

Emory Math Circle

Shilpi Mandal

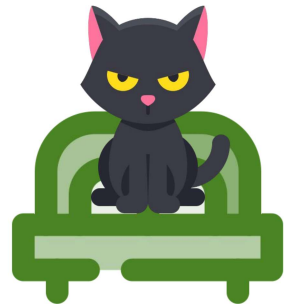
Do you have a pet? How many pillows does your pet need?



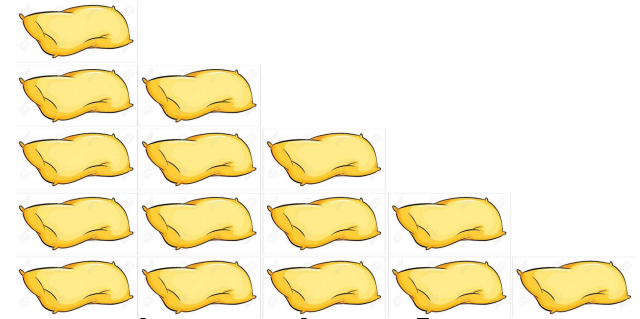
Rules

- Your cat has learned to speak and wants to play a pillow stacking game with you
- Why? Because cats love snoozing comfortably, of course.

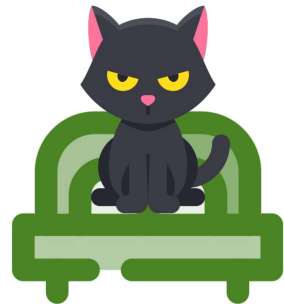
- You each get 15 pillows
- You play against each other, and get points based on your stacking
- If you have more points than your cat, you win!
- If your cat has more points, or you tie, your cat wins!
 - If this is unfair, it's because cats love winning.



Rules – Stacking and Points

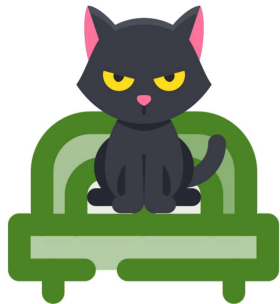


- The pillows must be stacked left to right in decreasing order of height
- When we compare stacks between you and your cat, we compare each column (including “empty” columns)
- For each column, whoever has more pillows in that column gets a point
- Above, we have a stack going 5,4,3,2,1

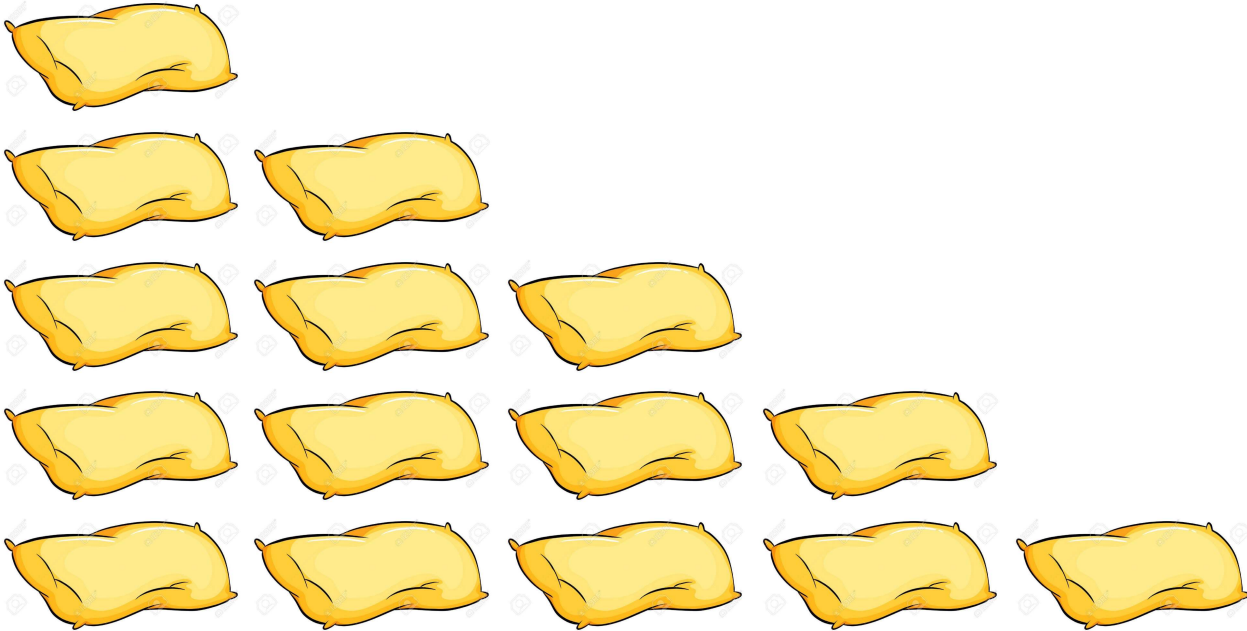


Round One

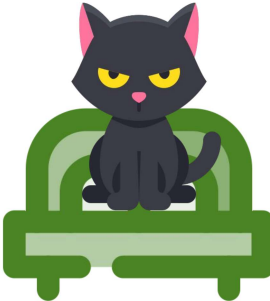
- Your cat, Ms. Caturday, tells you it's time for your daily pillow stacking game. She has stacked her pillows as 5,4,3,2,1
- Can you stack your 15 pillows to win?



The Pillow Game

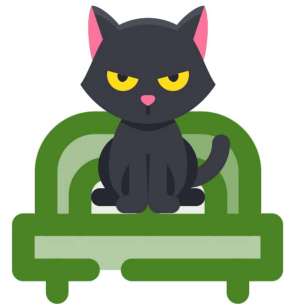


Ms. Saturday	You	Who won?
5,4,3,2,1		

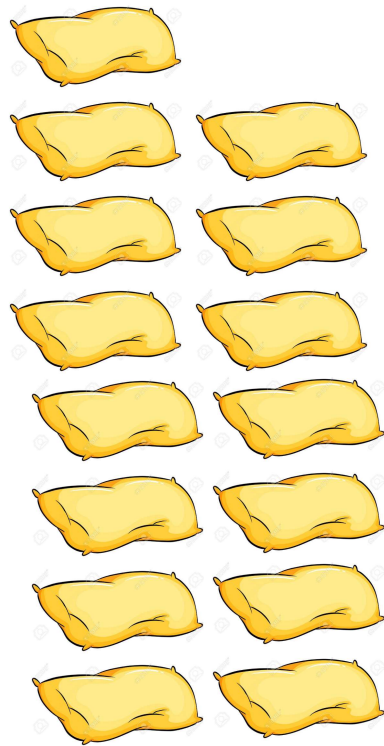


Is 8,7 the best stack?

- Ms. Caturday is very sneaky, and she keeps stealing your idea!
- Now she has the stack 8,7
- How do you compete with: 8,7

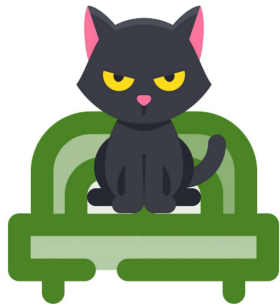


Round Two: You vs. 8,7



Round Two: Your solution

- We may have seen this solution before!
- Which means this can also be beaten...

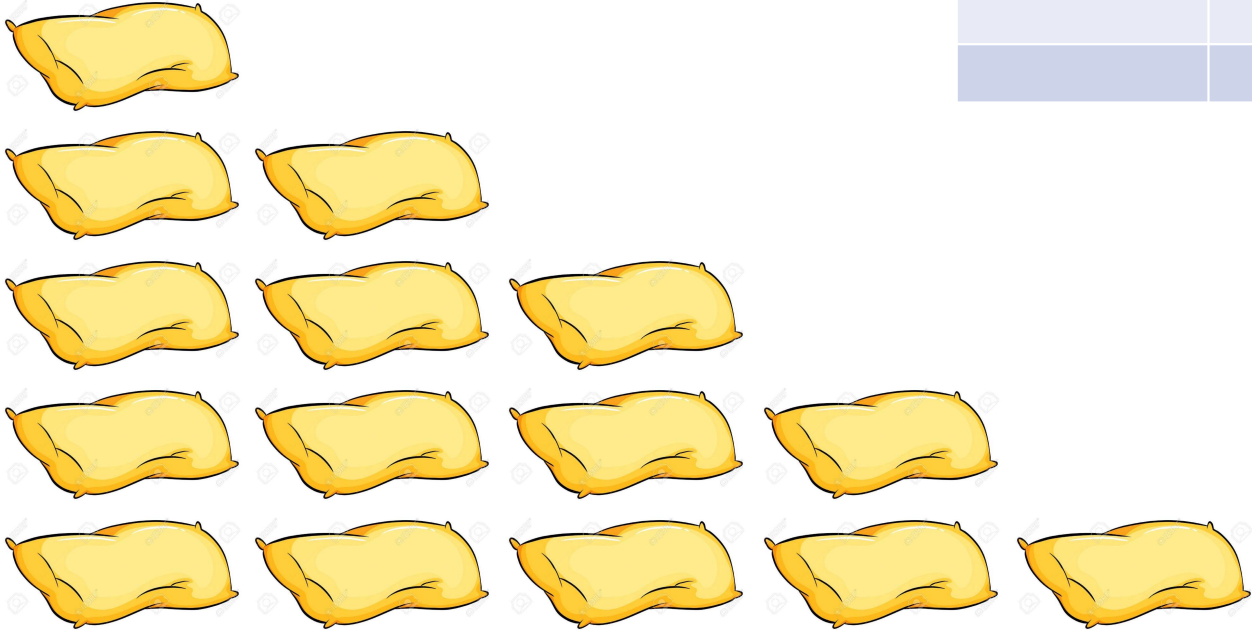


Who wins?

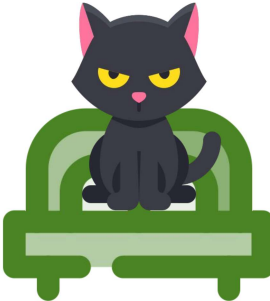
- Ms. Caturday really wants to sleep on her perfect pillow stack, but she also wants to finish the game
- You feel sorry for tired little Ms. Caturday
- Can you build a stack so that when Ms. Caturday steals it, she will finally win forever?



The Winningest Stack



Ms. Caturday	You	Who won?
5,4,3,2,1		

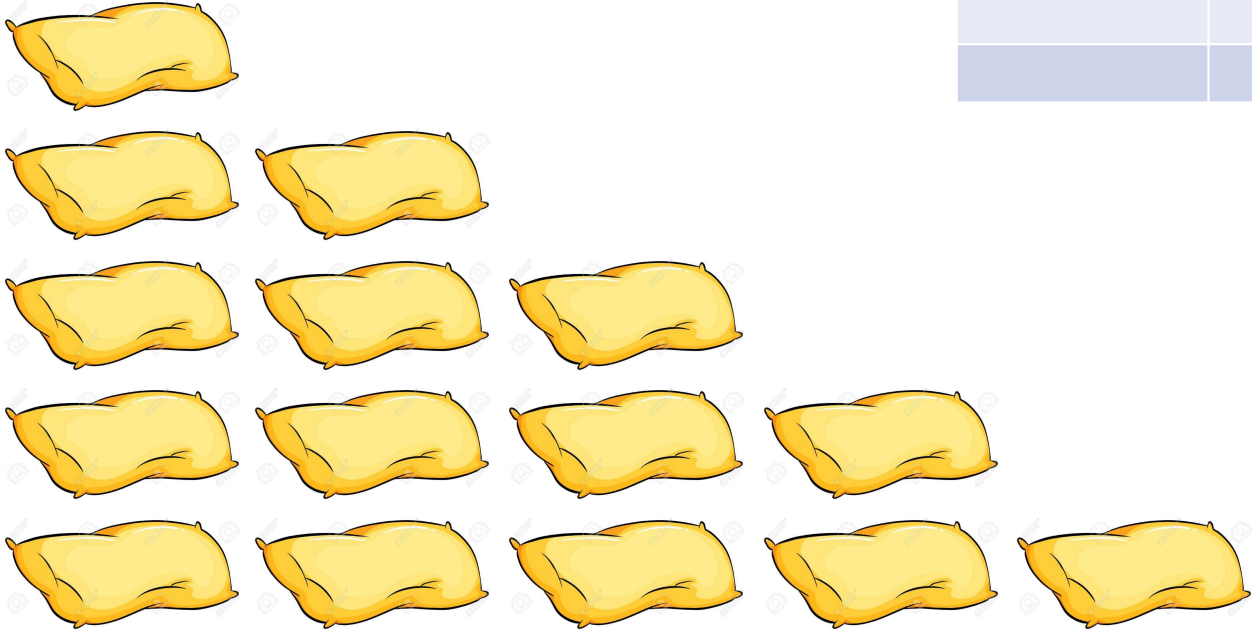


Who wins Part 2 – Winning Never Ends

- Ok , we have a winning stack: <placeholder>
- Are there any other winning stacks?
- (Hint: there are 2 other stacks!)



The Winningest Stack - II

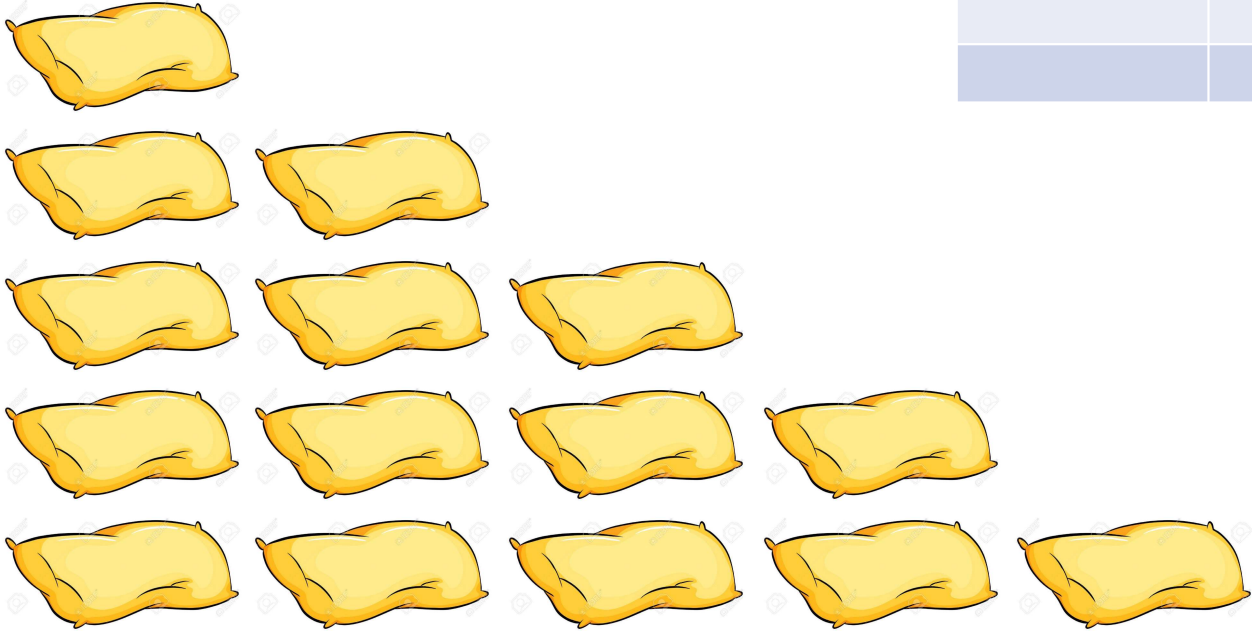


Ms. Caturday	You	Who won?
5,4,3,2,1		



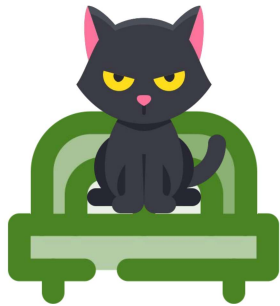
The Winningest Stack - III

Ms. Caturday	You	Who won?
5,4,3,2,1		

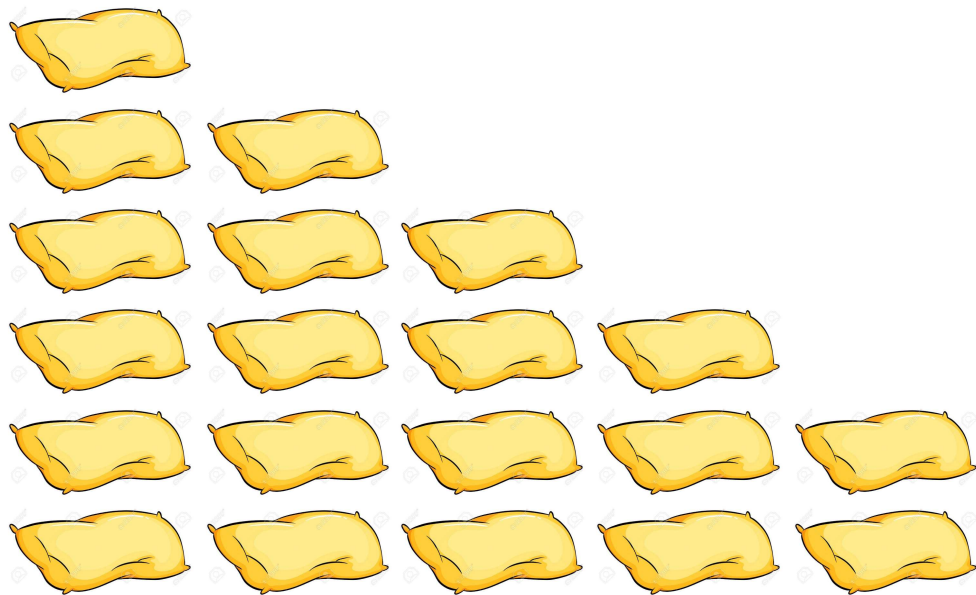


Challenge!

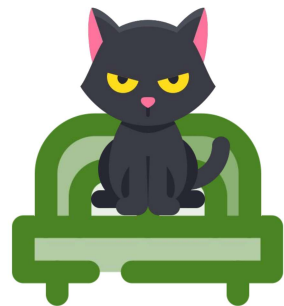
- It's a new day, and somehow, Ms. Caturday has 20 pillows.
- Can you find the winningest stack?



Challenge: 20 pillows!

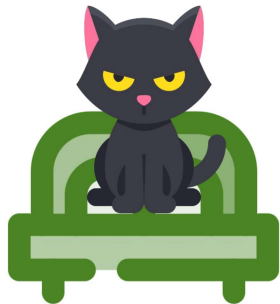


Ms. Caturday	You	Who won?
6, 5,4,3,2		



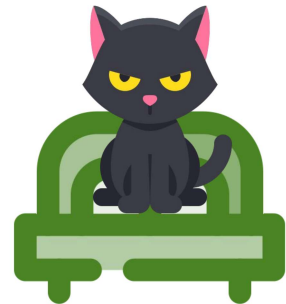
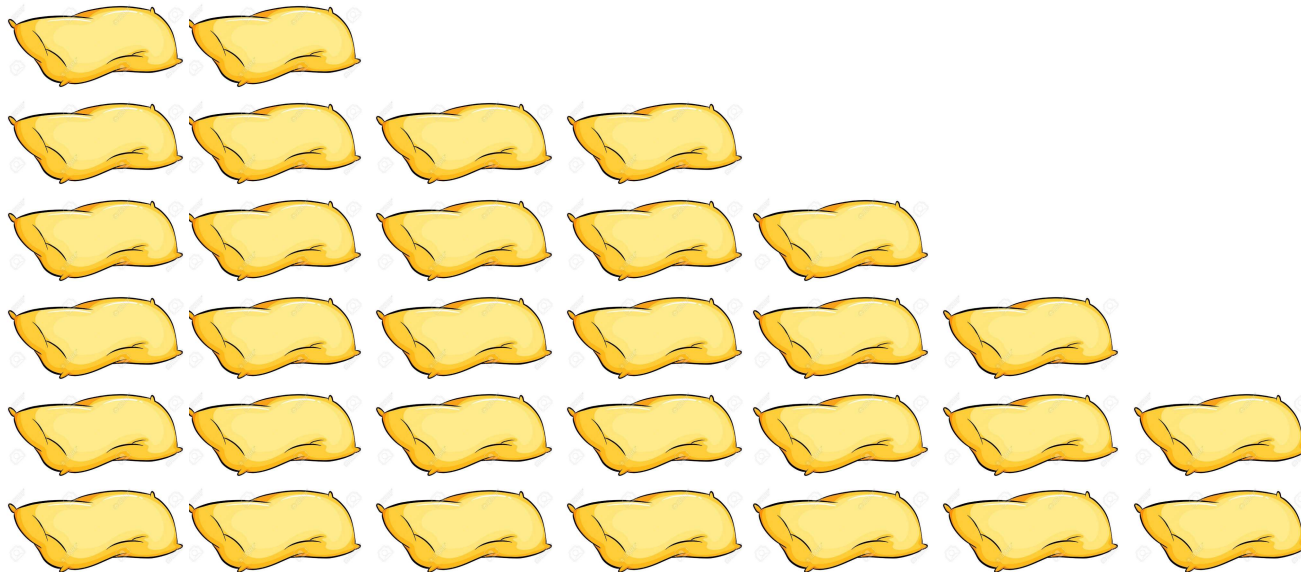
Challenge!

- It's Ms. Caturday's birthday and she has found 10 more pillows!
- Can you find the winningest stack with 30 pillows?

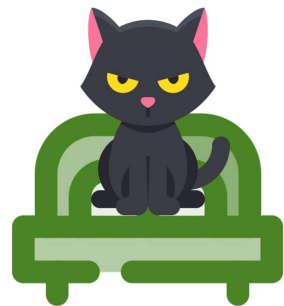
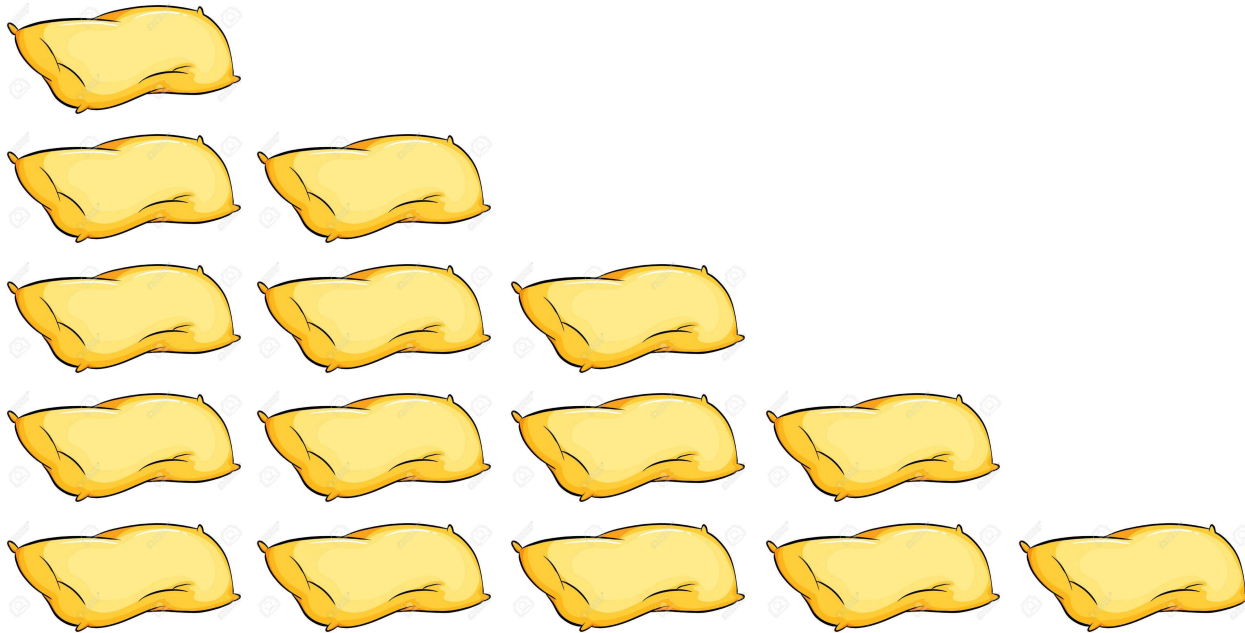


Challenge: 30 pillows!

Ms. Saturday	You	Who won?
6,6,5,4,4,3,2		



Round Three



# of Pillows	Result for Tyrant	Winning Arrangement	# of Pillows	Result for Tyrant	Winning Arrangement
1	WINS	1	11	WINS	6,4,1
2	WINS	2	12		
3	WINS	2,1 or 3	13		
4	WINS	3,1 or 4	14		
5	WINS	3,2 or 4,1 or 5	15	WINS	6,5,3,1 or 8,4,2,1
6	WINS	4,2 or 3,2,1	16		
7	WINS	4,2,1	17		
8	WINS	5,2,1	18		
9	WINS	6,3	19		
10	WINS	4,3,2,1	20		

