

2008 TI Cup Mathematics Contest

(Grade 11)

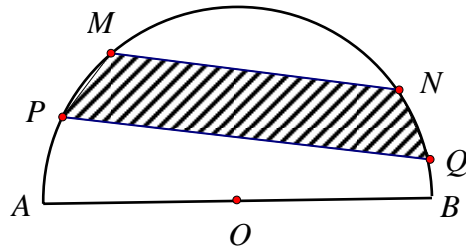
Script for Group Contest

(11:00AM ~ 11:30AM, May 25, 2008)

To solve the problems on this script, please give the necessary steps in your solutions, including your operation steps using the calculators.

I. (20 marks) As shown in the diagram, the shaded region is a section in a semi-circle with centre O . Given that chord MN is parallel to chord PQ , the distance between chords MN and PQ is 2m, $MN = 6\text{m}$, and $PQ = 8\text{m}$, find the length of arc MP (to the nearest 0.001m).

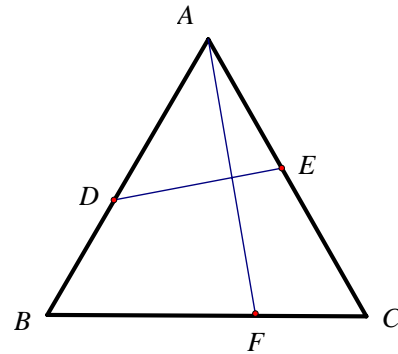
[Solution]



School _____ Name _____ Grade _____ Gender _____ Admission No. _____
.....Binding.....

II. (20 marks) ABC is an equilateral triangle with sides of length 1, and D and E are points on the sides AB and AC respectively. The triangle is folded along DE such that the vertex A lies directly on top of the point F on side BC . If $BD = x$ and $BF = y$, find a relationship between x and y , and sketch it in the Cartesian plane. Find the range of possible values of x .

[Solution]



III. (20 marks) The set S ($S \subseteq N_+$) is defined as a “good set” if for any x ($x \in S$), the sum of elements of any non-empty subset of $S \setminus \{x\}$ is not divisible by x . ($S \setminus \{x\}$ is the set of all elements in S excluding x)

(1) If $\{3, 4, n\}$ is a “good set”, find n_0 , the minimum value of n ;

(2) Prove that set $\{3, 4, n_0, m\}$ is not a “good set”, where $m \in N_+$.