1. *Big-Oh my!* You have been asked to choose one of two possible algorithms. You are given just two facts. First, one algorithm has an asymptotic running time of $O(n^{1.1})$ and the other $O(n \log_2 n)$. Secondly, n will be really huge. Which would you choose and why?

2. *Probability.* Suppose you roll a pair of 6-sided dice. What is the probability that the sum of pairs' values will be even?

3. *Calculus.* Consider the following function:

$$\Gamma(a) = \int_0^\infty t^{a-1} e^{-t} dt.$$

   Show that $\Gamma(a) = (a-1)\Gamma(a-1)$.

4. *Algorithms and data structures.* Consider an undirected graph $G = (V, E)$, where V is the set of its vertices and E its edges. We say G is *bipartite* if there exists a partitioning of the vertices, $V = V_1 \cup V_2$, such that

   a. $V_1 \cap V_2 = \emptyset$, that is, V_1 and V_2 are disjoint; and
   b. for every edge $(u, v) \in E$, $u \in V_1$ and $v \in V_2$ *or* $v \in V_1$ and $u \in V_2$. That is, all edges go between V_1 and V_2, and no edges lie wholly within a single partition.

   Give an algorithm to check whether a graph is bipartite.