

Problem 1

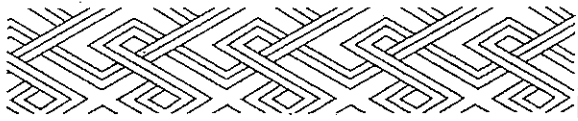
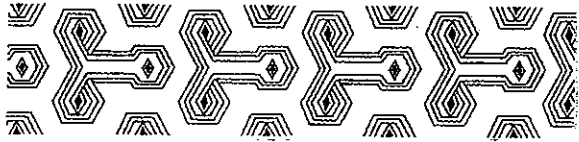
(a) Find the height of a golden rectangle whose perimeter is 5ϕ .

(b) Find the length of a side of a square that has the same area as a rectangle that is 4 by 9.

(c) A pair of newborn male and female rabbits is placed in an enclosure to breed. Suppose that the rabbits start to bear young TWO months after their own birth, and that they have THREE male-female pairs, which in turn mature and start to bear young two months later. Assuming that none of the rabbits die, how many pairs of rabbits will there be at the end of six months from the start?

Problem 11

For the following strip patterns,

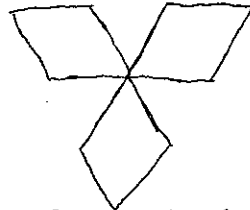
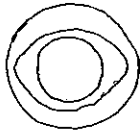


(a) Determine which rigid motions preserve the patterns.

(b) Use the flowchart below to identify the notation for the above strip patterns.

Problem 12

(a) Which rosette pattern do the following figures have?



(b) List the elements of the group of symmetries of a square.

Problem 4

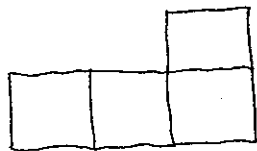
(a) How large is the interior angle of a regular decagon? (A decagon has ten sides.)

(b) How large is the exterior angle of a regular heptagon? (A heptagon has seven sides.)

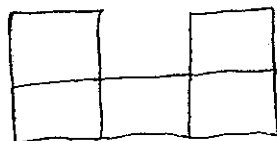
(c) Can a tiling be constructed using squares and octagons? Justify your answer. (Draw a cartoon and/or use the angle formulas.)

(d) Can a regular pentagon tile the plane? Justify your answer.

Problem 14



(a) Show that the above tile can tile the plane using translations only. Use the Translation criterion to justify your answer.



(b) Show that the above tile can tile the plane using translations and half turns only. Use the Conway criterion to justify your answer.

