Solving Day #25 ICQ Recurrence

T(1) = 1
T(N) = 2T(N/2) + N

Write recurrence using x as the variable: $T(x) = x + 2T(x/2)$

T(N)	= N + 2T(N/2)	plug N in for x
= N + 2(N/2 + 2T(N/2/2))	= N + N + 4T(N/4)	plug N/2 in for x
= N + N + 4(N/4 + 2T(N/4/2))	= N + N + N + 8T(N/8)	plug N/4 in for x
= N + N + N + 8(N/8 + 2T(N/8/2))	= N + N + N + N + 16T(N/16)	plug N/8 in for x
= …	= …	
	= N + N + N + N + … + N*T(N/N)	
	= N + N + N + N + … + N*T($N/2^k$)	
	= N + N + N + N + … + N*T(1)	
	= N + N + N + N + … + N	

$\log_2(N)$
because N/2 in recurrence