**Architecture Homework**

Moore’s Law predicts a 13% increase in speed each year. If an Intel i7 is 16 microns wide and currently runs at 3GHz, what is the predicted speed in 10 years? \*

* + 10.18 GHz



* + ***9.6 GHz***



* + 33.6 GHz



* + 13 GHz



Answer: By compute by each year an increasing of 13%

Look at the SPEC benchmark kernels (either CINT or CFP) at [http://www.spec.org/cpu2006/](http://www.google.com/url?q=http%3A%2F%2Fwww.spec.org%2Fcpu2006%2F&sa=D&sntz=1&usg=AFQjCNEPT3xyhvlH-l5iTvlfVh_CQmtpug).

Why are there so many varieties of benchmark programs? \*

* + ***Because some of the benchmarks are for legacy systems.***



* + Because some of the benchmarks have been adjusted in order to keep backwards compatibility.



* + Because different benchmarks target different program behaviors.



* + Because SPEC is almost considered obsolete, especially for highly parallel systems.



Your old computer earned a 51 on the SPEC integer benchmark, while your new one earned a 64 (higher is better). But your program runs 20% slower on your new computer than your old one. Why might this be? \*

* + The SPEC benchmark is obsolete.



* + Your program doesn't do many integer operations.



* + ***Your program doesn't do many floating point operations***.



* + Your program uses hyperthreading.



Your program currently takes 3 seconds to complete. You realize 80% of that time is spent inside a certain loop, representing 10% of the total source code. If you optimize that loop to double its speed, what is the expected program execution time? \*

* + 2.1 seconds



* + 0.8 seconds



* + 6.2 seconds



* + ***1.8 seconds*** (3 – 3\*0.8/2 = 1.2 = 1.8)



Represent 65 (decimal) in 8-bit binary. \*

* + 0100 1101



* + 0100 0011



* + 0101 0001



* + ***0100 0001***



Answers: 0100 0001

Take 65 and divide to 2 and get the remains

Represent 65 (decimal) in hexadecimal. \*

* + ***0x41***



* + 0x40



* + 0x65



* + 0x56



Answer: 0x41

Take 65 and divide to 16

Represent 123 (decimal) in 8-bit binary. \*

* + ***0111 1011***



* + 0111 1101



* + 0111 1010



* + 0111 0001



Answers: 0111 1011

Take 65 and divide to 2 and get the remains

Represent 123 (decimal) in hexadecimal. \*

* + 0x7A



* + ***0x7B***



* + 0x8B



* + 0x23



Answer: 0x7B

Take 65 and divide to 16

Represent 987,654,321 in 32-bit hexadecimal big-endian format. \*



Change to binary: 0011 1010 1101 1110 0110 1000 1011 0001

In big-endian, we store the MOST significant byte in the smallest address. So the result is changed to hex: ***05 E3 0A 6D***

This is a required question

Represent 987,654,321 in 32-bit hexadecimal little-endian format. \*



Change to binary: 0011 1010 1101 1110 0110 1000 1011 0001

In little-endian, we store the LEAST significant byte in the smallest address. So change the binary to 0110 1101 0000 1010 1110 0011 0000 0101

So the hex is ***6D 0A E3 05***

Suppose a computer has 2MB of memory. How wide is the address bus? \*

* + 19 bits



* + 20 bits



* + ***21 bits*** (1byte = 8 bits and 1MB = 2^20 bits => 2MB = 2^21 bits => 21 bits)



* + 22 bits



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