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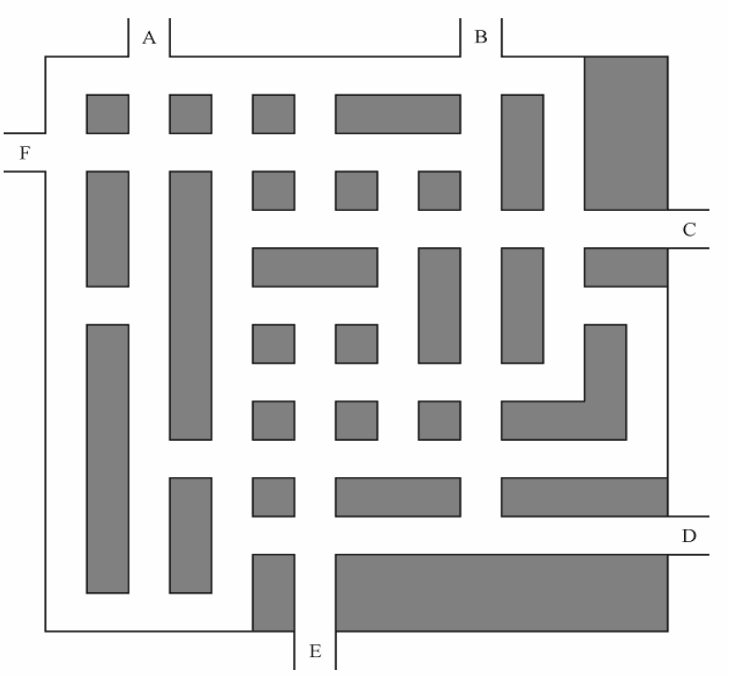
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Po Leung Kuk
11th Primary Mathematics World Contest
Team Contest 2007

Question 1:

The diagram below is the street map of a small town. There is a very strange traffic rule. No turns are allowed at any intersection unless it is impossible to drive straight on. Then both left turns and right turns, if possible, are allowed. Entering the town from point E, it is possible to exit from any other point except one. Which exit is impossible?



Question 2:

There are 10 hats. Each hat is a different colour. Two hats are cotton ($30 each), five are leather ($50 each) and three are wool ($10 each). How many ways are there to buy 5 hats such that the total cost is more than $101 but less than $149?

Question 3:

On a 1×5 board are four counters which are white on one side and black on the other side. A counter can only change position by jumping over at least one other counter and landing on the empty space. When a counter has been jumped over, it is flipped over, but the jumping counter itself is not flipped. The configuration in the diagram below on the left must be changed to that on the right in six jumps. Record each jump by indicating the initial position of the jumping counter. Give one possible solution and its corresponding 6-digit number.



Question 4:

At a certain school, four students ***W***, ***X***, ***Y*** and ***Z*** were predicting their grades before the final examination.

W said: We will all get different grades.
If I get an 'A', then ***Y*** will get a 'D'.

X said: If ***Y*** gets a 'C', then ***W*** will get a 'D'.
W will get a better grade than ***Z***.

Y said: If ***X*** does not get an 'A', then ***W*** will get a 'C'.
If I get a 'B', then ***Z*** will not get a 'D'.

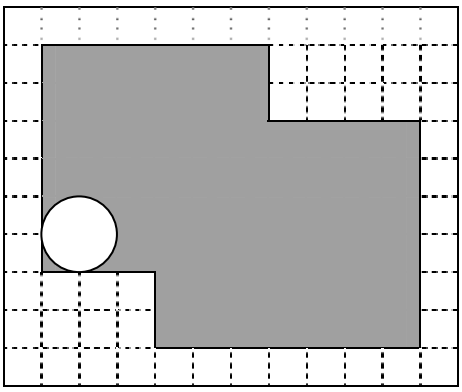
Z said: If ***Y*** gets an 'A', then I will get a 'B'.
If ***X*** does not get a 'B', I will not either.

After the final examination was graded, each of the students got his grade as predicted. What grade did each student get?

Question 5:

A circle of radius 1 cm rolls along the inside lines of the picture. The side length of each small square in the picture is 1 cm. What is the area in square centimetres that the circle covers when it rolls along the inside lines once?

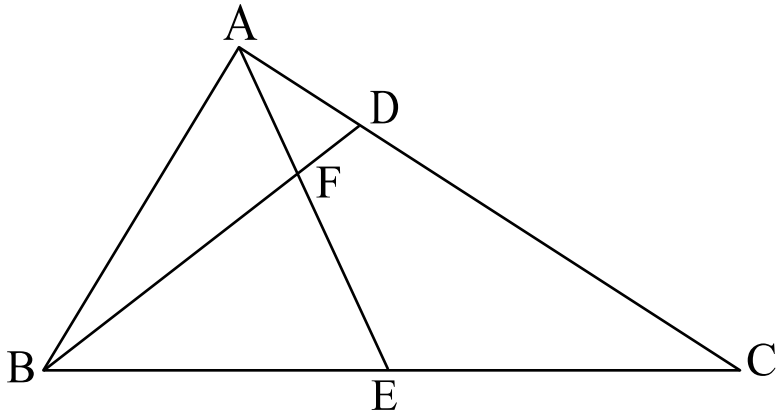
(Take $\pi = 3.14$)



Question 6:

In ΔABC, E is the midpoint of BC. F is on AE where $AE = 3AF$. BF meets AC at D as shown in the figure.

If the area of $\Delta ABC = 48$, find the area of ΔAFD.



Question 7:

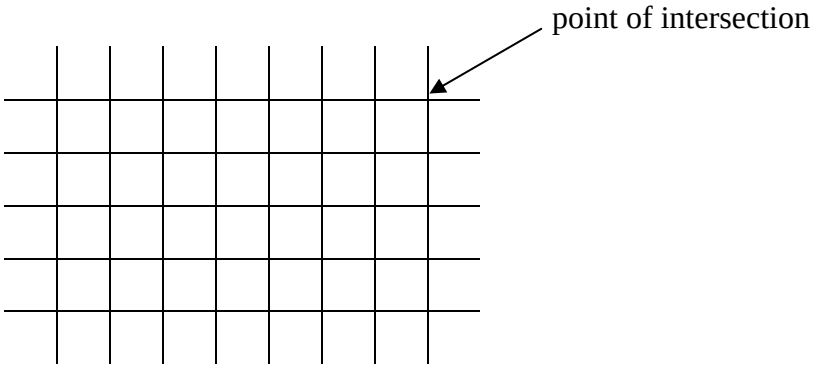
Consecutive counting numbers are grouped as follows:

(1), (2, 3), (4, 5, 6), (7, 8, 9, 10), . . .

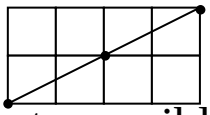
There is one number in the first group, two numbers in the second group, and three numbers in the third group, etc. What is the sum of all numbers in the 2007^{th} group?

Question 8:

A rectangle of area 3456 cm^2 lies on the grid lines of a larger grid which is formed by squares of side 1 cm as shown below:



We call the points where the grid lines meet "points of intersection" For example, the diagonal of a 2 cm × 4 cm rectangle passes through 3 points of intersection.



What is the greatest possible number of points of intersection which a diagonal of the rectangle of area 3456 cm^2 can pass?

Question 9:

There are 20 piles of stones. Each has 100 stones. Choose one of the twenty piles, take one stone from each of the remaining 19 piles and put them onto the chosen pile. This is called an operation. In subsequent operations, you may choose any pile amongst the twenty piles, and repeat the above process. After less than 50 operations, there are 66 stones in one of the piles. The number of stones in another pile is between 170 and 200 (inclusive). What is the exact number of stones in this pile?

Question 10:

A palindromic number is a whole number that is the same when written forwards or backwards (for example, 11511, 22222, 10001). Find the ratio, in proper fraction form, of the number of all five-digit palindromic numbers which are multiples of eleven to the number of all five-digit palindromic numbers.