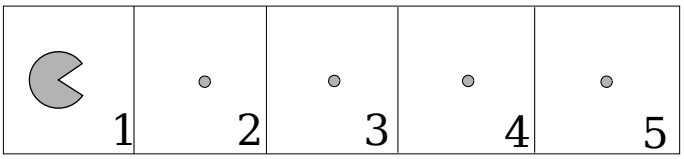
MDPs: Bonus level!



Pacman is in a bonus level! With no ghosts around, he can eat as many dots as he wants. He is in the 5×1 grid shown. The cells are numbered from left to right as $1, \ldots, 5$. In cells 1 through 4, the actions available to him are to move **Right** (R) or to **Fly** (F) out of the bonus level. The action **Right** deterministically lands Pacman in the cell to the right (and he eats the dot there), while the **Fly** action deterministically lands him in a terminal state and ends the game. From cell 5, **Fly** is the only action. Eating a dot gives a reward of 10, while flying out gives a reward of 20. Pacman starts in the leftmost cell (cell 1).
We write this as an MDP where the state is the cell that Pacman is in. The discount is γ.
Consider the following 3 policies:

$$\pi_0(s) = F \text{ for all } s$$
$$\pi_1(s) = R \text{ if } s \leq 3, \ F \text{ otherwise}$$
$$\pi_2(s) = R \text{ if } s \leq 4, \ F \text{ otherwise}$$

1. Assume $\gamma = 1.0$. What is:

   (a) $V^{\pi_0}(1)$?
   20

   (b) $V^{\pi_1}(1)$?
   50

   (c) $V^{\pi_2}(1)$?
   60

   (d) $V^*(1)$?
   60