*Heuristic*Problem*Solving*
QUIZ #1

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Q1. [+10] Define "multiplication" on ordered pairs:

$$\langle A, B \rangle \times \langle C, D \rangle = \langle AC + AD + BC, AC + BD \rangle$$

(i) Show that
$$\langle A, B \rangle \times \langle C, D \rangle$$

is simply encoding

$$(AX + B) \cdot (CX + D) \quad \mathrm{mod}\ (X^2 - X - 1).$$

(ii) What is
$$\langle A, B \rangle \times \langle 1, 0 \rangle?$$

(iii) Design an "efficient" algorithm to compute nth Fibonacci Number, which is defined as:[1]

[1] Source: Gosper & Salamin: HAKMEM Item 12.

$$
\begin{aligned}
FIB(0) &= 0; \\
FIB(1) &= 1; \\
FIB(N+1) &= FIB(N) + FIB(N-1); \qquad \forall_{N \geq 1}.
\end{aligned}
$$