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2014 Korea International Mathematics Competition

21~26 July, 2014, Daejeon City, Korea

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. The age of Max now times the age of Mini a year from now is the square of an integer. The age of Max a year from now times the age of Mini now is also the square of an integer. If Mini is 8 years old now, and Max is now older than 1 but younger than 100, how old is Max now?

2. In a choir, more than $\frac{2}{5}$ but less than $\frac{1}{2}$ of the children are boys. What is the smallest possible number of children in this choir?

3. Each girl wants to ride a horse by herself, but there are only enough horses for $\frac{10}{13}$ of them. If the total number of legs of all the horses and girls is 990, how many girls will have to wait for their turns?

4. Clearly, $\frac{23}{30}=\frac{57}{78}$ is incorrect. However, if the same positive integer is subtracted from each of 23, 30, 57 and 78, then it will be correct. What is the number to be subtracted?

5. A team is to be chosen from 4 girls and 6 boys. The only requirement is that it must contain at least 2 girls. How many different teams may be chosen?

6. The product of five positive integers is 2014. How many different values are possible as their sum?

7. A cat has caught three times as many black mice as white mice. Each day, she eats 6 black mice and 4 white mice. After a few days, there are 60 black mice and 4 white mice left. How many mice has the cat caught?

8. *M* is the midpoint of the side *CD* of a square *ABCD* of side length 24 cm. *P* is a point such that *PA* = *PB* = *PM*. What is the minimum length, in cm, of *PM*?

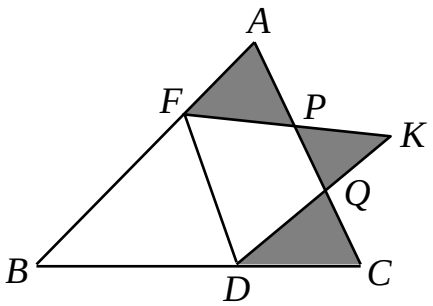
9. In a party, every two people shake hands except for Bob, who only shakes hands with some of the people. No two people shake hands more than once. If the total number of handshakes is 2014, with how many people does Bob shake hands?

10. The cost of a ticket for a concert is \$26 for an adult, \$18 for a youth and \$10 for a child. The total cost of a party of 131 people is \$2014. How many more children than adults are in the party?

11. Two overlapping squares with parallel sides are such that the part common to both squares has an area of 4 cm^2. This is $\frac{1}{9}$ the area of the larger square and $\frac{1}{4}$ of the area of the smaller square. What is the minimum perimeter, in cm, of the eight-sided figure formed by the overlapping squares?

12. The number of stars in the sky is $8 \times 12 + 98 \times 102 + 998 \times 1002 + \cdots + 99\cdots98 \times 100\cdots02$. In the last term, there are 2014 copies of the digit 9 in $99\cdots98$ and 2014 copies of the digit 0 in $100\cdots02$. What is the sum of the digits of the number of stars?

13. In a triangle ABC, D is a point on BC and F is a point on AB. The point K of reflection of B across DF is on the opposite side of AC to B. AC intersects FK at P and DK at Q. The total area of triangles AFP, PKQ and QDC is 10 cm^2. If we add to this the area of the quadrilateral $DFPQ$, we obtain $\frac{2}{3}$ of the area of ABC. What is the area, in cm^2, of triangle ABC?



14. After Nadia goes up a hill, she finds a level path on top of length 2.5 km. At the end of it, she goes down the hill to a pond. Later, she goes back along the same route. Her walking speed is 5 kph, but it decreases to 4 kph going up the hill, and increases to 6 kph going down the hill. Her outward journey takes 1 hour 36 minutes but her return journey takes 1 hour 39 minutes. She does not stop anywhere at any time. What is the length, in km, from start point to the pond?

15. Five colours are available for the painting of the six faces of a cube. One colour is used to paint two of the faces, while each of the other four colours is used to paint one face. How many differently painted cubes can there be? Two cubes painting the same colours on corresponding faces after rotation or flip are not considered to be different.