Task 1: Who Swims Faster?
Mechanisms: Crank vs. Cam
Objective: Compare speed of motion between two systems
Prompt:"Observe the two marine animals operating via Crank and Cam mechanisms. Which one swims faster in AR? Why do you think this happens mechanically?"

Task 2: Gear Power Showdown
Mechanisms: Bevel Gear vs. Worm Gear vs. Gear Train
Objective: Compare force and smoothness of motion
Prompt:"Activate each system with AR and observe. Which gear system pushes the turtle forward most efficiently against current? Which seems smoothest? Why?"

Task 3: Fish Power Battle
Mechanisms: Crank vs. Worm Gear
Objective: Compare torque differences
Prompt: "Scan the fish using each mechanism in AR. Which one shows stronger, slower movement? Why is that?"

Task 4: Movement Match
Mechanisms: Cam, Crank, Geneva
Objective: Match marine animal movement styles to mechanisms
Prompt: "Jellyfish bounces, eel wriggles, turtle glides. Which movement corresponds to which mechanism? What clues led you there?"

Task 5: Turtle Stuck!
Mechanisms: Geneva Stop vs. Crank
Objective: Determine which mechanism best represents interrupted vs. continuous motion. A turtle is shown getting stuck in plastic.
Part 1: Prompt: "Which mechanism best reflects stop-and-go behavior? Switch mechanisms **and observe changes in AR."**
Part 2: Prompt: “Which gear system would help the turtle swim away the fastest? Analyze the kits and explain with torque.”
Part 3: Prompt: “Turtle is slowing down even though there is no problem with the mechanical system. What might be happening? Explain how real life conditions affect.

<u>Answers:</u>

Task 1 – Which one swims faster?
Answer: Crank
Explanation: Crank mechanisms offer continuous, rhythmic motion, while cam systems produce uneven, jerky movement. Crank-driven creatures appear smoother and faster in both physical and AR simulations.

Task 2 – Gear Power Showdown
Answer: Worm Gear
Explanation: The worm gear's slow but high-torque movement allows the turtle to be gently and securely transported out of danger — ideal for precise, steady relocation

Task 3 – Fish Power Battle
Answer: Worm Gear
Explanation: Worm gear systems are designed to produce high torque but low speed. This means they apply a stronger force, though they move more slowly. In the AR experience, the fish powered by the worm gear will appear to move with more effort or power (useful for pushing through resistance, like water currents), while the crank mechanism will appear faster but less forceful. This makes worm gears ideal for tasks requiring strength over speed.

Task 4 – Movement Match
Jellyfish → Cam
Explanation: The up-down pulsing of jellyfish resembles the lift/drop pattern generated by a cam.
Eel → Geneva
Explanation: The eel's segmented, stop-start wriggle reflects Geneva's discrete rotational movement.
Turtle → Crank
Explanation: The turtle glides steadily, which corresponds with crank's smooth, circular motion cycle.

Task 5 – Turtle Stuck!
Answer:
Part 1: Geneva Stop
Explanation: Geneva Stop rotates in fixed intervals, producing a start–stop motion that matches the turtle's interrupted swimming. Crank, by contrast, generates smooth, continuous motion.
Part 2: Crank
Explanation: Crank systems provide continuous rotation with moderate torque, ideal for escaping quickly. Geneva's torque is inconsistent due to its interrupted motion, making it inefficient for swift response.
Part 3: Environmental drag or friction (e.g., plastic entanglement, current resistance)
Explanation: In real life, resistance from external forces like pollution, water drag, or subtle AR misalignment can simulate a slowdown. The system appears mechanically fine, but external variables (e.g., unmodeled drag forces or frame rate issues in AR) alter the experience — mimicking how real ecosystems affect locomotion despite optimal internal conditions.