

Assignment 5

Due Thurs, before June 4 class

Given the following sequence, for each formula, determine if it is true or false.

	a	b	c	d	e	f	g	h	i	j	k	
												→
x	0	0	3	7	0	1	1	0	2	(always ≠ 0)	
y	1	1	0	0	0	0	3	4	0	(always = 0)	

- a) $\Box \neg (x=0 \wedge y=0)$
- b) $\Box [x=0 \quad y'=0]_{x,y}$
- c) $\Diamond (x=7 \wedge y=0)$
- d) $\Diamond \langle y=0 \rangle / \langle x'=0 \rangle_y$
- e) $\Box \Diamond (y \neq 0)$
- f) $\Diamond \Box (x=0 \quad y \neq 0)$
- g) $\Diamond \Box [\text{FALSE}]_y$

Not to be turned in (from previous exams)

1) Consider the following trace sequence:

	a	b	c	d	e	f	g	h	i	j	k	
												→
x	0	0	3	7	0	1	1	0	2	(always = 1)	
y	2	2	2	0	0	0	3	4	0	(always = 0)	

Which of the following formulas hold for the behavior above? Explain your reasoning.

$$\Box \neg (x=3 \wedge y'=0)$$

$$\Box \Diamond (x+y > 2)$$

$$\Diamond \langle x=1 \wedge y'=3 \rangle_x$$

- 2) Consider a system with two processors and a shared memory. During execution of CISC instructions, each processor occasionally requires exclusive access to the memory to read values and possibly update the memory. To model the system, consider a game with 2 players who compete for a coin. Upon getting the coin, the player flips the coin. If the coin lands heads-up, the player increments a counter. The coin then is released and the players compete for the coin again. When one of the players has gotten 10 heads, the game restarts.

Write a specification using TLA+ that includes separate actions for getting the coin and flipping the coin. Think first. Then write an outline on this page of the structure of your specification (leaving lots of room to then fill in the details). Use auxiliary definitions. Exact syntax isn't critical, but will receive a bonus.

- 3) Are the following specs Next1 and Next2 equivalent? Explain your reasoning.

$$\begin{aligned} \text{Next1} == & \bigvee \bigwedge b = 0 \\ & \bigwedge b' = 1 \\ & \bigvee \bigwedge b = 1 \\ & \bigwedge b' = 0 \end{aligned}$$

$$\text{Next2} == b' = \text{IF } b = 0 \text{ THEN } 1 \text{ ELSE } 0$$