Examinee Info. 学生资料

Country/国家: _____ City/市（省）: _____ School/学校: _____

Name/姓名: _____ Sex/性别: _____ Instructor/辅导老师: _____

2013年第九屆“IMC國際數學競賽”(新加坡)
Ninth IMC International Mathematics Contest (Singapore),2013

Primary Five Contest Problem

Examination Time：90 min　Total Point：100points　Score： _____

- Contestant must write down the answer of each problem in the blank, answer with erasure will not be credited!
- For Problem 17 and 18, presentation of solution on the space provided is a must, no credit will be given if only the final answer is written down in the paper!

Multiple Choice	1	2	3	4	5	6	7	8
Answer								
Fill-in the blank	9	10	11	12	13	14	15	16
Answer								

A. Multiple-Choice Problems.（5 points each, a total of 40 points）

1. Compute: 9×99×9999.

   A. 9090909　　B. 8989899　　C. 8909109　　D. 9999999

2. What is the possible number of chess pieces *n* such that could be arranged either as a two layers hollow square or three layers hollow square?

   A. 24　　B. 36　　C. 48　　D. 60

3. What is the 2013^{th} digit after the decimal point when $\frac{10101}{14443}$ is expressed a repeating decimal number?

   A. 9　　B. 6　　C. 3　　D. 0

4. The letters *A* to *Z* are arranged clockwise in a circle. The rules of the operations are as follows: starting from letter *A*, cross out two letters after *A* and crossed out every two letters thereafter. Repeat the operations until all the letters were crossed out. What was the last letter to be crossed out?

   A. I　　B. M　　C. C　　D. V

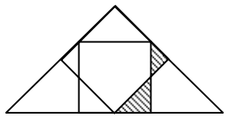
5. There are four mathematical sentence: “□+□=□，□−□=□，□×□=□□，□□□÷□=□□. If you are only allow to use three different digits to place in each □, so that the set up of all the four statements become true, at least how many times will the digits appear most number of times? (the first digit can’t be 0)

   A. 8　　B. 7　　C. 6　　D. 5

6. Find a positive integer such that have a remainder is 1 when it was multiplied by 2 and then divided by 3 while the result of the above computation when multiplied by 2 and then divided by 3 will give a remainder of 1 again. ?

   A. 80　　B. 62　　C. 44　　D. 26

7. Two squares are inscribed in an isosceles right-angled triangle as shown , such that each vertex lies on the side of the triangle. The area of these isosceles right-angled triangle is 90 square units. What is the difference of the two shaded portion?



   A. 2.5　　B. 2　　C. 1.5　　D. 3

8. There are two candles of the same length with different thickness, candle *A* can consume in three hours while candle *B* in 2 hours. During a city electric power failure, Elizabeth lit both candles, later when electric power resume, it was found out the length of candle *A* remain(not yet burn) twice that of candle *B*. How long was the power blackout?

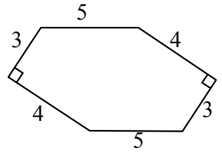
   A. 1　　B. 1.2　　C. 1.5　　D. 1.8

B. Fill in the blank.（5 points each, a total of 40 points）

9. What is the simplified value of $\frac{3}{4}+\frac{5}{36}+\frac{7}{144}+\frac{9}{400}+\frac{11}{900}$

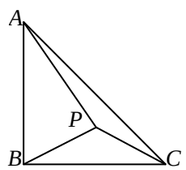
10. Teacher Lily prepared some pens and notebooks to be distributed to a class consists of boys and girls. If each pupil will be given 5 pens and 3 notebooks, then there will be 16 notebooks remain. If each girl will be given 6 pens and 4 notebooks, then each boy will received only 3 pens and 2 notebooks. How many boys are there in the class?

11. Using 2 pieces of wire with 3 dm, 4 dm and 5 dm each to surround a hexagon shape as shown in the diagram at the right such that the parallel sides must use the same lengths, the angle of those two wires with lengths of 3 dm and 4 dm will form a right angle. What is the greatest possible area of this hexagon?



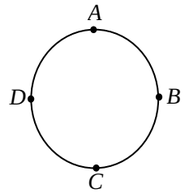
12. There are two three-digit numbers $\overline{abc}$ and $\overline{def}$ satisfy $\overline{abc} - \overline{def} = a+b+c+d+e+f$, the same letter represent the same digit, while distinct letter represent different digit. What is the value of greatest possible three-digit number $\overline{def}$?

13. Refer the isosceles right-angled ΔABC at the right, PB=5. If the area of ΔAPB and ΔBPC are 16 and 12 respectively, then what is the area of ΔAPC ?



14. The sum of two three-digit palindrome number is a four-digit palindrome number. For example, 282 + 939 =1221, this kind of expression is called ***palindrome expression***. How many palindrome expressions are there?

15. Points A, B, C and D divide a circular runway of 400 meter into four equal parts. Both Ernest and Dell are standing back to back at point A and run along the circular runway with Ernest in counterclockwise direction and Dell clockwise direction. When Ernest saw Dell has reached the point C, immediately turn back running in clockwise direction but reduce his speed by $\frac{1}{4}$ of his original speed, so Dell was able to catch up Ernest at point D. Suppose Dell will turn back running in counterclockwise direction when he reached point D, then the next time Ernest and Dell meet each other is how many meters from point B?



16. Arrange numbers 1 to 7 in a circle, tabulate the difference between two adjacent numbers (it must be large number minus small number), we discover the largest sum of these seven difference is 24. Then how many ways of arrangement will be?(Arrangement of seven numbers in clockwise or counterclockwise or symmetry is consider as one way)

C. Problem Solving. (10 points each, a total of 20 points. Show your detailed solution on the space below each question)

17. Determine a 7-digit number $\overline{A\ B\ C\ D\ C\ B\ A}$ such that the same letter stands for the same digit and the first digit of this seven-digit number is divisible by 2, the first two digits of the given number is divisible by 3, the first three digits of the given number is divisible by 4, ··· and the given seven-digit number is divisible by 8. What does $\overline{ABCDCBA}$ represent?

18. For a group of numbers that were arranged in one line, let us perform a certain operation to any four neighboring numbers such as *a*, *b*, *c*, *d* by re-arrange it as *d*, *c*, *b*, *a*; such kind of operation is called *a transformation*.
For a series of numbers 1, 2, 3, ...,19, 20;
(a) At least after how many transformation will the number 20 become the first term? List down the step.
(b) Is it possible that the original series of numbers be transform as 20, 13, 1, 2, 3, ...,12, 14, 15, ..., 19? If possible, list down the step or else explain why it is not possible.

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Singapore.Final Grade 5