

**THE ASSOCIATION OF MATHEMATICS TEACHERS OF INDIA**  
**SUB JUNIOR GROUP**

**Classes -VII & VIII**  
**Saturday, 22th October\_2016.**

**Instructions :**

1. Answer as many questions as possible.
2. Elegant and novel solutions will get extra credits.
3. Diagrams and explanations should be given wherever necessary.
4. Fill in FACE SLIP and your rough working should be in the answer book.
5. Maximum time allowed is THREE hours.
6. All questions carry equal marks.

1. (a) If  $\frac{x}{a} = \frac{y}{b} = \frac{z}{c} = 2016$ , where  $x, y, z, a, b, c$  are non zero real numbers, find the value of

$$\frac{xyz(a+b)(b+c)(c+a)}{abc(x+y)(y+z)(z+x)}$$

- (b) Four boys Amar, Benny, Charan, Dany, four boys and four girls Azija, Beula, Chitra and Dais have to work on a project. They should form 4 pairs, one boy and one girl in each. They know each other with the following constraints :

- i. Amar knows neither Azija nor Beula
- ii. Benny does not know Beula
- iii. Both Charan and Dany know neither Chitra nor Daisy.

In how many ways can the pairs be formed so that each boy knows the girl in his pair.

2. In a triangle ABC,  $\angle C = 90^\circ$  and  $BC = 3AC$ . Points D, E lie on CB such that  $CD = DE = EB$ . Prove that

$$\angle ABC + \angle AEC + \angle ADC = 90^\circ$$

3. Let  $m, n, p$  be distinct two digit natural numbers. If

$$m = 10a + b, n = 10b + c, p = 10c + a$$

find all possible values of  $\text{GCD}(m, n, p)$ .

4. If  $xy = ab(a+b)$  and

$$x^2 + y^2 - xy = a^3 + b^3$$

find the value of  $\left(\frac{x}{a} - \frac{y}{b}\right) \left(\frac{x}{b} - \frac{y}{a}\right)$

5. The square ABCD of side length  $a$  cm is rotated about A in the clockwise direction by an angle  $45^\circ$  to become the square AB'C'D'. Show that the shaded area is  $(\sqrt{2} - 1)a^2$  square cms.

