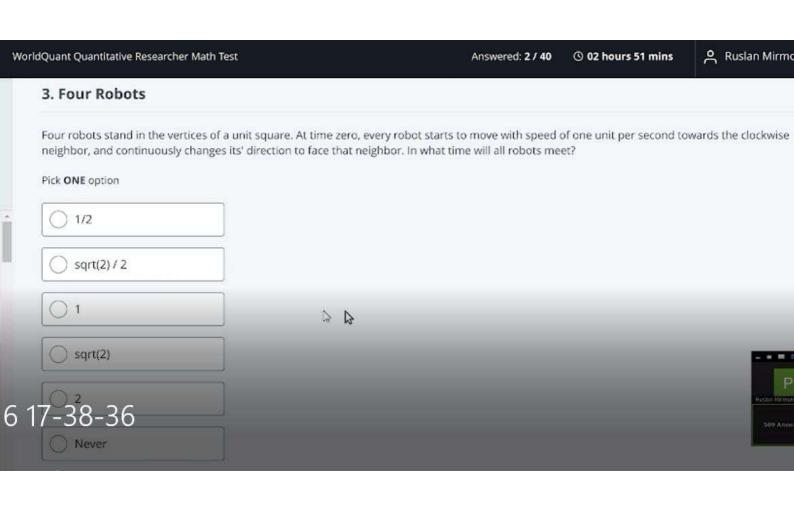
R(n,m) is false for every pair of integers n<=m.

WorldQuant Quantitative Researcher Math Test

Answered: 1 / 40

© 02 hours 56 mins

A Rusla



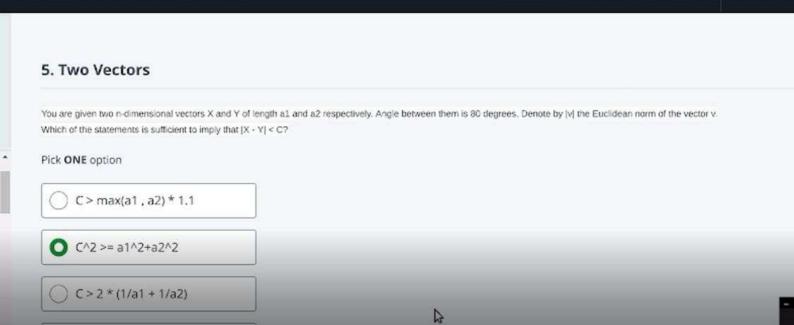
## 4. Prime Numbers Program

Complete the blanks in the following question with the appropriate answer.

What is the value of the variable A after running the following program?

```
A = 0
B = 2
While (B < 30)
    If (B is a prime number)
        A = A + 81
    End
    B = B + 1
End
```

13



Answered: 4 / 40

WorldQuant Quantitative Researcher Math Test

C > sqrt (a1 \* a2)

A Ruslan I

3 02 hours 44 mins

C Madian Distance				
6. Median Distance				
Complete the blanks in the f	following question with the appropriate a	nswer.		
Mark a point randomly inside a circle of	radius 1 meter. Let D1 be the distance from the point to t	the center of the circle, and D2 be the	distance from the point to the cir	cumference
Let D = min(D1,D2). Observe the distrit	oution of D, what is the median value of D (in cm)?		D <sub>2</sub>	
The answer is	cm. Please enter an integ	er		
ſ				
Submit Answer & Contin	nue			

#### 7. Guessing Game

Complete the blanks in the following question with the appropriate answer.

Alice and Bob are playing a guessing game. Than game is played in 10 rounds.

At each round, Alice draws a number from a truncated normal distribution with mu=30 & sigma=10 (values being capped between [0, 60]) and bob tries to guess the number Alice draws.

- · If Bob's guess is right he receives 1000 dollars
- · If Bob's guess is lesser than Alice's number, Bob loses 2 dollars
- · If Bob's guess is higher than Alice's number, Bob loses 1 dollar

In a 10 rounds, what is the MAXIMUM EXPECTED money Bob can get?

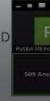
Note:

M

Truncated Normal Distribution (bounded between a and b) is defined with following probability density function (PD

$$\begin{cases} 0, & \text{if } x < a \\ \frac{\phi(\mu, \sigma, x)}{\Omega(\mu, \sigma, b) - \Omega(\mu, \sigma, a)}, & \text{if } a \leq x \leq b \\ 0, & \text{if } x > b \end{cases}$$

A





- · If Bob's guess is lesser than Alice's number, Bob loses 2 dollars
- · If Bob's guess is higher than Alice's number, Bob loses 1 dollar

In a 10 rounds, what is the MAXIMUM EXPECTED money Bob can get?

Note:

Truncated Normal Distribution (bounded between a and b) is defined with following probability density function (PDF)

$$\psi(\mu,\sigma,a,b,x) = \left\{ egin{array}{ll} 0, & ext{if } x < a \ rac{\phi(\mu,\sigma,x)}{\Omega(\mu,\sigma,b) - \Omega(\mu,\sigma,a)}, & ext{if } a \leq x \leq b \ 0, & ext{if } x > b \end{array} 
ight.$$

where  $\phi(\mu, \sigma, x)$  is the probability density function for Normal distribution and  $\Omega(\mu, \sigma, x)$  is the cumulative density function for the Normal distribution.

In this question  $a=0,b=60,\mu=30,\sigma=10$ 

D



The answer is 6

dollars. Please enter an integer

Submit Answer & Continue

© 02 hours 32 mins

#### 9. Biased Coin

Complete the blanks in the following question with the appropriate answer.

When flipped a biased coin has a probability of 0.99 for heads. You get \$1 for heads and lose \$100 for tails, what is your expected wealth after 3500 tosses?

The answer is \$-35 . Please enter an integer

Submit Answer & Continue

B

ate answer.
ate answer.
ger
3

WorldQuant Quantitative Researcher Math Test	Answered: 8 / 40	© 02 hours 30 mins
11. Inequalities		
Which of these inequalities is true?		
Pick ONE option		
tan(pi) > sin(pi)		
sin(1 / 10000) > cos(1 / 10000)	<b>₽</b>	
3^(3^100000) > 4^(2^100000)	74	
log_(2^1000)(3^100) < log_(3^10000)(2^1000)		
None of the above		
6 17_38_36		

	t	Answered: 9 / 40	(S) 02 hours 28 mins	Ruslan Mirmom
12. Two dice				
Complete the blanks in the followin	g question with the appropriate a	nswer.		
Player A rolls a fair die 2021 tim numbers that turned up as a re What is the probability that Play	sult of each roll is tracked.			umbers and even
The answer is:	. Please enter it as the de	cimal fraction using point to	denote the decimal po	oint (e.g., 0.123, 0.9 ar
The answer is:so on)	. Please enter it as the de	cimal fraction using point to	o denote the decimal po	oint (e.g., 0.123, 0.9 ar
C.	. Please enter it as the de	cimal fraction using point to	o denote the decimal po	oint (e.g., 0.123, 0.9 ar
C.		cimal fraction using point to	o denote the decimal po	oint (e.g., 0.123, 0.9 ar
so on)		cimal fraction using point to	o denote the decimal po	oint (e.g., 0.123, 0.9 a

## 13. Exponential Decay

For any integer k > 2, which equation below depicts exponential decay?

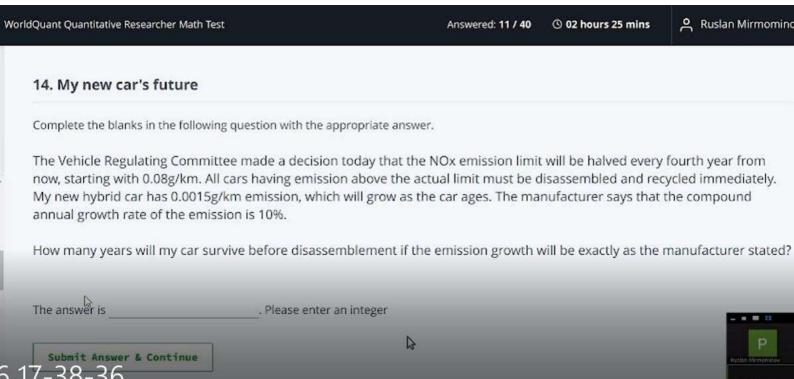
Pick ONE option

 $y = ((2k + 1) / (2k + 2))^x$ 

) y = (2k - 1)^x

y = ((2k - 1) / (2k - 2))^x

6 17-38-36



Answered: 12 / 40

Complete the blanks in the following question with the appropriate answer.

What is the value of the variable sum after the following pseudo-code runs?

sum = 0

for n in range 1 to 100 (inclusively):

if n is odd:

sum = sum + n

eise

sum = sum - 2



The answer is

. Please enter an integer

rldQuant Quantitative Researcher Math Test	Answered: 13 / 40	③ 02 hours 20 mins	Ruslan Mirmo
16. Quadrilateral			
We cut zero-one interval into 4 parts by dealing the 3 that the 4 segment can form a quadrilateral?	separator points uniformly and independently fr	om zero-one interval. Wł	nat is the probability
Pick ONE option			
2/3			
5/8			
O 1/2	D D		
3/8			- • •
17-38-36			Ruston Microson Self Annua

Wo

ĵ

# 3 02 hours 18 mins

# 17. Sample Standard Deviation

Let S be a sample consisting of 300 real numbers. The sum of all numbers in S is 1500. The sum of squares of all numbers in S is 9000. What is the sample standard deviation for this sample?

Pick ONE option

( ) sqr	t(3)	

B

18.	Fungi	Popul	lation
-----	-------	-------	--------

The population of fungi changes every minute by 5% up or down with the same likelihood. The expected population size after 60 minutes is:

## Pick ONE option

( ) Ec	qual to the init	tial population size	
--------	------------------	----------------------	--

0	Cannot	know	from	the	given	information	
				4	0		

-						
( )	Smaller	then	the	initial	population	size

	Larger	then	the	initial	nonu	lation	ciza
1 1	POI PCI	CHACTI	CI 150	militari	Popu	RECION	2152

Clear Selection

7

Answered: 15 / 40

3 02 hours 14 mins

## 19. Asymptotic Complexities

Complete the blanks in the following question with the appropriate answer.

Below is a list of asymptotic complexities of eight functions, each with input of length N:

- A. O(N^3)
- B. O(Log(N))
- C. O(Sqrt(N))
- D. O(N \* log(N))
- E. O(2<sup>A</sup>N)
- F. O(N^N)
- G. O(N!)
- H. O(Log(Log(N)))

Sort the functions by order of growth, with slower-growing functions first.

Your solution should be a sequence of letters corresponding to the functions above, eg "BACFDEHG"

6 17-38-36<u>cdaegf</u>

I . Please enter without quotation marks

Submit Answer & Continue

Answered: 15 / 40

3 02 hours 14 mins

## 19. Asymptotic Complexities

Complete the blanks in the following question with the appropriate answer.

Below is a list of asymptotic complexities of eight functions, each with input of length N:

- A. O(N^3)
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- G. O(N!)
- H. O(Log(Log(N)))

Sort the functions by order of growth, with slower-growing functions first.

Your solution should be a sequence of letters corresponding to the functions above, eg "BACFDEHG"

6 17-38-36<u>cdaegf</u>

I . Please enter without quotation marks

Submit Answer & Continue

#### 20. Red-Blue Line

Complete the blanks in the following question with the appropriate answer.

First half of a line of length 60 is painted by red. The other half is painted by blue. Two points are chosen, uniformly and independently distributed, on a line of length 60. What is average (expected) distance between them, given that both points are in the same half of the line (same color)?

The answer is:

Submit Answer & Continue

3

5 17-38-36

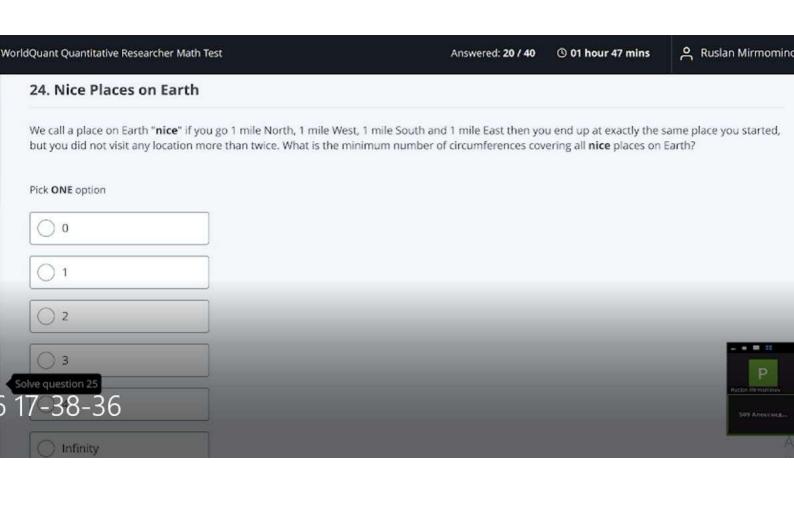
1 01 hour 57 mins

Answered: 16 / 40

WorldQuant Quantitative Researcher Math Test

World	dQuant Quantitative Researcher Math Test		Answered: <b>17 / 40</b>	③ 01 hour 56 mins	Ruslan N			
	22. Linear Subspaces							
	Complete the blanks in the following	g question with the appropriate a	nswer.					
	Suppose that there are three linear subspaces in a space V, each of them has dimension 5 and each of their pairwise intersection has dimension 3.  What is least number of dimension can V be?							
	The answer is:	. Please enter an integer						
	Submit Answer & Continue	ß						
S 1	7-38-36				Rest			

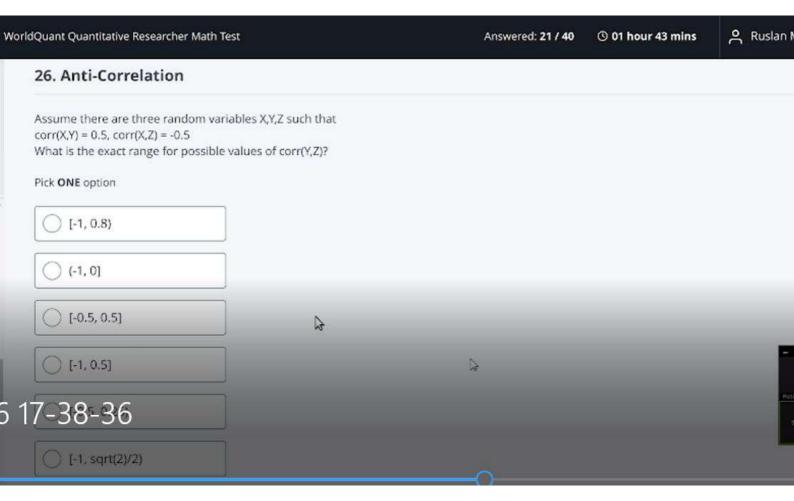
orldQuant Quantitative Researcher Math Test	Answered: 18 / 40	© 01 hour 53 mins
23. Perfect Squares		
Complete the blanks in the following question with the ap	propriate answer.	
How many integers n such that n!*(n+1)!*(n+2)!*(n+ (The factorial of a positive integer n, denoted by n!,		range [1, 1000] ?
The answer is		
Submit Answer & Continue		



3 01 hour 44 mins

Answered: 20 / 40

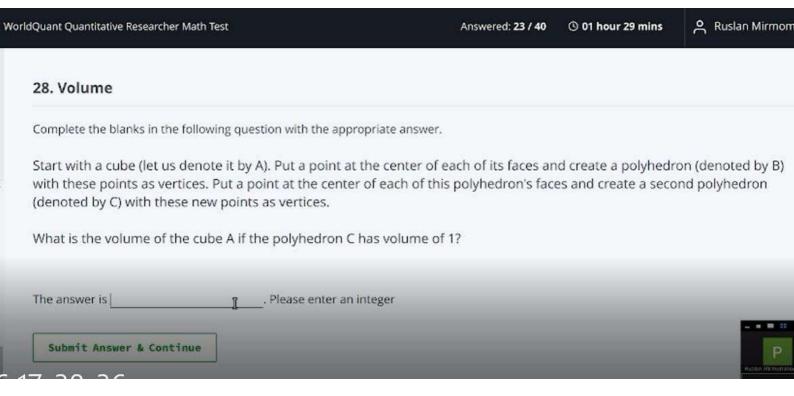
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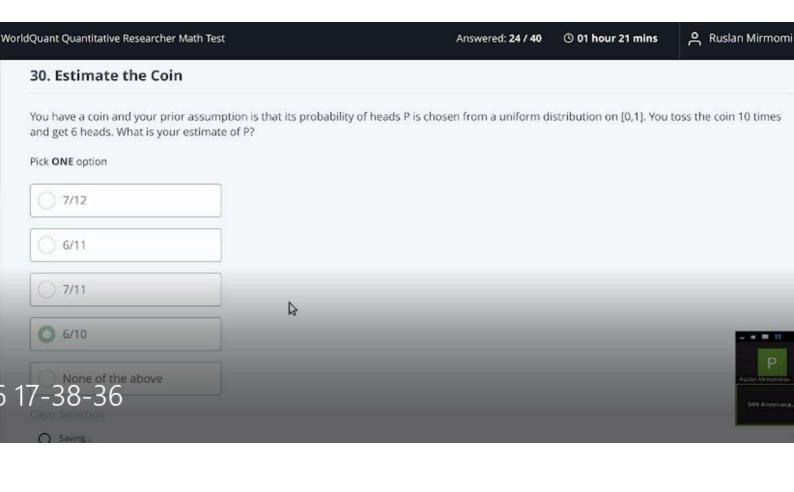


Answered: 22 / 40

30 01 hour 37 mins

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#### 33. Random Game

Complete the blanks in the following question with the appropriate answer.

Each of four players writes their name on a card (all names are different). Each round these four cards are shuffled and randomly distributed among the players: one card to each player. If a player gets a card with their name, they get 1 point in the round. Otherwise, they get zero points. The game stops after 2021 round.

What is the the correlation between the numbers of points scored by two different players by the end of the game?

The answer is . Please enter and irreducible proper fraction, eg 1/2, 3/4. Please do not enter any spaces.

Submit Answer & Continue

P.

17 20 26

**③** 01 hour 19 mins

Ruslan Mirmominov

#### 34. Point in the Triangle

Complete the blanks in the following question with the appropriate answer.

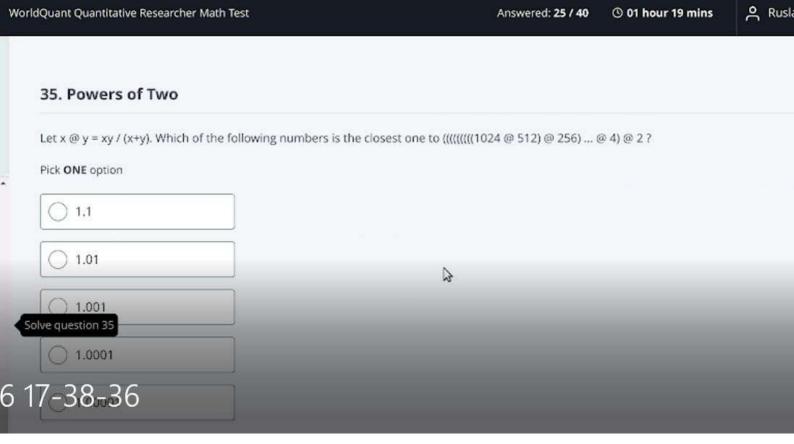
Triangle ABC has sides of length AB = 45, AC = 60, and BC = 75. Place a point D randomly and uniformly inside the triangle. What is the probability that the largest perpendicular distance from point D to the triangle's three sides is the distance to side BC?

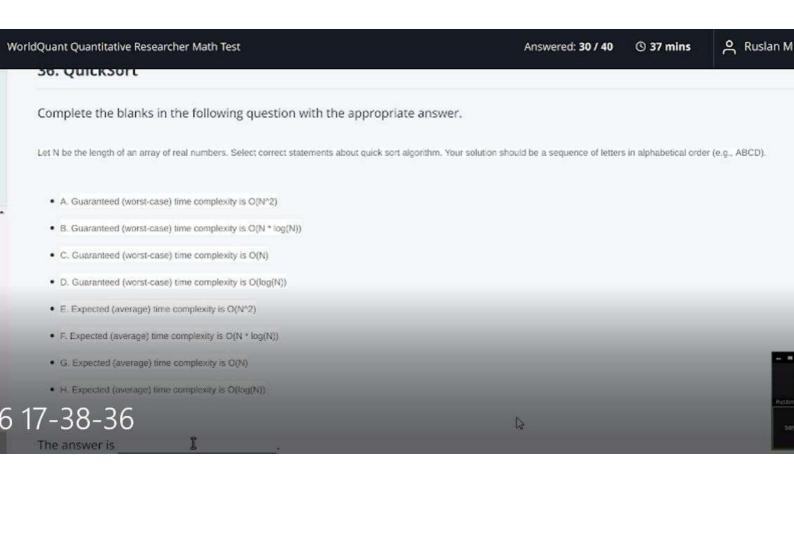
The answer is \_\_\_\_\_\_. Please enter a proper irreducible fraction. Please separate numerator and denomination by '/' and do not use any spaces. Examples: 1/2, 2/3, 23/97

Solve question 34 swer & Continue

5 17-38-36







#### 37. Inverse Matrix

Complete the blanks in the following question with the appropriate answer.

Given the following 3x3 matrix A:

122

221

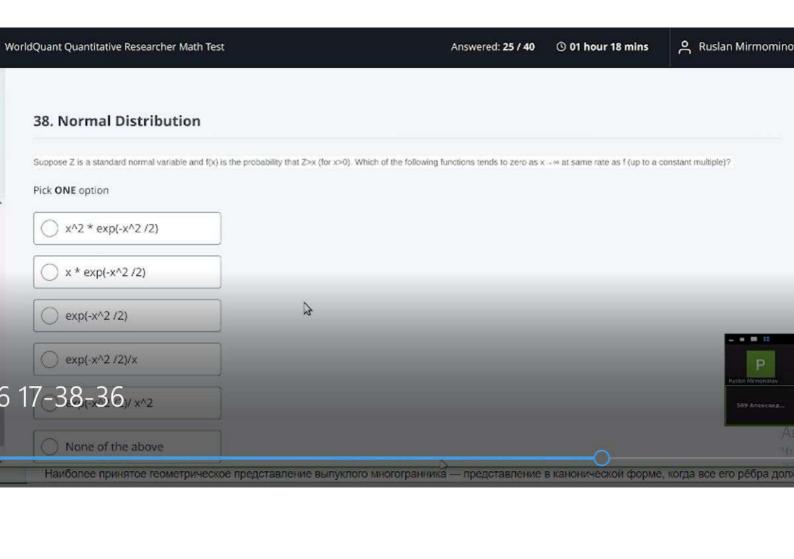
121

What is the determinant of the inverse of A? (Please give the answer in decimal format, e.g. 1.1)

The answer is:

Submit Answer & Continue 5 17-38-36

(3



#### 39. Three Dollars

Peter, Amy and John play the following game. Each starts with \$1. A bell rings every 10 seconds, at which time each of the players who currently have money simultaneously chooses one of the other two players independently and at random and gives \$1 to that player. Please note the player with \$0 stays in the game.

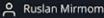
What is the probability that after the bell has rung 2021 times, each player will have \$1?

For example, Peter and Amy may each decide to give \$1 to John, and John may decide to give his dollar to Amy, at which point Peter will have \$0, John will have \$2, and Amy will have \$1, and that is the end of the first round of play. In the second round Peter has no money to give, but John and Amy might choose each other to give their \$1 to, and the holdings will be the same at the end of the second round.

Pick ONE option







#### 40. Knapsack Problem

Complete the blanks in the following question with the appropriate answer.

You are given a list of items each having weight w\_i and price p\_i. You are to select the subset of items with total weight not exceeding W and with maximal possible total price (each item can be used at most once).

For a given table of w\_i and p\_j, what is the maximal possible total price for W=18?

Item number	W_i	p_i
1	3	10
2	- 4	12
3	5	18
4	No.	19
5	7	20
7-38-36	8	19
7	5	12

