

9th World Mathematics Team Championship 2018

Intermediate Level Individual Round 2

English Version

Instructions: This round has 8 questions (**40 minutes**).

Question numbers 1, 2, 3, 4, 5 and 6 are worth 4 points each.

Question numbers 7 and 8 are worth 8 points each.

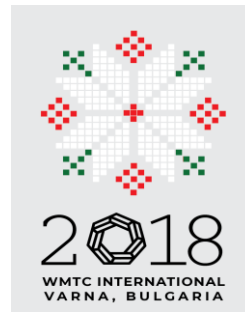
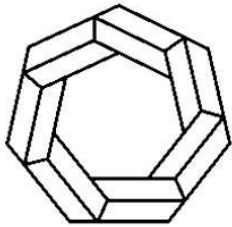
No point penalty for submitting wrong answers.

1. Car with 4 wheels and 1 spare tire travelled for 1000 kilometers. Denote the five tires used by A, B, C, D and E . Tires A and B have been used at the same time on the car for 550 km and tires C and D have been used at the same time on the car for 700 km. Determine how many kilometers tire E has been in use.
2. For a quadrilateral $ABCD$ we have $BC = CD = DA$ and $\angle BAD + \angle ABC = 120^\circ$. If AC and BD intersect at point O find $\angle AOB$.

3. For the sequence $a_1, a_2, \dots, a_{2018}$, where $a_1 = 2$ and $a_{n+1} = \frac{a_n^2 + 1}{2}$, find

$$a_{2018}^2 - (a_1 - 1)^2 - (a_2 - 1)^2 - \dots - (a_{2018} - 1)^2.$$

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4. In a triangle ABC the angle between altitudes from A and B equals 100° . Find the angle between the angular bisectors of angle A and angle B .
 5. A 3-digit number \overline{abc} is called *good* if $\overline{abc} + \overline{cba}$ has only odd digits. Find the number of good integers.
 6. Points P and Q on the sides AB and AC of right triangle ABC ($\angle B = 90^\circ$) are such that $AP = 2PB$ and $AQ = QC$. If $CP = 2018$ cm find the length of PQ .
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7. Amy has 5 different rings. She wants to put them on the four fingers (without the thumb) of her right hand. In how many ways can she do this? (The order of the rings on a finger matters and it is not obligatory for each finger to have a ring.)
 8. To prepare for WMTC a student solved n problems during 31 day period. It is known that:
 - From day 1 to day 14 inclusive he solved in average 5 problems per day
 - From day 12 to day 31 inclusive he solved in average 3 problems per dayFind the number of different values of n for which this is possible.