

Intermediate Math Circles

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COMPUTER PROGRAMS - SOLUTIONS

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Reading Computer Programs

1. Given the program `t 4[s] T 3[t S]` draw the corresponding banner.
2. Given the program `2[2[s S] t T]` draw the missing shapes in the following banner:



Reading Computer Programs - Solutions

1. t 4[s] T 3[t S]



2. 2[2[s S] t T]



Writing Computer Programs

3. Create two different programs that will draw the following banner:



4. Given the incomplete program `?[2[?] t ?[s T ?]]` complete the missing instructions in order to draw the following banner:



Writing Computer Programs - Solutions

3. One possible program is `s T s T t S t S`.
Another possible program is `2[s T] 2[t S]`.



4. `2[2[S] t 3[s T s]]`



Fixing Computer Programs

5. Suppose you want to draw the following banner:



You create the program `2[S T t] 2[T S s]` which incorrectly draws this banner:



What are the mistakes in your program?



Fixing Computer Programs - Solutions

5. The small triangle instruction, t , and the small square instruction, s , should be moved outside of their repeating blocks. The correct program is $2[S\ T]\ t\ 2[T\ S]\ s$.



Enhancing Computer Programs

6. For each program in parts (a) through (f), decide whether or not it will draw the following banner:



- (a) $2[T (t:T/t)]$
- (b) $T (T:t/s) (t:T/S)$
- (c) $T 2[(t:T/t)]$
- (d) $t (t:T/s) (s:S/t)$
- (e) $T (T:t/S) (S:s/T)$
- (f) $3[(T:t/T)]$



Enhancing Computer Programs - Solutions

6. (a) No. The program draws this banner:



(b) Yes

(c) Yes

(d) No. The program draws this banner:



(e) Yes

(f) No. The program is invalid and will not draw any banner. The first instruction is the new if instruction, but there is no previously drawn shape that it can use in order to make a decision about what to draw next.

