InIMC - 2017
India International Mathematics Competition
Organized by - CITY MONTESSORI INTER COLLEGE, RDSO Campus, Lucknow - INDIA
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Elementary Mathematics International Contest

Individual Contest

Time limit: 90 minutes

Information:

- You are allowed 90 minutes for this paper, consisting of 15 questions to which only numerical answers are required.
- Each question is worth 10 points. No partial credits are given. There are no penalties for incorrect answers, but you must not give more than the number of answers being asked for. For questions asking for several answers, full credit will only be given if all correct answers are found.
- Diagrams shown may not be drawn to scale.

Instructions:

- Write down your name, your contestant number and your team's name on the answer sheet.
- Enter your answers in the space provided on the answer sheet.
- You must use either a pencil or a ball-point pen which is either black or blue.
- You may not use instruments such as protractors, calculators and electronic devices.
- At the end of the contest, you must hand in the envelope containing the question paper, your answer sheet and all scratch papers.

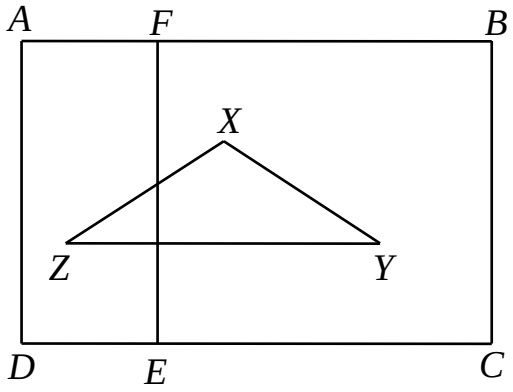
English Version

Team: _____ ***Name:*** _____ ***No.:*** _____

1. The sum of the reciprocals of three positive integers is 1. It is known that one of them is a multiple of 2 and another one is a multiple of 3.The quotient when the multiple of 2 is divided by 2 is added to the quotient when the multiple of 3 is divided by 3. What is the largest possible sum of the two quotients?

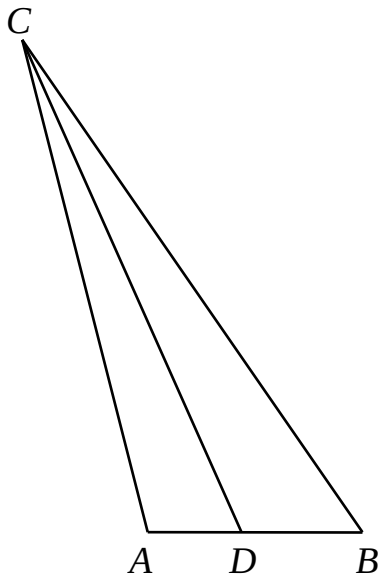
2. Weni cuts a long loaf of bread into 10 equal pieces but leaves the entire loaf together. Lia and Anggi also did the same thing on the same loaf of bread, but cutting it into 15 and 18 equal pieces, then the loaf falls apart. How many pieces are there altogether?

3. Suppose a rectangle $ABCD$ has area 2016 cm^2. E is a point on CD and F is a point on AB such that EF is parallel to AD. The distance from X to CD is twice the distance from X to AB. The distance from Y or Z to AB is twice the distance from Y or Z to CD. The distance from Y to EF is twice the distance from Y to BC. The distance from Z to EF is twice the distance from Z to AD. Find the area, in cm^2, of triangle XYZ.



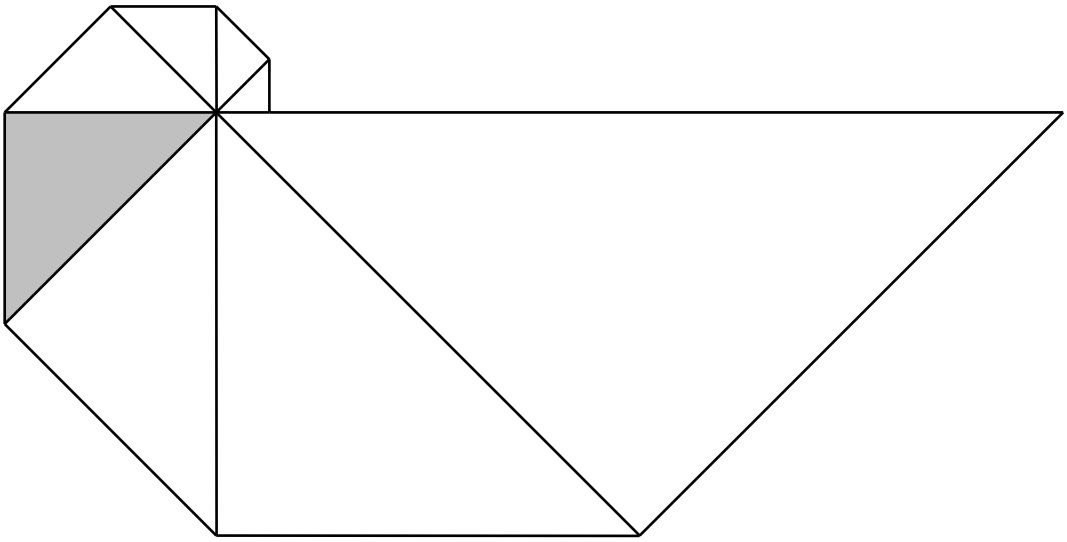
4. Each of A and B, both starting with 50 dollars each, are taking turns in tossing a coin. If the coin lands heads, the other player losses 4 dollars and if the coin lands tails, the other player wins 3 dollars. After each player has tossed the coin 10 times, A has 42 dollars more than B. If A got heads 6 times, how many times did B get heads?

5. In $\triangle ABC$, $\angle A = 2\angle B$, CD bisects $\angle ACB$, $AC = 11\,\text{cm}$ and $AD = 2\,\text{cm}$. Find the length, in cm, of BC.



6. Burton calculates the least common multiple of some consecutive positive integers starting from 1. Vargas performs the same computation but includes the next four consecutive positive integers from Burton's list. If they have the same answer, what is the smallest possible value of the largest number of Burton's positive integers?

7. The diagram shows eight isosceles right triangles placed around a point so that the hypotenuse of each triangle coincides with the leg of the next triangle. If the total area of all eight triangles is 637.5 cm^2, find the area, in cm^2, of the shaded triangle.

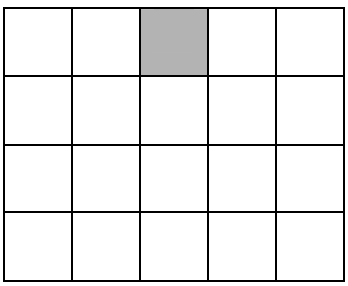


8. Mary writes down 2017 on the first day. Every day after, she writes down the sum of the cubes of the digits of the number of the preceding day. What number will Mary write down on the 2017th day?

9. How many distinct 4-digit numbers are there such that sum of the first three digits is 20 and sum of the last three digits is 17?

10. In how many ways can 1, 2, 3, 4, 5 and 6 be arranged in a row so that the difference between any two adjacent numbers is not equal to 3?

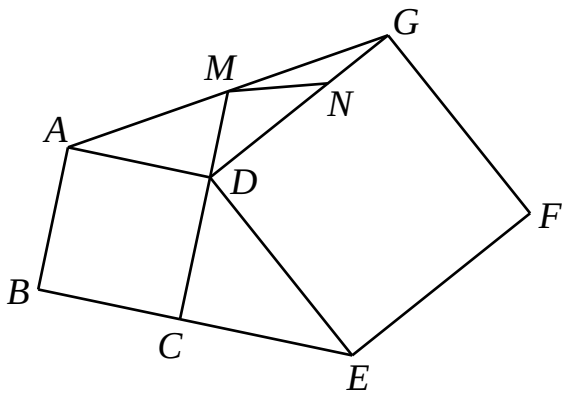
11. In the diagram, the middle square on the top row of a 4×5 rectangle is shaded. How many rectangles can be formed using some of the 20 unit squares, which contain the shaded square?



12. Angus writes down all odd positive integers from 1 to 2017, and then removes all the digits that are even. How many digits are left?

13. A 2017-digit number begins with 3. The number formed by any two adjacent digits is either divisible by 17 or 23. There are exactly two such integers that can be formed. What is the positive difference between them?

14. There are two squares *ABCD* and *DEFG*, with *E* on the extension of *BC*, as shown. *M* is the midpoint of *AG* and the length of *DN* is twice of that of *GN*. If the area of triangle *DCE* is 14 cm^2, find the area, in cm^2, of triangle *MDN*.



15. The diagram shows a 7×7 grid composed of 17 black unit squares and 32 white unit squares. Select any 2 unit squares, where the first square is black and second square is white and the 2 squares have no common points. How many different such pairs are there?