CLASS24

| PAPER CODE | - |
|---|---|
| FORM NUMBER | |

# Genius Seed Program

**(ACADEMIC SESSION 2023 – 2024)**

## National Mathematics Talent Contest 2023

## MOCK TEST – 2 (Junior)

### Time : 3 Hours

**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

- Rulers and compasses are allowed.
- Answer all questions. Each question carries 10 marks.
- Elegant and innovative solutions will get extra marks.
- Diagrams and justification should be given wherever necessary.
- Before answering, fill in the FACE SLIP completely.
- Your ‘rough work’ should be in the answer sheet itself.
- The maximum time allowed is THREE hours.

Name of the Candidate (in Capitals) ______________________________

Form Number : ______________________________

Centre of Examination (In Capitals) : ______________________________

Candidates’s Signature :

Invigilator’s Signature :

**Time : 3 hours** **Mathematics : Mock Test -2**

**1.** (a) If $x=\left(b^{\frac{2015}{2016}}-a^{\frac{2015}{2016}}\right)^{\frac{2016}{2015}}$ find the value of

$$\sqrt[2015]{x^{2015}+\sqrt[2016]{a^{2015}x^{(2015)^2}}}+\sqrt[2015]{x^{2015}+\sqrt[2016]{x^{2015}a^{(2015)^2}}}-b$$

(b) If $N=\sqrt{1+\frac{1}{1^2}+\frac{1}{2^2}}+\sqrt{1+\frac{1}{2^2}+\frac{1}{3^2}}+\ldots+\sqrt{1+\frac{1}{2014^2}+\frac{1}{2015^2}}$

Find [N], the integral part of N.

**2.** (a) a, b, c are nonzero real numbers such that a + b + c = abc and $a^2$ = bc. Prove that $a^2 \geq 3$.

(b) Find all prime numbers x, y, z such that x (x + y) = z + 120.

**3.** Let ABC be an acute angled triangle with BC > AC. Let O be the circumcenter and H, the orthocenter of the triangle ABC. F is the foot of the perpendicular from C on AB and the perpendicular to OF at F meets the side CA at P. Show that ∠FHP = ∠A.

**4.** If ${}^{n}C_r=\frac{n!}{r!(n-r)!}$, then prove $\sqrt{C_1}+\sqrt{C_2}+\ldots+\sqrt{C_n}\leq 2^{n-1}+\frac{n-1}{2}$.

**5.** ABCD is a square E and F are points on BC and CD respectively such that AE cuts the diagonal BD at G and FG is perpendicular to AE. K is a point on FG such that AK = EF. Find the measure of the angle EKF.

**6.** Let $N=2^5+2^{5^2}+2^{5^3}+\ldots+2^{5^{2015}}$

Write in the usual decimal form, find the last two digits of N.