

# Problems of the Month

## Winter 2018

### General Problem:

A certain credit card has 24% nominal interest, compounded monthly. This means that 2% is added to the balance at the end of each month. Assume your credit card has a \$1000 balance on January 1<sup>st</sup>. If you make a \$25 payment each month, what is the balance at the end of the year?

### Calculus Problem:

A so called "fat circle" is the curve given by  $x^n + y^n = 1$  for  $n = 4, 6, 8, \dots$ . If  $L_n$  is the generalized circumference of these fat circles, find the limit below.

$$\lim_{n \rightarrow \infty} L_n$$

### Challenge Problem:

Pat, Shannon and Fido (Their dog) are on a circular path 100 feet around. Fido is very excited. Shannon starts walking around the path maintaining a speed of 1 foot per second, while Pat stays still. Fido begins racing back and forth between Pat and Shannon on the circular path along the section of the path Shannon has NOT walked on. What is Fido's overall average speed if he has just returned to Pat for the 5<sup>th</sup> time when Shannon gets to the half-way point? Assume Fido maintains a constant speed of 3 feet per second for his last run back to Pat. Also assume that Fido met Shannon at equally spaced moments in time (including the starting).

