Objective:

The main objective of this homework is to help you understand the benefits of forwarding and branch prediction. This assignment is much smaller than previous assignments, that said you should not finish it as quickly without giving it much thought. Try to think through the questions thoroughly as it will help you while designing your pipelined processor.

Note: We encourage you to write assembly codes in WiscSP13-ISA. You can write them using MIPS ISA and we will consider those as acceptable answers also. But why not just write it in WiscSP13-ISA so you can use them as personal tests for pipelined implementation part.

Problem 1

A. Write an assembly program to demonstrate forwarding in a pipelined processor implementation. Write your code in `p1.asm`.
B. Also, write an explanation of your program including where and why forwarding takes place. Write your answer in `p1.txt`.

Try to cover as many different types of forwarding as possible.

Problem 2

A. Write an assembly program to demonstrate why branch prediction is necessary and useful. Write your code in `p2.asm`.
B. Write an explanation of your program and how branch prediction helps in `p2.txt`.
C. Will branch prediction always take only 1 cycle? Include your answer in `p2.txt` as well.

What to submit:

Create a zip named `hw4.tar` with the following structure for your answers and submit it on canvas:

```
hw4_1:
    p1.asm
    p1.txt
hw4_2:
    p2.asm
    p2.txt
```