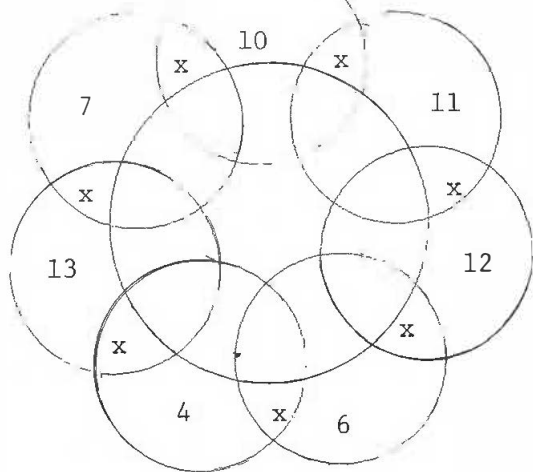


PUZZLES TO PONDER

1. DONALD
GERALD
 ROBERT

Replace the letters in the three names with digits 0, 1, 2, ..., 9 so as to name three numbers in Hindu-Arabic numerals, with the third number being the sum of the first two. To help you get started, D represents 5.

2.



The numerals 1 through 14 are to be placed in the spots marked by x's in the figure so that the sum of each set of three numbers indicated in a small circle is 21. One number in each small circle is named for you.

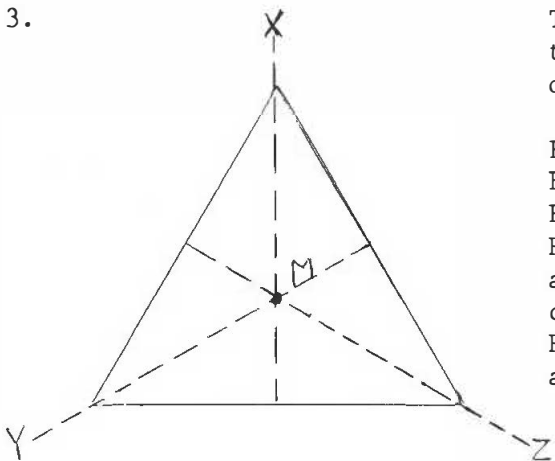
Perhaps the set at the top is 5, 10, 6. After all, $5 + 10 + 6 = 21$.

2. 10, 2, 11, 8, 12, 1, 6, 14
 4, 3, 13, 5, 7, 9.

1. 526485 + 197485 = 723970

ANSWERS TO PUZZLES

3.



The symmetries of an equilateral triangle form a mathematical system of six elements as follows:

Flip about axis X is A.
Flip about axis Y is B.
Flip about axis Z is C.
Rotation counterclockwise 120° about M is D. Rotation counterclockwise 240° about M is E.
Rotation counterclockwise 360° about M is F.

If the operation on the elements A, B, C, D, E, F is "followed by" and symbolized "f", then, for example, $A f B = D$.

- (a) Is the operation closed? commutative? associative?
- (b) Is there an identity element for the operation?
- (c) Are there inverses?
- (d) Does the system change if the axes X, Y, Z are thought of as being a fixed frame of reference external from the triangle, instead of being part of the triangle?

(The foregoing puzzle, or problem, was prompted by a letter received from a Grade VII mathematics student in Forestburg.)