QUICK 1

KNITTING A PATTERN

Write a _MATHEMATICA_ function  

\[ \text{nice}[a\_, b\_, c\_, m\_, x\_, y\_] \]

which returns

\[ a \ x^2 + c \ x \ y + b \ y^2 \pmod{m} \]

Note that to get \( 12 \mod 5 \) (which is 2) the _MATHEMATICA_ command is  

\[ \text{Mod}[12, 5] \]

Next write a procedure with heading  

\[ \text{paintit}[a\_, b\_, c\_, m\_, x\_, y\_] \]

which causes the display of a square of side 1 with bottom left vertex \((x, y)\), colored with _Hue_ value given by \( \text{nice}[a\_, b\_, m\_, x\_, y\_]/m \). Note that _Hue_ values are to be between 0 and 1, that is why we need to divide the output of _nice_ by \( m \) here. Moreover, recall that the graphic object consisting of a square with opposite vertices \((3, 4), (4, 5)\) and _Hue_ value .23 is given by the _MATHEMATICA_ expression

\[ \{\text{Hue}[.23], \text{Rectangle}[\{3, 4\}, \{4, 5\}]\} \]

Finally write a procedure with heading  

\[ \text{mkshow}[\text{size}\_, a\_, b\_, c\_, m\_] \]

which causes the display of a \( \text{size} \times \text{size} \) array of these colored squares constructed according to _paintit_. To do this simply make a table of such colored squares, store it in “picture” and then end your procedure with the call

\[ \text{Show}[\text{Graphics}[\text{picture}], \text{AspectRatio} > 1] \]

Try your procedures with various choices of the parameters.

As a starter see what you get if you type

\[ \text{mkshow}[50, 1, 3, 13, 17] \]

Have fun trying other values of \( a, b, c, m \).

Here are two patterns that may be obtained by these procedures.