Theoretical Computer Science (M21276)

Part Essential from Mathematics (Review)

(before we start...)

Question 1. We are given the sets $A = \{3, 8, 7, 16, 10, 15\}$ and $B = \{1, 2, 8, 10, 15\}$.

- Is it true that $B \subset A$?
- Which elements belong to the set $A \cup B$?
- Which elements belong to the set $A \cap B$?
- Which elements belong to the set $A \setminus B$?
- What is the meaning and the value of $|A|$?
- Find a subset of B which will be a subset of A as well.
- How many different subsets can you create from the set $\{1, 2, 8\}$? And how many from the set B?

Question 2.

- Are the sets $\{1, 2, 3, 5\}$ and $\{5, 1, 3, 2\}$ different?
- Are the set $\{2, 4, 6, \ldots\}$ and $\{2k - 2, k \in \mathbb{N}\}$ different?

Question 3. If $f(x) = 2x^2 + 3x + 1$, what is $f(2)$?

Question 4. Write down the formula for $1 + 2 + 3 + 4 + \ldots + n$.

Question 5. Given $T(n) = T(n-1) + n$, and $T(1) = 0$, write down the value of (i) $T(3)$, (ii) $T(n)$.

Question 6. What is 4! ?

Question 7. What is the value of: $\sum_{i=1}^{4} i^2$

Question 8. What is the value of:

$$1 + 2 + 4 + 8 + 16 + \cdots + 2^{n-1}?$$

Question 9. What is the meaning of **logarithm**? What is the value (i) $\log_2 8$, (ii) $\log_2 32$, (iii) $\log_2 2^8$?

Question 10. What is the value (i) $\log_2 64 - \log_2 4$, (ii) $\log_2 32 + \log_2 4$?

Question 11. Give a value for n, so that 2^{10} is very close to 10^n.

Question 12. If $T(n) = Kn^2$, and $T(100) = 0.5 \times 10^{-3}$, what is the value of K?

Question 13.[hard] If $T(n) = Kn \log_{10} n$, and $T(100) = 0.5 \times 10^{-3}$, what is the value of n when $T(n)$ is close to 60?