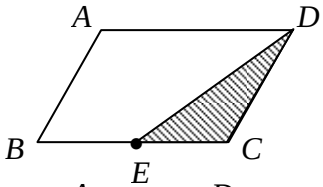
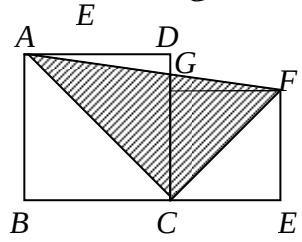
PEMIC PROBLEMS – Team Contest

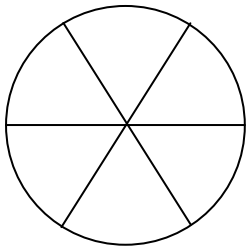
1. In parallelogram *ABCD*, *BE* = *EC*. The area of the shaded region is 2 cm^2. What is the area of parallelogram *ABCD*, in cm^2?



2. Refer to the diagram at the right. The length of one side of the large square is 4 cm and the length of one side of the small square is 3 cm. Find the area of the shaded region, in cm^2.



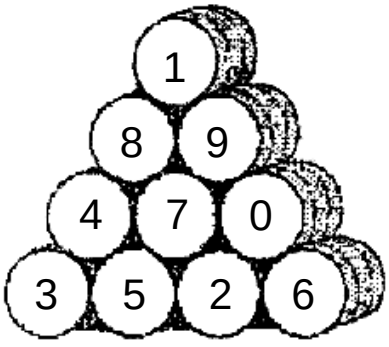
3. The circle below is divided into six equal parts.

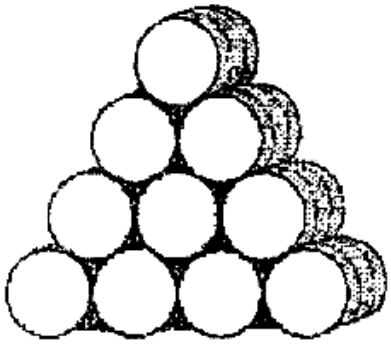


Suppose you paint one or more of these parts black, how many **different** patterns can you form? Any rotation of a pattern will be counted once.

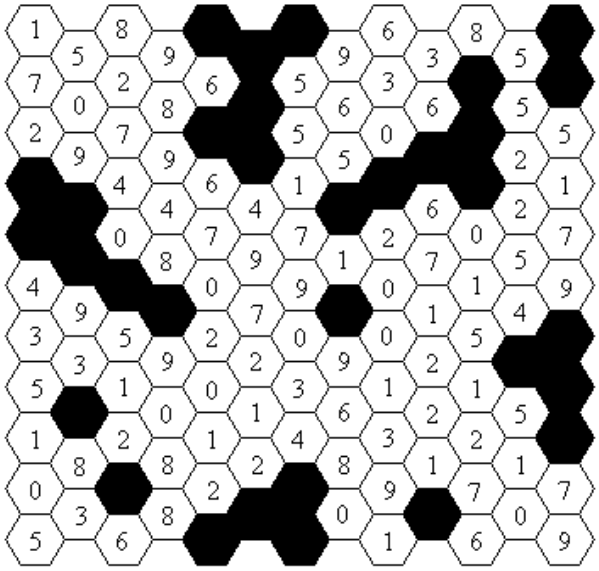
4. Let $n = 9 + 99 + 999 + \cdots + 99999\cdots9$, where the last number to be added consists of 2005 digits of 9. How many times will the digit 1 appear in n?

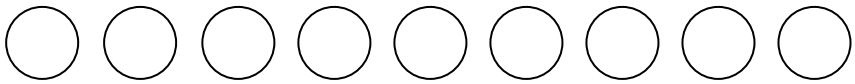
5. A merchant had ten barrels of oil which he arranged as a pyramid, as shown. Every barrel bore a different number. You can see that he had accidentally arranged them so that for each side the numbers add up to 16. Rearrange them so that for each side, the numbers add up to the smallest sum possible. The sum must be the same for all three sides.





6. Find a route from a top cell to a bottom cell of this puzzle that gives 175 as a total. When your route passes any cell adjacent to zero, your total reduces to zero. Each cell may be used only once.



7. 

Arrange the digits 1 – 9 in the circles in such a way that:

1 and 2 and all the digits between them add up to 9.

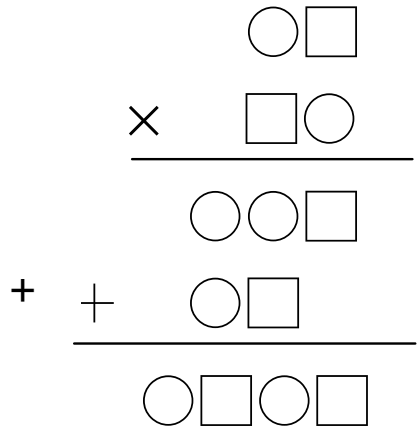
2 and 3 and all the digits between them add up to 19.

3 and 4 and all the digits between them add up to 45.

4 and 5 and all the digits between them add up to 18.

8. During a recent census, a man told the census taker that he had three children all having their birthdays today. When asked about their ages, he replied, “The product of their ages is 72. The sum of their ages is the same as my house number.” The census taker ran towards the door and looked at the house number. “I still can’t tell” the census taker complained. The man replied, “Oh, that’s right. I forgot to tell you that the oldest one likes ice cream.” The census taker promptly wrote down the ages of the three children. How old were they?

9. Digits of the multiplication operation below have been replaced by either a circle or a square. Circles hide odd digits, and squares hide even digits. Fill in the squares and the circles with the missing digits.



10. Donuts are sold only in boxes of 7, 13, or 25. To buy 14 donuts you must order two boxes of 7, but you cannot buy exactly 15 since no combination of boxes contains 15 donuts. What is the largest number of donuts that **cannot** be ordered using combinations of these boxes?