International Mathematics Competition (TIMC 2016)

Chiang Mai, Thailand 14 - 20 August 2016

Elementary Mathematics International Contest

Individual Contest

Time limit: 90 minutes

Instructions:

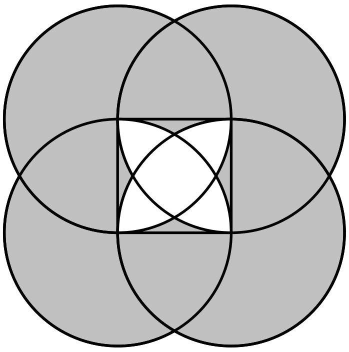
- Do not turn to the first page until you are told to do so.
- Write down your name, your contestant number and your team's name on the answer sheet.
- Write down all answers on the answer sheet. Only Arabic NUMERICAL answers are needed.
- Answer all 15 problems. Each problem is worth 10 points and the total is 150 points. For problems involving more than one answer, full credit will be given only if ALL answers are correct, no partial credit will be given. There is no penalty for a wrong answer.
- Diagrams shown may not be drawn to scale.
- No calculator, calculating device or protractor is allowed.
- Answer the problems with pencil, blue or black ball pen.
- All papers shall be collected at the end of this test.

English Version

1. *ABCDE* is a regular pentagon of side length 1 m. There are 5, 15, 14, 9 and 17 students at the vertices *A*, *B*, *C*, *D* and *E* respectively. The teacher wants the same number of students at each vertex, so some of the students have to walk to other vertices. They may only walk along the sides. What is the minimum total length, in m, the students have to walk?

2. A, B and C run a 200-m race in constant speeds. When A finishes the race, B is 40 m behind A and C is 10 m behind B. When B finishes, C still has to run another 2 seconds. How many seconds does B still have to run when A finishes?

3. With each vertex of a 1 cm by 1 cm square as centre, circles of radius 1 cm are drawn, as shown in the diagram below. How much larger, in cm^2, is the area of the shaded region than the area of a circle of radius 1 cm? (Take $\pi = 3.14$)



4. How many multiples of 18 are there between 8142016 and 8202016?

5. In a basketball game, a foul shot is worth 1 point, a field shot is worth 2 points and a long-range shot is worth 3 points. Stephen makes 8 foul shots and 14 others. If he had made twice as many field shots and half as many long-range shots, he would have scored 7 extra points. How many points has Stephen actually scored?

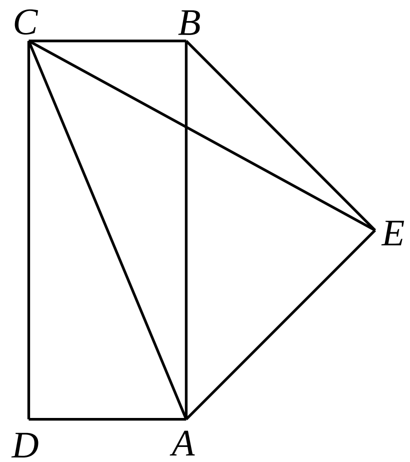
6. John's running speed is twice his walking speed. Both are constant. On his way to school one day, John walks for twice as long as he runs, and the trip takes 30 minutes. The next day, he runs for twice as long as he walks. How many minutes does the same trip take on the second day?

7. Jimmy has some peanuts. On the first day, he eats 13 peanuts in the morning and one tenth of the rest in the afternoon. On the second day, he eats 16 peanuts in the morning and one tenth of the rest in the afternoon. If he has eaten the same number of peanuts on both days, how many peanuts will he have left?

8. The sum of 49 different positive integers is 2016. What is the minimum number of these integers which are odd?

9. The sum of 25 positive integers is 2016. Find the maximum possible value of their greatest common divisor.

10. *ABCD* is the rectangle where $AB = 12$ cm and $BC = 5$ cm. *E* is a point on the opposite side of *AB* to *C*, as shown in the diagram below. If $AE = BE$ and the area of triangle *AEB* is 36 cm^2, find the area, in cm^2, of triangle *AEC*.



11. Anna starts writing down all the prime numbers in order, 235711…. She stops after she has written down ten prime numbers. She now removes 7 of the digits, and treats what is left as a 9-digit number. What is the maximum value of this number?

12. Three two-digit numbers are such that the sum of any two is formed of the same digits as the third number but in reverse order. Find the sum of all three numbers.

13. The sum of two four-digit numbers is a five-digit number. If each of these three numbers reads the same in both directions, how many different four-digit numbers can appear in such an addition?

14. When 2016 is divided by 3, 5 and 11, the respective remainders are 0, 1 and 3. Find the smallest number with the same properties that can be made from the digits 2, 0, 1 and 6, using each at most once.

15. Each student writes down six positive integers, not necessarily distinct, such that their product is less than or equal to their sum, and their sum is less than or equal to 12. If no two students write down the same six numbers, at most how many students are there?