Part 1

1. Yes, emotion is computation. For something to be a computation, it must take in an input and map it to an output through some function. When we feel emotion, it's in response to some stimuli, which could be visual, auditory, etc. This stimuli acts as an input, which is then processed through our cognition, resulting in some final emotion, or an output.

2. In order for the final statement to be true, the first 2 statements must both be true as well. However, the premise that "no physical object can do X" is not true. Simply because we cannot conceive of a physical object that can do X in the present doesn't mean there will be no physical objects that can do X in the future.

3. The tri-level hypothesis is made up of the computation, representation and algorithm, and physical implementation. Despite being given the same computation and physical implementation as the rest of the students, Gauss was simply able to create a better representation and algorithm for solving the problem by pairing up 1 and 100, 2 and 99, etc. to derive a simple formula for the sum of numbers from 1 to X.

4. Monism claims that there is only one type of substance in the universe, which makes up both mind and body. Dualism claims that there are 2 types of substances: the physical matter that our body is made of and the stuff that the mind is made of. The matter/body is material and perishable, while the mind is immaterial and eternal. Since there are no answers for what this mysterious substance that makes up the mind is, monism typically falls more in line with scientific evidence. For instance, we know that damaging a specific part of your brain results in damage to your mind, or that stimulating specific parts of the brain may lead to specific thoughts, or that stimulating electrical activity in the brain may reduce depression.

5. Examples of structural kinds include steel or graphite, while examples of functional kinds include a knife or a pencil.

6. Programmers have a very direct say in how the computers we know today behave, which means that we can know both what a given computer does and why it does it. This results in the image that computers are very artificial and don't learn/think the way our minds do in a given environment. Even if we take into account processes like neural networks, it's still extremely hard to imagine being able to program a computer to process information and learn from it in a manner that exactly resembles the behavior of the human mind.

7. The biggest flaw in Searle's argument is that the information in the books must have gotten there somehow, so that, by asking the man in the room a question and receiving an answer, the person on the outside is really having a discussion with the author of the books, who does know Chinese. As a result, this argument is essentially broken down because, although the man in the room doesn't have the understanding, another part of the system he belongs to does.

8. The intralaminar nuclei of the thalamus connects to many sensory areas and may connect to cortical neurons to play a role in consciousness.

1. This is because people with higher IQs are more likely to choose to breastfeed their babies due to factors like their knowledge of the health benefits that come with breastfeeding. As a result, breastfed babies appear to have a higher IQ than non-breastfed babies because of genetics rather than the breastfeeding itself.

2. You would use operant conditioning, perhaps by giving positive reinforcement in the form of treats to your dog every time they bark the correct note, and continue doing so note by note until they can bark the whole song.

3. The Bayesian approach attempts to control for results with extremely unlikely outcomes by lowering the necessary p-value required for the results to be meaningful. Typical hypothesis testing requires a p-value of 0.05 or lower for the results to be significant, while a Bayesian approach may require something like a 0.0005 in order to offset the sheer improbability of the outcome. This lower value may be different for each experiment.

4. You would use classical conditioning. You would start with an unconditioned stimulus that causes the unconditioned response of salivation, such as the presentation of food. You could preempt the presentation of food with the conditioned stimulus of a Taylor Swift song. Over time, the dog will associate the conditioned stimulus of Taylor Swift to the conditioned response of salivating.

5. Structuralism tended to ignore the whole human experience and operated entirely under the assumption that our experience could be broken down into the limited set of elements and dimensions that were laid out, which turned out to not be the case.

6. When we detect motion, the main inputs we pay attention to are retinal motion, perceived distance, and our own perceived motion. The combination of having no points of reference to work with and our own inability to fully comprehend how far away the moon is results in us having a very flawed perceived distance of the moon being ~1 mile away. This, combined with the retinal motion of 0 and our own motion, leads us to believe that the moon must be moving with us.

7. The motion after-effect is a phenomenon that occurs when we switch from looking at specific patterns of motion to stationary objects, and causes us to see movement where there is none. This occurs because our motion detection is made up of neurons that detect inward motion and neurons that detect outward motion. When we look at a

display that activates one of these types significantly more than the other, over time, we adapt to listen less to the neurons being activated. As a result, when we look elsewhere, the normal balance of inward/outward is upset, as one is being listened to much more than the other.

8. The neurons that process the various colors in the illusion stop firing at slightly different rates. As a result, when you look away from a certain spot, your motion system misinterprets this timing of the neurons as motion.

Part 3

1. Iconic memory can hold about 4-5 items with respect to a whole report, but this could show improvement for a partial report (12 items in lecture). This memory lasts for 250-300 milliseconds.

2. Visual working memory has an average capacity of 4 items.

3. A typical person has a working memory capable of remembering around 8 digits forwards and 7 digits backwards. On average, this is generally stated as 7 plus or minus 2 items.

4. A visual search is self-terminating, which means we stop when we find the target, while working memory searches are exhaustive, which means each item is checked, whether the target is there or not.

5. The central executive is dysfunctional.

6. The experiment involved taking grandmasters and regular people and giving them a snapshot of a chess game and seeing who could remember more pieces. Afterwards, the pieces were placed in random positions and the groups were given the same task. The grandmasters significantly outperformed the regular people on the first task, but didn't on the second task. This told the experimenters that the grandmasters didn't have an inherently larger memory, but were instead able to use their memory more efficiently by chunking certain pieces with related pieces in the first task. This advantage disappeared when given a random layout that didn't make sense in the context of chess.

7. Examples of implicit learning include getting better at a video game's mechanics with continued play or learning the motor skills for how to play tennis.

8. When using their explicit memories, the subjects performed best when they had to generate the word, followed by when they were given the word with context, followed by when they were given the word without context. When using their implicit memories, the opposite was true. This is because when using implicit memory, actually having seen the word makes the task easier, and seeing the word without the interference of context is ideal. On the other hand, explicit memories benefit from having more mental work put into the encoding process, explaining how generating the word was ideal.

Part 4

1. They use heuristic judgement to simplify the question. They think of the question as asking what percentage of a square is taken up by a circle since it's easier to assess, and 74% is a good estimate for that.

2. The automatic, easy answer of $1 is given to us by our intuition is given to us very quickly, and our more conscious system fails to verify it before answering.

3. If question 1 is asked before question 2, there is no correlation between answers, but if question 2 is asked before question 1, there's a fairly strong correlation between answers. This tells us that our sense of our happiness can be easily driven by more accessible factors, shown by how the evaluation of one's romantic life before answering question 1 causes us to correlate our romantic life with our happiness.

4. Your remembered pain would be 57.

5. An example of violation of dominance is that the population of Chinese people is higher in China than in Asia.

6. Most people will choose the 100% for 1 million dollars because, to the average person, despite the large difference in value, the difference in utility between 1 million and 500 million dollars is relatively low. As a result, they'll take the guaranteed money since the utility would be really high anyways. Someone like Jeff Bezos wouldn't take the 1 million because his wealth gives him a different perspective on the utility of 1 million dollars versus 500 million.

7. A well-defined problem consists of a set of states that define a problem space, a clearly defined initial and goal state, operators that move between states, and path constraints that clarify what solutions are acceptable. To solve a well-defined problem, you could use a heuristic search, where you only consider states/operators that are likely to provide a solution. You could also use satisficing, where you don't bother looking for the best solution, but simply an acceptable one. Finally, you could use means-end analysis, where you divide your problem space up and work towards sub-goals that will ultimately lead to a solution.

8. An example of such a problem is proving whether or not you can cover a chessboard with 2 black corners removed perfectly with dominoes, assuming each domino covers 2 squares. In order to solve this in a reasonable amount of time, you have to remodel the

question so that you think of each domino as covering a white and a black square. Doing this, it's easy to see that in order to cover the board, there must be an equal amount of white and black squares. Since we initially removed 2 black squares, this isn't true, and we proved you cannot cover the chessboard.

9. I think that the thing that stood out the most to me was the idea that free will doesn't physically make sense. I've always seen the free will debate as an extension of the debate over whether or not a higher power exists. If we didn't have free will, there must've been something that controlled us. However, the idea that our brains and bodies are just another physical entity never really occurred to me. When I think of it now, it's almost as if my original stance is flipped. If our minds were somehow able to subvert the laws of physics that should dictate which neurons are firing when and, therefore, what actions we'll perform, surely something resembling a higher power made us that way? If we assume that free will in fact doesn't exist and that our brain is destined to make us behave a certain way since birth, it also makes me wonder if it would be possible to end the free will debate once and for all. If our lives are just the result of a certain sequence of neurons firing, then it should theoretically be possible to map out exactly how someone's life would unfold with enough computational power and the right environment. If someone could provide a correct mapping, then surely the discussion would be over.

Continuing from there, I do also resonate with the point that someone brought up that free will or not, it doesn't really matter. The hypothetical situation where we can explicitly prove if we have free will or not is just a hypothetical. At the end of the day, most people still behave as if free will does exist and that they are responsible for their actions. Based on how I understand free will, it seems to me that it's not really possible for us to comprehend what it would mean for it to not exist. From this, I feel that I end up rerouting my stance back to the idea that free will does in fact exist, because, regardless of how we function internally, our external behavior is still indicative of free will. Since we create understanding from what we observe and experience, I feel that free will, as we understand it, does exist in the world, even if the way we define it isn't correct.