

**Today** Reducability. §§ 5.\*.

**Next class** Portfolio presentations.

**Reminders** Newsgroup.

1. List the members of your group below. Underline your name.
  
2. Suppose there is a blackbox program `haltcheck` that, when given the Java or Python source of any program  $H$  as standard input, writes, to standard output, **yes** if  $H$  *always* halts (regardless of input given to  $H$ ) and **no** otherwise. Provide the Java or Python source for a program  $D$  that behaves as follows:
  - It reads two items from standard input (separated by the special token `-----`): Python source of a program  $P$  and string input  $w$  for  $P$ .
  - It writes **yes** to standard output if  $P$  halts on input  $w$  with output **yes**; otherwise it writes **no**.

3. The *hailstone sequence* from  $s$ , written  $h_s(1), h_s(2), \dots$ , is defined as follows for positive integers  $s$  and  $i$ .

$$h_s(i) = \begin{cases} s & \text{if } i = 1 \\ 1 & \text{if } i > 1 \text{ and } h_s(i-1) = 1 \\ h_s(i-1)/2 & \text{if } i > 1, h_s(i-1) > 1, \text{ and } h_s(i-1) \text{ is even} \\ 3h_s(i-1) + 1 & \text{otherwise} \end{cases}$$

Can the program `haltcheck` of Question 2 be used to determine whether the sequences  $h_i(s)$  converge to 1 for all  $s$ ? Explain your answer.