**Artificial Intelligence - Chapter 1: Exercises Solutions**

# Exercises 1.1 - 1.15

**1.1 Define in your own words:** (a) Intelligence: Ability to perceive, reason, and act effectively. (b) Artificial Intelligence: Machines or programs that perform tasks requiring human-like intelligence. (c) Agent: An entity that perceives its environment and acts. (d) Rationality: Acting to maximize performance measure. (e) Logical reasoning: Drawing valid conclusions from facts and rules.

**1.2 Turing Test and objections:** - Some objections still valid: consciousness, understanding, emotions. - His refutations partially valid; modern AI shows some capabilities. - New objections: bias in data, ethical concerns. - Probability of passing 5-min Turing test today: ~60-70%; next 50 years: could exceed 90%.

**1.3 Reflex actions:** - Reflex actions are not intelligent but may be rational in safety context.

**1.4 High IQ program:** - IQ 200 doesn’t mean human-level intelligence; intelligence is broader (emotions, creativity).

**1.5 Sea slug vs computer:** - Sea slug: ~20,000 neurons, cycle ~1ms → 20,000 updates/ms. - Modern computer (Fig 1.3): billions of operations/sec → vastly higher computational power.

**1.6 Introspection:** - Can be inaccurate; we may misreport thoughts or be unaware of mental processes.

**1.7 AI systems instances:** - Bar code scanners: Not AI. - Web search engines: AI (ranking algorithms). - Voice menus: Weak AI. - Internet routing: AI-like dynamic response.

**1.8 Human vs computational models:** - Brain may compute implicitly; we don’t need conscious knowledge of operations. - Computational analogy describes underlying process.

**1.9 Evolution and rationality:** - Evolution favors behavior maximizing survival and reproduction (rational goals).

**1.10 AI: science or engineering:** - Both: science (understanding intelligence), engineering (building systems).

**1.11 Computers only do what programmers tell them:** - True in literal sense, but can exhibit emergent intelligence via learning.

**1.12 Animals do only what genes tell them:** - Partially true; behavior shaped by genes + environment; does not negate intelligence.

**1.13 Atoms obey physics:** - True; intelligence emerges from interactions of physical elements.

**1.14 Current computer capabilities:** (a) Ping-Pong: partially feasible with robotics. (b) Driving Cairo: difficult. (c) Driving Victorville: feasible with self-driving cars. (d) Grocery shopping offline: challenging. (e) Grocery shopping online: feasible. (f) Bridge competitive play: partially feasible. (g) New theorem discovery: partially feasible (automated theorem provers). (h) Funny story: weak AI only. (i) Legal advice: partially feasible. (j) Real-time English-Swedish translation: feasible with modern NLP. (k) Complex surgery: partially feasible (robot-assisted).

**1.15 AI contests:** - DARPA Grand Challenge: autonomous driving. - RoboCup: robotic soccer. - TREC: information retrieval. - Machine translation competitions. - International Planning Competition. - Progress: advanced state-of-the-art, but can divert energy from novel ideas.

**End of Solutions**