← Dynamic Programming
Тренировочный тест • 45 min

✓ **Поздравляем! Вы прошли тест!**

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Dynamic Programming

ОБЩИЙ БАЛЛ 14

1. **The value of any state under an optimal policy is __ the value of that state under a non-optimal policy. [Select all that apply]**

1 / 1 балл

☐ Strictly greater than

☑ Greater than or equal to

✓ **Correct**
Correct! This follows from the policy improvement theorem.

☐ Strictly less than

☐ Less than or equal to

2. **If a policy is greedy with respect to the value function for the equiprobable random policy, then it is guaranteed to be an optimal policy.**

1 / 1 балл

● False

○ True

✓ **Correct**
Correct! Only policies greedy with respect to the optimal value function are guaranteed to be optimal.

3. **If a policy π is greedy with respect to its own value function v_π, then it is an optimal policy.**

1 / 1 балл

● True

○ False

✓ **Correct**
Correct! If a policy is greedy with respect to its own value function, it follows from the policy improvement theorem and the Bellman optimality equation that it must be an optimal policy.

4. **Let v_π be the state-value function for the policy π. Let π' be greedy with respect to v_π. Then $v_{\pi'} \geq v_\pi$.**

1 / 1 балл

○ False

● True

✓ **Correct**
Correct! This is a consequence of the policy improvement theorem.

5. **Let v_π be the state-value function for the policy π. Let $v_{\pi'}$ be the state-value function for the policy π'. Assume $v_\pi = v'_\pi$. Then this means that $\pi = \pi'$.**

1 / 1 балл

○ True

● False

✓ **Correct**
Correct! For example, two policies might share the same value function, but differ due to random tie breaking.

6. **What is the relationship between value iteration and policy iteration? [Select all that apply]**

1 / 1 балл

☐ Value iteration is a special case of policy iteration.

☐ Policy iteration is a special case of value iteration.

☑ Value iteration and policy iteration are both special cases of generalized policy iteration.

✓ **Correct**
Correct!

7. **The word synchronous means "at the same time". The word asynchronous means "not at the same time". A dynamic programming algorithm is: [Select all that apply]**

1 / 1 балл

☑ Asynchronous, if it does not update all states at each iteration.

✓ **Correct**
Correct! Only algorithms that update every state exactly once at each iteration are synchronous.

☑ Asynchronous, if it updates some states more than others.

✓ **Correct**
Correct! Only algorithms that update every state exactly once at each iteration are synchronous.

☑ Synchronous, if it systematically sweeps the entire state space at each iteration.

✓ **Correct**
Correct! Only algorithms that update every state exactly once at each iteration are synchronous.

8. **All Generalized Policy Iteration algorithms are synchronous.** 1 / 1 балл

● False

○ True

✓ **Correct**
Correct! A Generalized Policy Iteration algorithm can update states in a non-systematic fashion.

9. **Policy iteration and value iteration, as described in chapter four, are synchronous.** 1 / 1 балл

● True

○ False

✓ **Correct**
Correct! As described in lecture, policy iteration and value iteration update all states systematic sweeps.

10. **Which of the following is true?** 1 / 1 балл

● Asynchronous methods generally scale to large state spaces better than synchronous methods.

○ Synchronous methods generally scale to large state spaces better than asynchronous methods.

✓ **Correct**
Correct! Asynchronous methods can focus updates on more relevant states, and update less relevant states less often. If the state space is very large, asynchronous methods may still be able to achieve good performance whereas even just one synchronous sweep of the state space may be intractable.

11. **Why are dynamic programming algorithms considered planning methods? [Select all that apply]** 1 / 1 балл

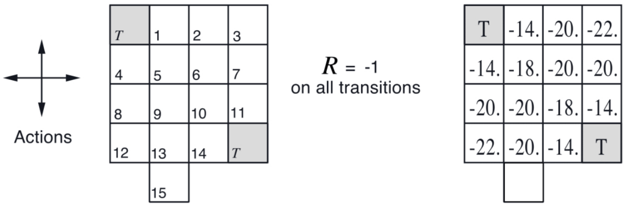
□ They learn from trial and error interaction.

□ They compute optimal value functions.

☑ They use a model to improve the policy.

✓ **Correct**
Correct! This is the definition of a planning method.

12. **Consider the undiscounted, episodic MDP below. There are four actions possible in each state, A = {up, down, right, left}, which deterministically cause the corresponding state transitions, except that actions that would take the agent off the grid in fact leave the state unchanged. The right half of the figure shows the value of each state under the equiprobable random policy. If π is the equiprobable random policy, what is $q(11, \text{down})$?** 1 / 1 балл



T	-14.	-20.	-22.
-14.	-18.	-20.	-20.
-20.	-20.	-18.	-14.
-22.	-20.	-14.	T

○ $q(11, \text{down}) = 0$

○ $q(11, \text{down}) = -15$

● $q(11, \text{down}) = -1$

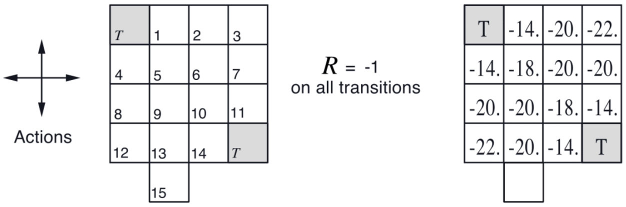
○ $q(11, \text{down}) = -14$

✓ **Correct**
Correct! Moving down incurs a reward of -1 before reaching the terminal state, after which the episode is over.

episode is over.

13. **Consider the undiscounted, episodic MDP below. There are four actions possible in each state, A = {up, down, right, left}, which deterministically cause the corresponding state transitions, except that actions that would take the agent off the grid in fact leave the state unchanged. The right half of the figure shows the value of each state under the equiprobable random policy. If π is the equiprobable random policy, what is $q(7, \text{down})$?**

1 / 1 балл



T	-14.	-20.	-22.
-14.	-18.	-20.	-20.
-20.	-20.	-18.	-14.
-22.	-20.	-14.	T

● $q(7, \text{down}) = -15$

○ $q(7, \text{down}) = -20$

○ $q(7, \text{down}) = -14$

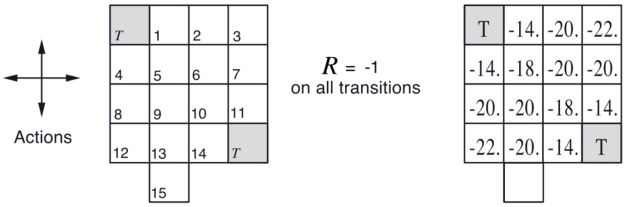
○ $q(7, \text{down}) = -21$

✓ **Correct**

Correct! Moving down incurs a reward of -1 before reaching state 11, from which the expected future return is -14.

14. **Consider the undiscounted, episodic MDP below. There are four actions possible in each state, A = {up, down, right, left}, which deterministically cause the corresponding state transitions, except that actions that would take the agent off the grid in fact leave the state unchanged. The right half of the figure shows the value of each state under the equiprobable random policy. If π is the equiprobable random policy, what is $v(15)$? Hint: Recall the Bellman equation** $v(s) = \sum_a \pi(a|s) \sum_{s',r} p(s', r|s, a)[r + \gamma v(s')]$.

1 / 1 балл



T	-14.	-20.	-22.
-14.	-18.	-20.	-20.
-20.	-20.	-18.	-14.
-22.	-20.	-14.	T

○ $v(15) = -21$

○ $v(15) = -23$

● $v(15) = -24$

○ $v(15) = -22$

○ $v(15) = -25$

✓ **Correct**

Correct! We can get this by solving for the unknown variable $v(15)$. Let's call this unknown x. We solve for x in the equation $x = 1/4(-21) + 3/4(-1 + x)$. The first term corresponds to transitioning to state 13. The second term corresponds to taking one of the other three actions, incurring a reward of -1 and staying in state x.