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Homework Quiz (HW #2)

September 19, 2001
CS152 Computer Architecture and Engineering

This quiz covers one of the problems from homework #2.
Good Luck!

Your Name:	
SID Number:	
Discussion Section:	

Total:	

General Base Conversions

In homework problem 3.22, you were asked to write a MIPS assembly language program to convert an ASCII decimal string to *32-bit* integer. For this quiz, construct a similar program that can convert a decimal string into an *arbitrary-precision* integer.

- The first argument (a0) contains a pointer to a null-terminated input string
- The Second argument (a1) contains a *pointer* to an array of words in memory for the result, least-significant word first.
- On exit, v0 will contain the number of 32-bit words in the result (at least 1), or an error.
- This procedure (call it "atoapi") must adhere to all MIPS conventions

If any character in the string (before the final null character) is not a legal character for the specified base, then v0 should contain an error code of –1. Also, a zero-length string should return –1.

Examples:

If the input string is "0", the output memory at [a1] will contain 1 word (0), and v0 = 1
If the input string is "452" the output memory at [a1] will contain 1 word (452), and v0 = 1

If the input string is "4294967298", which is $2^{32}+2$, then the output memory pointed at by a0 will contain a "2" for the first word (least-significant word) and a "1" for the second word. Further, v0 = 2.

If the input string is "6B7" the result register, should contain –1
If the input string is "" (i.e. first character is null), the result register should contain –1

The important portion of the ASCII character table is as follows (Note that values are in HEX notation):

Character	ASCII Value
"0"	0x30
"1"	0x31
"2"	0x32
"3"	0x33
"4"	0x34
"5"	0x35
"6"	0x36
"7"	0x37
"8"	0x38
"9"	0x39

The MIPS instruction set is included as an attachment. Write this routine in as few instructions as possible on the following page. Assume the virtual MIPS machine (no branch delay slots). *Hint: start by writing a "times-ten" routing that takes the current number in your memory register (pointed at by a0 and of some length) and multiplies it by 10. Possibly extending the number of words as necessary.*

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[This page is for your answer]