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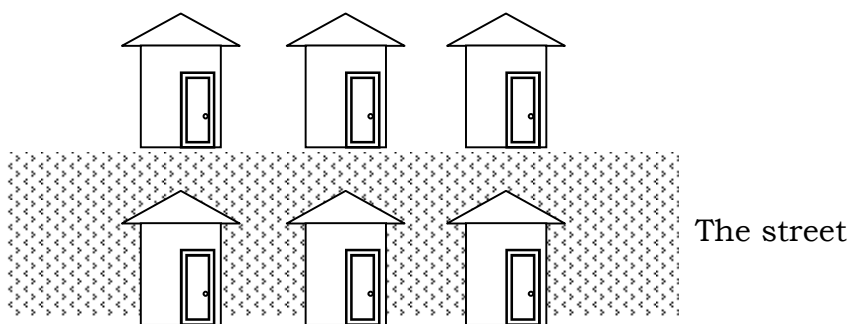
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**Math Essay Problems****IMSO 2011**

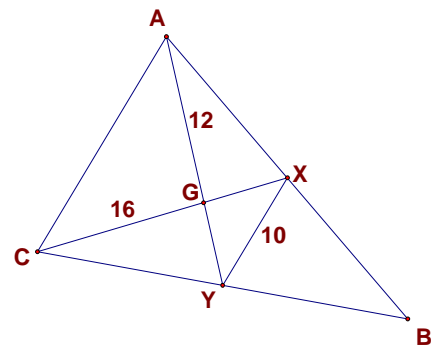
- 1) There are 53 Tuesdays in the year 2019.  
What day is the Pi day (14 March) in the year 2020?
- 2) Let  $a = 0.363636\dots$  and  $b = 0.515$ . Find the digit on the 2011<sup>th</sup> decimal place of the product  $ab$ .
- 3) There are six business establishments located on both sides of a certain street which are named as  $A$  to  $F$ , as figure shown below. The store which was shaded is named as shop  $A$ , the location of the other stores are described in the following relationship:
  - a. the store on the right side of shop  $A$  is a bookstore;
  - b. the front of the bookstore is a flower shop;
  - c. a bakery is located beside the flower shop;
  - d.  $E$  shop is in front of  $D$  shop;
  - e. the hotel is the neighbor of  $E$  shop;
  - f.  $E$  shop and the stationery store are on the same side of the street.What kind of establishment is shop  $A$ ?



- 4) There are 111 apples to be distributed to 9 children. The number of apples received by each child is different. The child receiving the smallest number of apples is kid #1 while the child receiving the most number of apples is kid #9. What is the least number of apples received by kid #9?
- 5) Find all possible six-digit number  $\overline{x2011y}$  that is divisible by 36, where  $x$  and  $y$  are digits.
- 6) A palindrome is a number that can be read the same forwards and backwards. For example, 246642, 131 and 5005 are palindromic numbers. Find the smallest even palindrome that is larger than 56789 which is also divisible by 7.

- 7) Ben and Josh together have to paint 3 houses and 20 fences. It takes Ben 5 hours to paint a house and 3 hours to paint a fence. It takes Josh 2 hours to paint a house and 1 hour to paint a fence. What is the minimum amount of time, in hours, that it takes them to finish painting all of the houses and fences?
- 8) A farmer tells his son to select five watermelons to bring to town to be sold at the weekly farmer's market. Because the watermelons are sold by weight, they must be put on a scale before the trip to town. But the son made a mistake. Instead of weighing them individually, he weighed them in pairs. These are the weights he came up with, in pounds: 20, 22, 23, 24, 25, 26, 27, 28, 30 and 31. How much does each of the watermelons weigh?
- 9) Andy has to fill either Tank A or Tank B. His objective is to have the highest water level in a tank in 20 minutes. Tank A measures 60 cm by 10 cm by 30 cm, while Tank B measures 20 cm by 20 cm by 30 cm. Tank B leaks water at a rate of  $150 \text{ cm}^3$  per minute. Which tank should Andy fill if he uses a pipe with water flowing out  $600 \text{ cm}^3$  per minute?
- 10) How many ways can we select six consecutive positive integers from 1 to 999 so that the tailing of the product of these six consecutive positive integers end with exactly four 0's?
- 11) 276 pupils are seated in a school hall. There are 22 rows of seats and each row has 15 seats. At least how many rows have an equal number of pupils?

- 12) In triangle  $ABC$ , let  $X$  and  $Y$  be the midpoints of side  $AB$  and  $BC$  respectively. Let  $AY$  and  $CX$  intersect at  $G$ . If  $AG = 12$ ,  $CG = 16$  and  $XY = 10$ , what is the area of triangle  $GXY$ ?



- 13) The figure on the right shows a square and 12 congruent semicircles. In particular, points  $C$  and  $D$  are endpoints while points  $A$  and  $B$  are the centers of the semicircles. If the length of  $\overline{AB}$  is 2011, find the total area of all the regions that are shaded?

