

19. Quadratic Cost

Adding Up the Turns

An AI agent has a 200-token system prompt, and each turn is a 100-token question and a 200-token answer. Turn one sends 300 input tokens and every turn after adds another 300, so k is 300. Two numbers decide the total, and only one of them changes as the conversation runs. Fill in the running total for four turns and check each one against the equation.

$$\text{total after } n \text{ turns} = k \times \frac{n \times (n + 1)}{2}$$

k what one turn adds to the input
n how many turns have gone by

Step 1: Add each turn's input to the running total, and check it against the equation

Turn (n)	Input tokens	Running total	By equation
1	300	0 + 300 = 300	300 x (1 x 2)/2 = 300
2	600	300 + 600 = 900	300 x (2 x 3)/2 = 900
3	900	900 + 900 = 1800	300 x (3 x 4)/2 = 1800
4	1200	1800 + 1200 = 3000	300 x (4 x 5)/2 = 3000

19. Quadratic Cost (continued)

Practice 1

An AI agent has a 100-token system prompt, and each turn is a 100-token question and a 100-token answer. Turn one sends 200 input tokens and every turn after adds another 200, so k is 200. Fill in the running total for four turns and check each one against the equation.

Step 1: Add each turn's input to the running total, and check it against the equation

Turn (n)	Input tokens	Running total	By equation
1	200		
2	400		
3	600		
4	800		

Practice 2

An AI agent has a 300-token system prompt, and each turn is a 200-token question and a 300-token answer. Turn one sends 500 input tokens and every turn after adds another 500, so k is 500. Fill in the running total for four turns and check each one against the equation.

Step 1: Add each turn's input to the running total, and check it against the equation

Turn (n)	Input tokens	Running total	By equation
1	500		
2	1000		
3	1500		
4	2000		