1.
   a. Yes it can be currently solved. https://www.majortom.com/mercury-blog/ces-2019-what-a-ping-pong-playing-robot-can-teach-us-about-the-future-of-digital-marketing/
   b. d) Yes, is currently implemented https://www.grocerydive.com/news/grocery--artificial-intelligence-improves-efficency-of-online-grocery-shopping/535113/
   c. g) while this has already been done with the Robbins algebra. https://www.cs.unm.edu/~mccune/papers/robbins/, AI wouldn't feasibly find new theorems or prove new ones. Even Google has made a program that has learned from old proofs, and was able to solve proofs that were new to it, but that is different than discovering its own proof and solving it. https://www.technologyreview.com/2019/05/20/103054/google-ai-language-translation/ I think the main roadblock to this is discovering new mathematical proofs. I think once found, a computer could do the work to solve it, but finding it is not feasible yet. I don't think this roadblock will disappear soon, if ever. The act of discovery comes from very complex thinking, and I think that kind of thinking won't be available for 50+ years. We might need help from a different AI in order to accurately solve this roadblock.
   d. j) Yes, this has been implemented by Google recently with Spanish: https://www.technologyreview.com/2019/05/20/103054/google-ai-language-translation/

2. Speed running video games. I believe that this currently could be solved by computers, as I think it is a pretty simple thing with a fixed environment. Computers would accurately be able to input controls to change their environment, and would learn how to do things efficiently and eventually incredibly fast.

3.
   a. Poker
      i. PEAS: P: Earning a lot of money, losing least amount of money. E: cards you have, cards opponents have, money you have, money in play, whether players are lying or not. A: play a card, draw a card, put chips in, up ante. S: camera for cards, camera for money, maybe a camera to identify tells.
      ii. Environment:
         1. Observable: Partially, you can't tell what other players have in their hands, but you can look at what you have and how much money is in play.
         2. Deterministic: No, while you can influence the state of the environment, you don't overall determine what the environment will be, as there are other players involved who also influence the environment.
         3. Episodic: Yes, each hand would be an episode, and depending on the current episode a decision will be made (depending on hand, money stack)

4. Static: Yes, others need to wait while you take your turn.
5. Discrete: Yes, the poker playing ai would examine its own and the number of hand options would be finite and countable.
6. Single-Agent: No, there are multiple players involved in the game.

b. Security that monitors a building's hallway at night
   i. PEAS: P: Whether they can catch intruders, how quickly they can sound alarm, accuracy between intruders and employees. E: hallway with people, dark surroundings, small animals/other distractions. A: sound alarm, notify authorities. S: Camera, maybe microphone, speaker to alarm, screen/recorder.
   ii. Environment:
      1. Observable: Fully, with the right set up, the AI should be able to see the entire hallway
      2. Deterministic: Partially. There are many things that could happen in the environment that could not be predicted by the AI, such as if an intruder runs or doesn't after an alarm is sounded. It is real world so there could be any number of options.
      3. Episodic: No, the AI wouldn't observe the hallway in episodes, but as a continuous feed.
      4. Static: No, because the environment is changing always (intruder walking down hall) it is dynamic, and will not wait for the AI to make a decision
      5. Discrete: No, there are an infinite number of states the hallway can be in
      6. Single-Agent: Yes, the observing AI will be the only agent in the environment

c. (Scheduling agent that coordinates employee meetings)
   i. PEAS: P: How efficient they are at managing an employee's time, no overlapping meetings. E: regular meetings, special case meetings, multiple employees with different schedules. A: book rooms in the building, notify employees, notify other members of the meeting. S: camera to observe rooms, keyboard/screen for inputting employee schedules.
   ii. Environment:
      1. Observable: Yes. The AI would have complete access to all employee's schedules/availability.
      2. Deterministic: Yes, because the AI schedules the meetings, the state of the environment depends on what decisions the AI makes
      3. Episodic: Yes, there is no reason for the AI to need past data, as it simply would make future decisions based on a current snapshot of employee schedules
      4. Static: Yes, no meeting would happen unless scheduled by the AI

     5.   Discrete: Yes, there are a finite number of possible actions and states (rooms are all open, rooms are all closed, some are open for meetings, etc.)
     6.   Single-Agent: Yes, the only agent in play in the environment would be the scheduler AI

4.
a. Taking a test on a curve. You can do either really bad or really good, but because you rely on the test scores of the other students, you no longer have a deterministic result of whatever you choose.
b. Any board game, (Uno). Throughout the game, you can never know exactly what cards other players have, but you can know what cards you have and the number of cards of other players.
c. Building a building. There are many moving parts to a building, as well as multiple people doing different things. Architects, engineers, and management are all examples of different agents involved, so building a building is a task that has multiple agents.
d. Driving. This is a great example of a dynamically changing state, because no matter when you made a decision, you know that during that time the state will be changing. If you take a long time to decide to get into the left lane, between the time you decided to go there and when you started thinking what to do next, there could be another driver now preventing you from changing lanes.