Hardware part:

1. Identify which LED's are going to be used. (identifier, Vf and If)
2. Identify microcontroller characteristics
3. if you have two full ports (20 pins), make connections of diodes to eight pins of ports 2. Red and green LEDs in diode will be used for the game.
4. An alternative to using the LEDs is using seven segment displays. You can use a dual package if you want to see both bytes at the "same time"
5. By hand, draw a schematic of what you will connect.
6. Let everything ready to build.
7. write a simple program to test that LEDs are working.

Software part:
You have to program a game which consists in the following:
There are four polynomials:

$$P_0(x) = 25x^3 - 2x^2 + 102x + 5$$

$$P_1(x) = -9x^3 + 6x^2 - 13x + 15$$

$$P_2(x) = x^3 + 25x^2 - 6x + 7$$

$$P_3(x) = 4x^3 + 106x^2 - 110x + 87$$

and four values for x:

$$x_0 = 12, x_1 = -10, x_2 = -15, \text{ and} x_3 = -30$$

The LEDs are flashing together. When the player pushes-and-releases the push button, the LED's turn off and the microcontroller evaluates the polynomial value $P_h(x_j)$, where h and j are randomly selected. Be sure that h and j can appear in any possible combination. **That is, ensure that your algorithm does not always yield the same pair $h - j$.**

The polynomial evaluation must be done using synthetic division. The result should be within $-32,768$ and $32,767$. If it falls outside this range, then the red LED of the PCB is turned on and the player eliminated. If the evaluation is correct, then the green LED of the PCB is turned on and the hex result will be read with the LED's you added.

Since only eight LEDs are being used, first show the LSB, write it down on a page. Then show the MSB and complete the evaluation.

ON PAPER, HANDWRITTEN, write the result in decimal (signed) terms.

Push the button again, and all LEDs should be turned off, including that in the launch-pad PCB. The CPU must be then turned off. Another game can be started by pressing the RESET push button.

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1. The project is due on May 15, NO EXTENSIONS.
2. Any person signing for the project has the right to eliminate four problems from the set of problems of the final (not the one on the 17)

3. Once the student has signed for the project, he/she has only 24 hours to decline doing it. Otherwise, the project becomes compulsory

4. A hard copy of the flowcharts for the main code and each of the subroutines must be prepared.

5. The work can be done with interrupts or with polling, but in any case subroutines must be used.

6. The program must be loaded onto the launchpad, so I can test it.

7. The program must be sent no later than May 15, 12:00 noon, by email to rogelio.palomera@upr.edu. There is a penalty of ten points (from the total final) for each five minutes or fraction after that hour.

8. Documentation in the program MUST include description of resources.

9. If two or three students (no more) worked together, they must present only one work.

10. The professor may ask oral or written questions about the project.

11. For the questions, **IF ONE STUDENT IN A GROUP DOES NOT KNOW THE ANSWER TO A QUESTION AND THE OTHER PEOPLE DO, THEN ALL THE GROUP GET THE PENALTY FOR THAT QUESTION**.

12. For the questions, **IF NEITHER STUDENT IN A GROUP KNOWS THE ANSWER TO A QUESTION FOR A PROGRAM OR SUBROUTINE THAT RUNS PERFECTLY, OR FOR CORRECT HARDWARE CONNECTIONS, THE GROUP GETS 0 IN THE FINAL EXAM, NOT ONLY IN THE PROJECT**.