The results of this test do NOT count towards your grade. It is given to measure your ability to take the course. No calculators are allowed. Please write your solutions clearly, and legibly.

Compute all solutions like integers (like 2, 3, etc.) or in a simplified form, like $4\pi/15$ for instance.

1. How many rearrangements of $abcd$ are there in which no two adjacent letters are also adjacent letters in the alphabet? For example, no such rearrangements could include either $ab$ or $ba$.


2. If $y + 4 = (x - 2)^2, x + 4 = (y - 2)^2,$ and $x \neq y,$ what is the value of $x^2 + y^2$?


3. One quarter of the world population is Chinese and one fifth of the rest is Indian. What percentage of the world’s non-Indian population is Chinese?

4. Prove: $1^3 + 2^3 + \cdots + n^3 = (n(n + 1)/2)^2.$

5. A garden hose is pumping water out at the rate of 10 cubic centimeters per second. The water is pumped into a cylindrical tank, with radius equal to 5 cm. How fast is the water rising in the tank?