

Grading Scheme

6th Iranian Geometry Olympiad



September 2019

Elementary Level

Problem 1.

3 points. Easy case of A (1 point), the other case (2 points)

2 points. Cases of B

3 points. Easy case of C (1 point), the other case (2 points)

Problem 2.

First Solution. the official solution (appeared in the booklet)

2 points. Construction of KPLC.

2 points. Using Thales's theorem for collinearities.

3 points. Proving KPLC is a parallelogram

1 point. Finishing the solution.

Second Solution.

3 points. Drawing perpendicular lines from N and T.

2 points. Calculation of distances of M to feet of perpendiculars.

3 points. Finishing the proof using Thales' theorem.

Problem 3.

8 points. Complete Solution

Comment.

0 points for correct answer without proof.

Problem 4.

1 point. Introducing point F.

3 points. Congruence of FAD and CAD.

4 points. Finishing the solution.

Problem 5.

3 points. Proving there are at most 2 bisector diagonals.

5 points. Correct example together with justification.

Comment. In case of drawing an example without checking the required condition 4 points of the second part will be deducted.

Intermediate Level

Problem 1.

8 points. Finishing the solution.

Comment. At most 4 points for incomplete angle chasing.

Problem 2.

4 points. Proof for convex quadrilateral case.

4 points. Proof for concave quadrilateral case.

Problem 3.

6 points. Proof of the case l_1, l_2, l_3 are not parallel.

1 point. Construction of X, Y and Z

4 points. Perpendicular bisectors are angle bisectors of XYZ

1 point. Finishing the solution.

2 points. The case where two lines are parallel.

Problem 4.

1 point: Equivalent assertion (R is orthocenter)

1 point: Elementary properties of R and S. ($\angle BRS = \angle PTD$)

1 point. Elementary properties of point Q (ACPQ parallelogram)

2 points. Congruence of triangles ARB, CTD and its consequences.

3 points. Finishing the solution.

Problem 5.

1 point. $CE \cdot CA = CI \cdot CF$

5 points. $AE < CE$ (assuming contradiction)

2 points. $AE \geq CE$ or $AF \geq BF$.

Advanced Level

Problem 1.

2 points. $AYBC$ is cyclic and computations for angle CYB .

3 points. $PYBX$ or $ZQBY$ is cyclic.

3 points. Finishing the solution.

Problem 2.

8 points. Complete Solution.

Comment.

0 points for correct answer without proof.

Problem 3.

3 points. PN and PM are tangents (using pole and polar)

1 point. $AMNB$ are on a circle with diameter AB .

For the continuation we have different solutions.

First Solution. the official solution (appeared in the booklet)

2 points. Considering A' and collinearity with N, B (similar for B')

2 points. Finishing the solution.

Second Solution. Menelaus' theorem.

2 points. Lines AN and BM intersect on the radical axis.

2 points. Finishing the solution.

Third Solution.

1 point. MN passes through outer homothety center of circles.

1 point. BM and AN are intersecting on the radical axis.

2 points. Finishing the solution.

Problem 4.

1 point. ZT is the bisector of BTC (or equivalents)

2 points. Two circles are tangent at T.

2 points. K is the center of Ω .

3 points. Ω is tangent to two other circles.

Problem 5.

2 points. Inversion with center on the focus of the parabola.

1 point. True radius of inversion.

1 point. H lies on the incircle (and I on the line of symmetry).

2 points. Mentioning and proving properties of a triangle which its orthocenter lies on the incircle. ($r^2 = 4R^2 \cos A \cos B \cos C$)

2 points. Finishing the solution.