

Chapter 3 Problems

1) Can you always inscribe a square in a triangle?

2) In the Stillwater High School the economics, English, French, history, Latin, and Mathematics classes, are taught, though not necessarily respectively, by Mrs Arthur, Miss Bascomb, Mrs Conroy, Mr Duval, Mr Eggleston, and Mr Furness.

- The mathematics teacher and the Latin teacher were roommates in their college dorm.
- Eggleston is older than Furness but has not taught as long as the economics teacher.
- As students, Mrs Arthur and Miss Bascomb attended one high school while the others attended a different high school.
- Furness is the French teacher's father.
- The English teacher is the oldest of the six both in age and in years of service. In fact he had the mathematics teacher and the history teacher in class when they were students in the Stillwater High School.
- Mrs Arthur is older than the Latin teacher.

3) A set of dominoes was placed into a flat tray. A photograph was then taken. However, although the numbers can be seen in the photo, the positions of the individual dominoes cannot. Can you find the position of each domino?

Each domino is a rectangle composed of two adjacent squares, each with a number. In the set there is only one domino with each combination of numbers from the numbers 0 through 6. For example, there is one domino with 2,3, and one with 4,4.

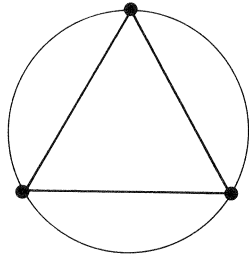
3	6	2	0	0	4	4
6	5	5	1	5	2	3
6	1	1	5	0	6	3
2	2	2	0	0	1	0
2	1	1	4	3	5	5
4	3	6	4	4	2	2
4	5	0	5	3	3	4
1	6	3	0	1	6	6

4) The following is a long division problem where the digits were replaced by X except in the quotient—where they were almost entirely removed.

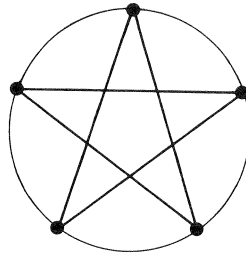
$$\begin{array}{r}
 8 \\
 \hline
 XXX \overline{)XXXXXXXXX} \\
 XXX \\
 \hline
 XXXX \\
 XXX \\
 \hline
 XXXX \\
 XXXX \\
 \hline
 XXXX
 \end{array}$$

One can see that the 8 is the third digit in a five digit answer. Can you recover what the numbers in this long division problem were?

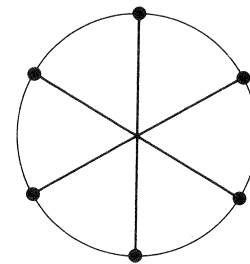
5) A number of pins are placed around a circle. A thread is tied to one pin, and then looped tightly around a second pin so that the clockwise gap between the first and second pin is the same as the clockwise gap between the second and third pin as illustrated in the example:



3 pins, gap of 1



5 pins, gap of 2



6 pins, gap of 3

The process is continued, always preserving the same clockwise gap until the first pin is reached. If some pin has not been used, the process starts again.

Five pins with a gap of two uses just one thread. How many pieces of thread will be needed in general?