INTERMEDIATE AI

NEOM

ReadyAi

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Lesson Plans

Standards and Guidelines Cited

ISTE Standards

The International Society for Technology in Education (ISTE) produces a series of standards for those involved in education. The lessons in the following curriculum utilize the seven ISTE Student Standards.

- The ISTE Student Standards can be found at https://www.iste.org/standards/iste-standards-for-students

AI4K12 Guidelines

AI4K12.org has released a list of "Five Big Ideas in AI" along with draft grade band progression charts for each of these ideas.

- The five big ideas are summarized on a poster that can be found at https://ai4k12.org/resources/big-ideas-poster/.
- The grade band progression charts are available at https://ai4k12.org/gradeband-progression-charts/
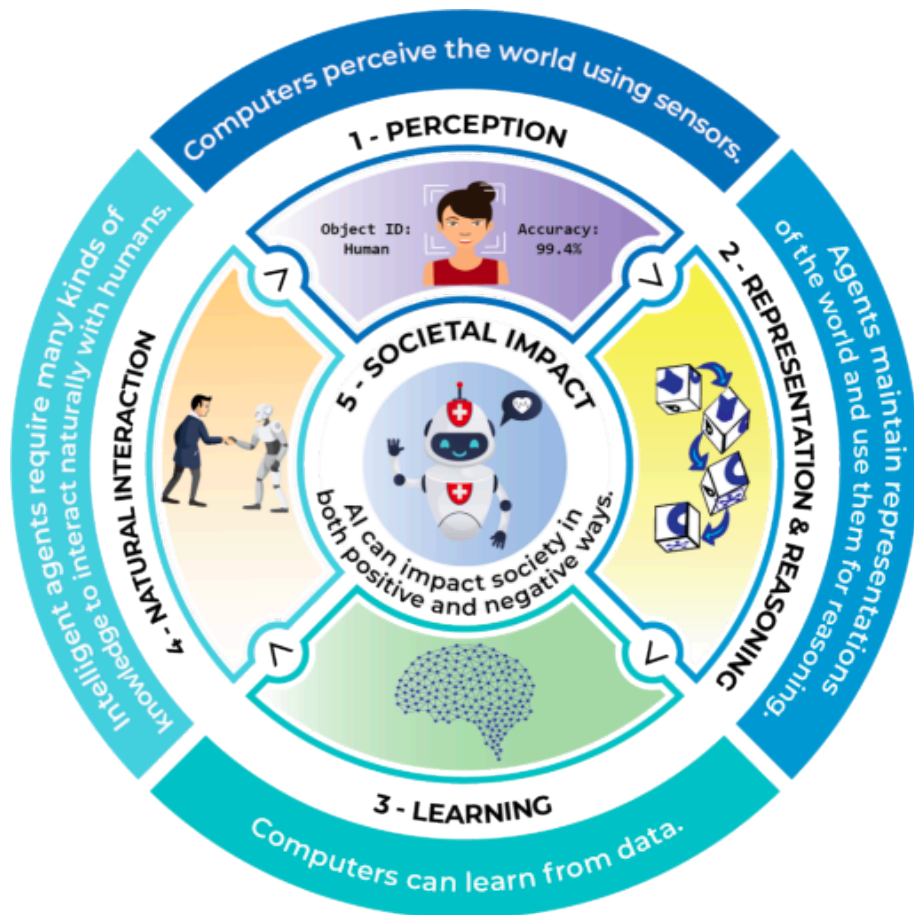
Big Idea 1 - Perception: Computers perceive the world using sensors.

Big Idea 2 - Representation and Reasoning: Agents maintain representations of the world and use them for reasoning.

Big Idea 3 - Learning: Computers can learn from data.

Big Idea 4 - Natural Interaction: Intelligent agents require many kinds of knowledge to interact naturally with humans.

Big Idea 5 - Societal Impact: AI can impact society in both positive and negative ways.

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01

State Machines - Unplugged

TEACHING GUIDE

Lesson Objectives:
By the end of this lesson, students will be able to
- Explore why multiple states are needed to express complex behaviors
- Learn how to create states within Calypso
- Design an unplugged map of states within a program to accomplish a goal

Alignment with Big Ideas:
Big Idea #4: Natural Interaction

ISTE Standards for Students:
1.1 Empowered Learner
1.3 Knowledge Constructor
1.4 Innovative Designer
1.5 Computational Thinker

ISTE Computational Thinking Competencies:
5.1 Computational Thinking (Learner)

Equipment

Cozmo and light cubes.

Preparation

Robots should be fully charged and paired with their cubes. Cube batteries should be at least 1.2V. Teachers should gather scissors, glue, tape, construction paper, cardboard, and possibly other items that help students affix items to a board, such as pushpins, thumb tacks or round head fasteners.

Topics Covered

- Initiating State Machines with Dialog
- Initiating State Machines with Timers
- Initiating State Machines with Conditions

Lesson Orientation
## - Unplugged Activity to understand State Machines

Teachers may use the following videos as needed:

▶ [5A Video 1 State Machine Overview](#)

▶ [5A Video 2 State Machine Creating the Pieces](#)

▶ [5A Video 3 State Machine Assembly](#)

1. State machines are useful for constructing robot behaviors that are too complex to fit on a single page because the rules would interfere with each other. Each page is a state.
2. To begin today's lesson, we will not be using Cozmo or Calypso at first. Instead, we want to cut out six "states" of the following values:
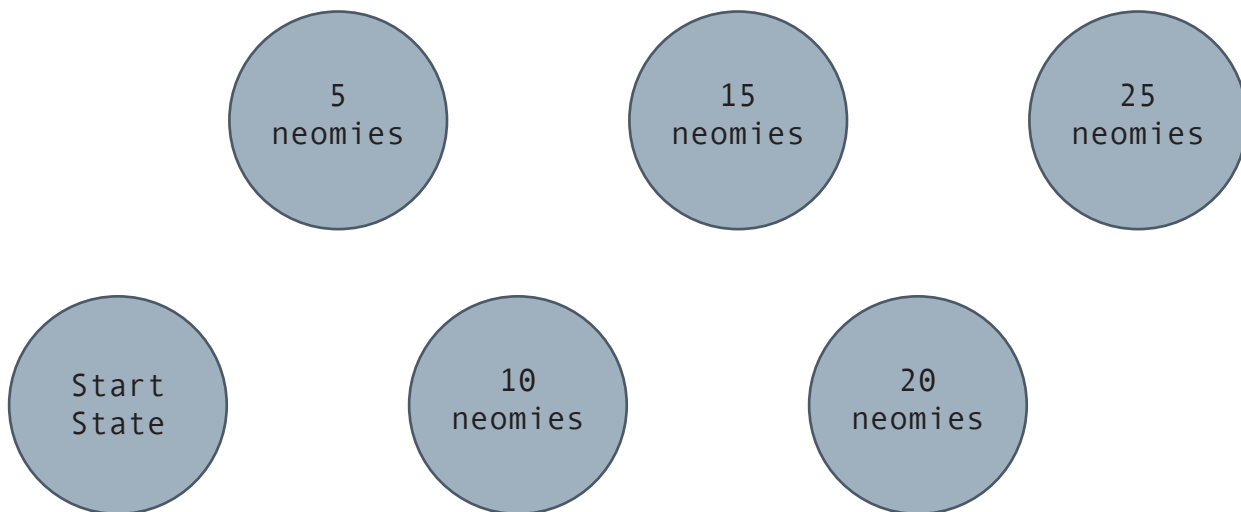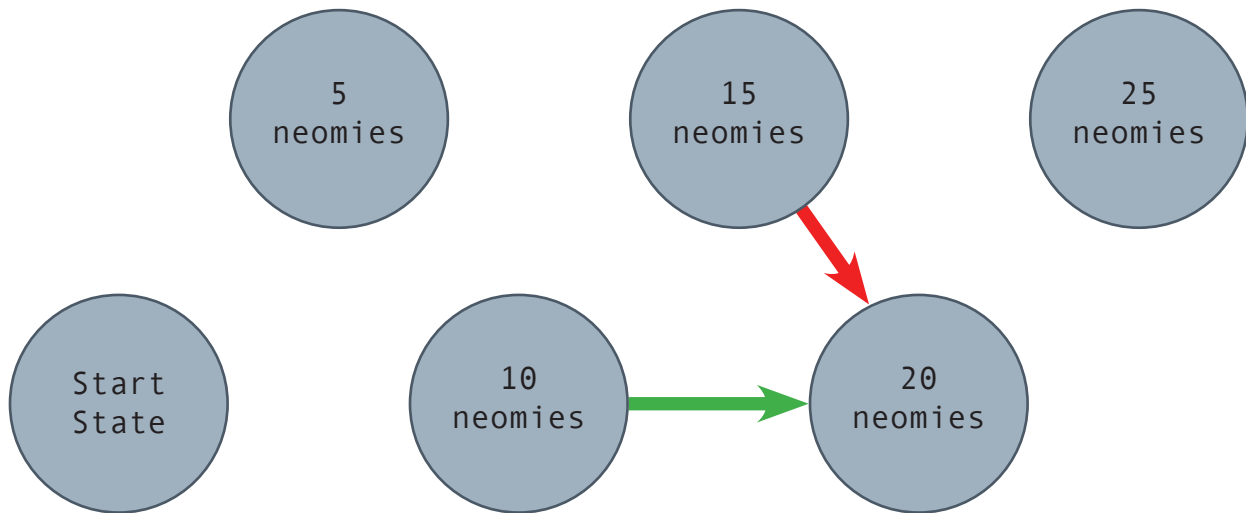

3. Your goal is to get to 25 neomies. You have nickels and dimes. How many ways can you get to the 25 neomies state? Your job is to show the transitions (or arrows) to 25 neomies. Let's do one together.
4. Look at the red arrow below. It's a nickel. How many neomies does it represent?
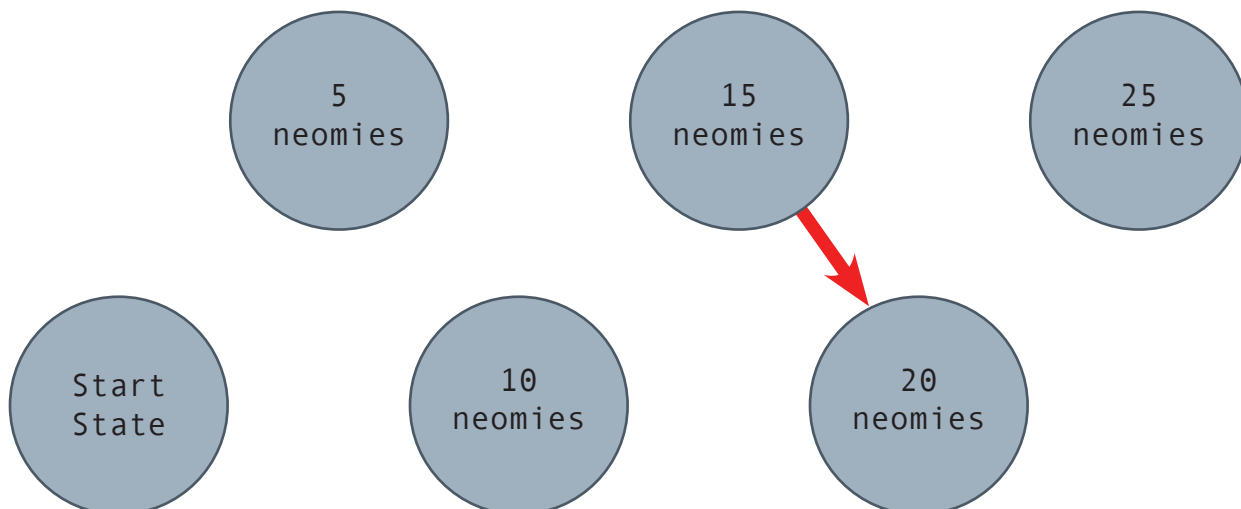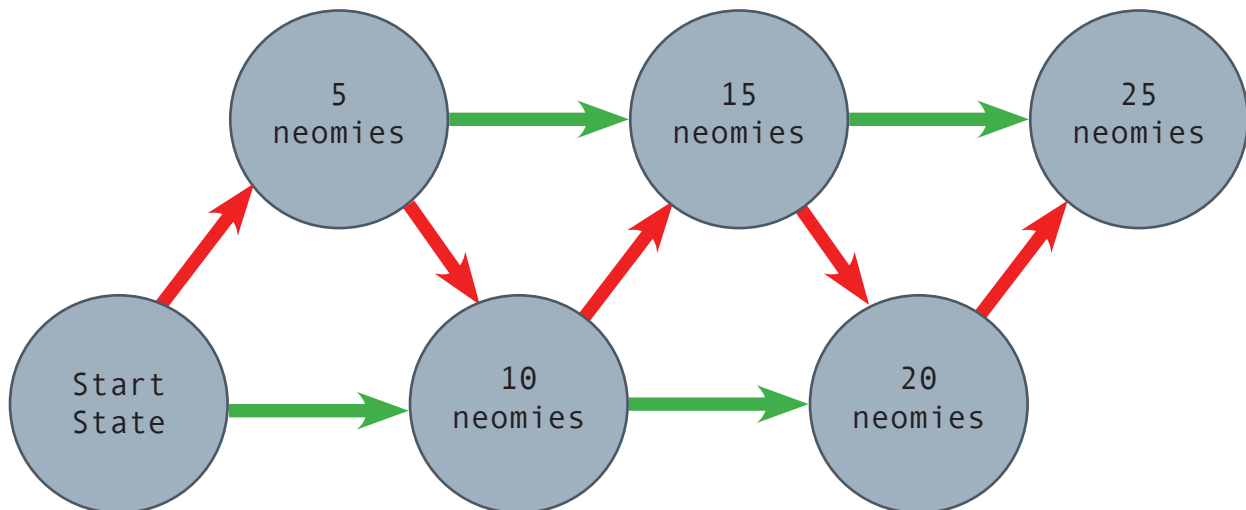
Answer:
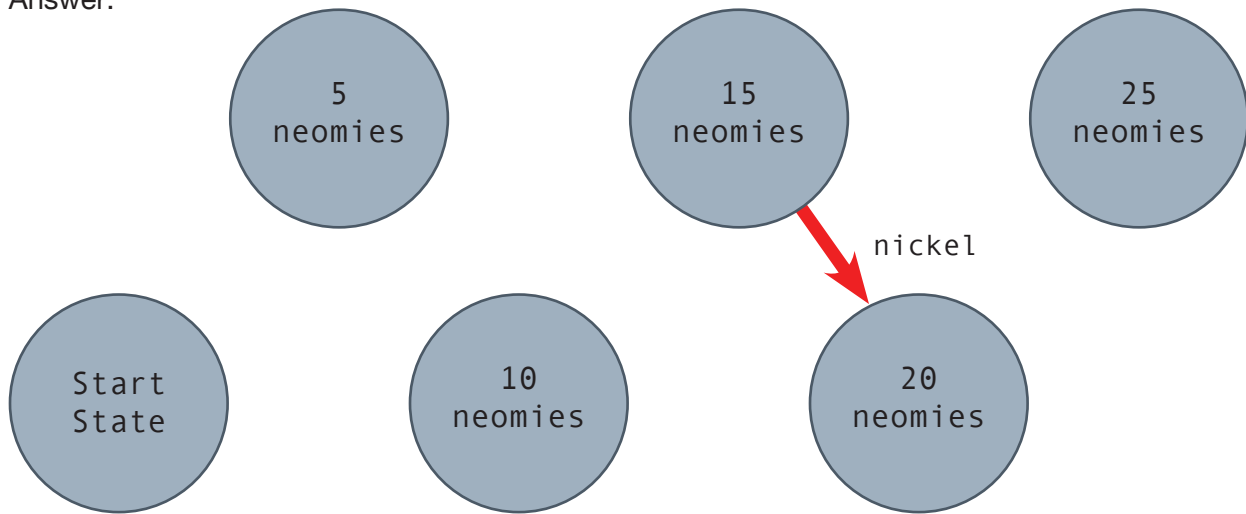
5. Now look at the new green transition...It's a dime. How many neomies does it represent?

6. Now, you should draw in all the transitions that get you from the State Machine to the 25 neomies state.

7. Now, you need to simulate the state machine. A marker or an eraser can work. We want to move it from state to state.
8. Start in the "Start State." One student says "dime" or "nickel" and the other student moves the marker or eraser from state to state to get to 25 neomies.

9. **Enrichment:** What happens if a student puts in 3 dimes and gets to the 30 neomies state? Since there is no 30 neomies state, what can happen?
   a. The user loses the 5 neomies over 25. How can this be represented?
      Answer: A green transition line can represent 20 to 25.
      People are allowed to overpay for candy bars. They simply lose the money.
   b. A more complex machine would recognize that someone overpaid. How can this be represented?
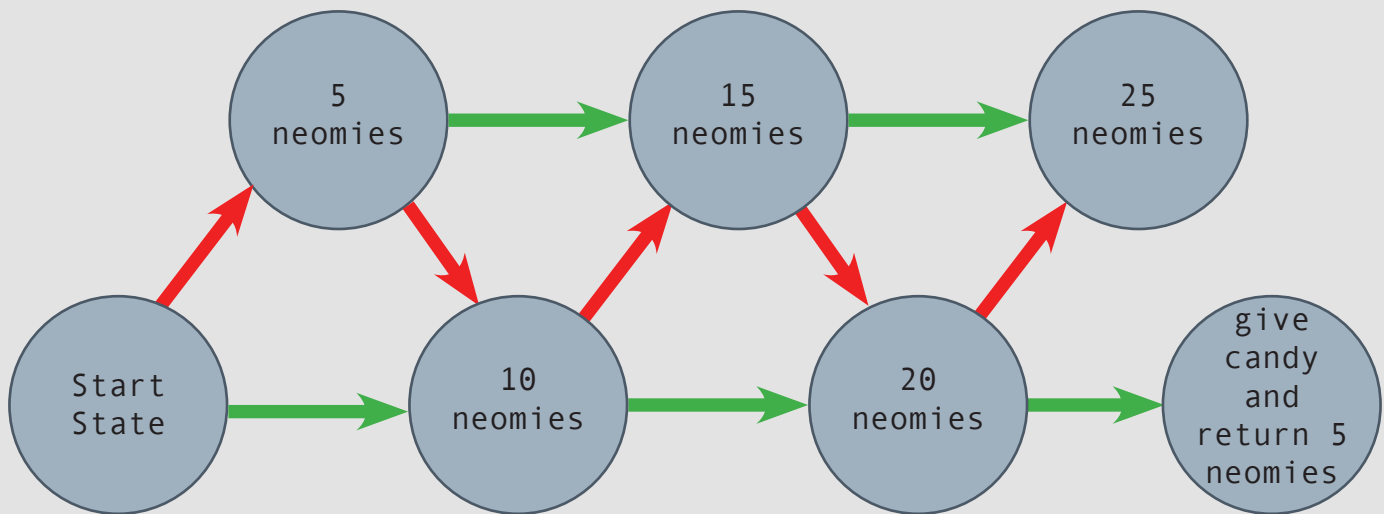
   c. What additional transition should always be included?
      Answer: A return to the Start State should return to 'reset' the machine.

10. Now, ask students to create more discs. They should create discs for 25 neomies, 30 neomies, and 40 neomies. "Give candy" can function as a 45 neomies state.
11. Introduce the concept of a third transition representing 25 neomies. This provides a third line to create. Ask students to replicate the experience from creating transitions to the 25 neomies state, but this time, they should create transitions that lead to 45. Here is an example of what this may look like. (See next page)
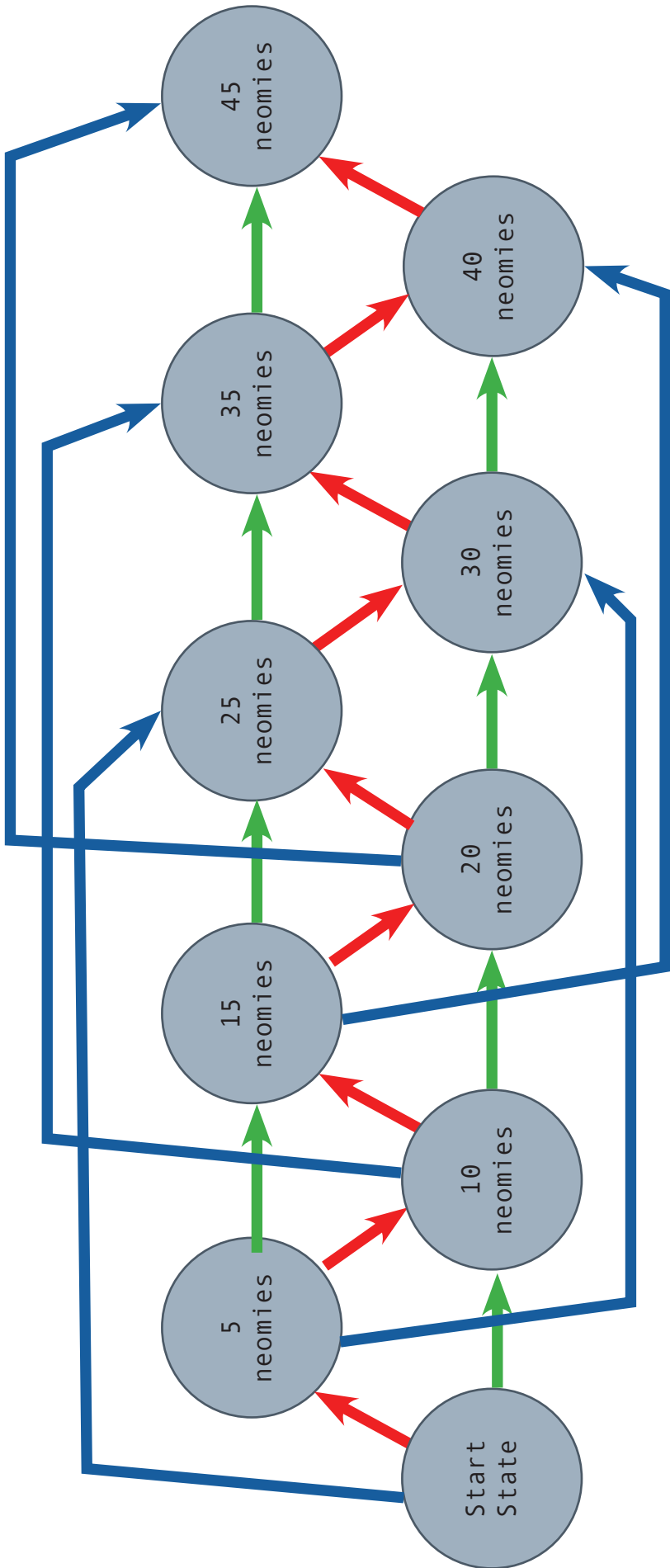
How many ways are there to get to 25?
What are they?

How many ways are there to get to 45?
What are they?

How much does the red line indicate?
How much does the green line indicate?
How much does the blue line indicate?