The CPU - Central Processing Unit

The CPU - Central Processing Unit | Tech Tips Podcast by PcCG

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What is the CPU?

The CPU is the "brain" of the computer. *(See here for other parts of the computer)* [2] It does the thinking, the "processing" of information and is one of the 3 critical components that relate to the speed of the computer. The main CPU makers today are Intel and AMD. At least one of these is in every computer sold today, most of the time you can find a sticker on the machine indicating which it has.

CPU's have several factors that are worth considering. It's not critical for this to all sink in, but still interesting to point out.

Multi-core CPU's are standard these days. That that means generally is instead of having "one brain", it has 2 or more. Older computers were single-core, one brain. Modern processors have between 2 and 8 cores… almost like having 2-8 CPU's, just on a single chip. This has been one of the main factors in CPU speed increase over the past decade.

Gigahertz (GHz) is the "clock speed". Think of it like RPM (rotations per minute) of a car engine. It is a factor, not as important as most people think. Just like car engines produce different power at different RPM's, the same is true for CPU's. Some are actually more powerful at lower Ghz than others.

CACHE is the amount of "memory" built onto the CPU. Having memory built into the CPU speeds things up tremendously over using the system's normal RAM.

Budget vs Standard Processors

We receive a number of calls about "slow computers". We roll out, and do what we can, but sometimes the issue is simply "your CPU is not powerful enough".

Most processors are powerful enough these days that they'll handle normal (web browsing, email, office documents) without issue. However people sometimes make the mistake of getting the "budget low end" processors without realizing what they are purchasing.

You get what you pay for! [3] We've said that over and over in tech tips and this is another example in that vein.

Low-end CPU's are produced by AMD and Intel in order to not lose customers who might otherwise purchase another computer/processor because it's cheaper.

For example if Intel did not offer its "Celeron" CPU's, and you went to purchase a computer – you might see an AMD Sempron for less and go with that. It's for this reason, both CPU makers offer these low-end CPU's.

What isn't known by most people is that these low-end cheap CPU's are crippled in a number of ways and perform significantly worse than the "flag-ship" main processors offered at the time. The key word being significantly!

You might save $100 over the cost of the cheaper processor compared to the flag-ship processor, purchasing a product that will likely not last as long and you may be unhappy with not long after purchase.

Unfortunately when we run across these computers, there isn't a lot we can do to make the system run as the user expects, and this is because the CPU is maxed out.

In the chart below, we compare an i3 (an Intel "standard") vs a Celeron. Both processors are "dual-core", but the Celeron is actually running at 2.16Ghz (faster) than the i3 running at 1.8Ghz.
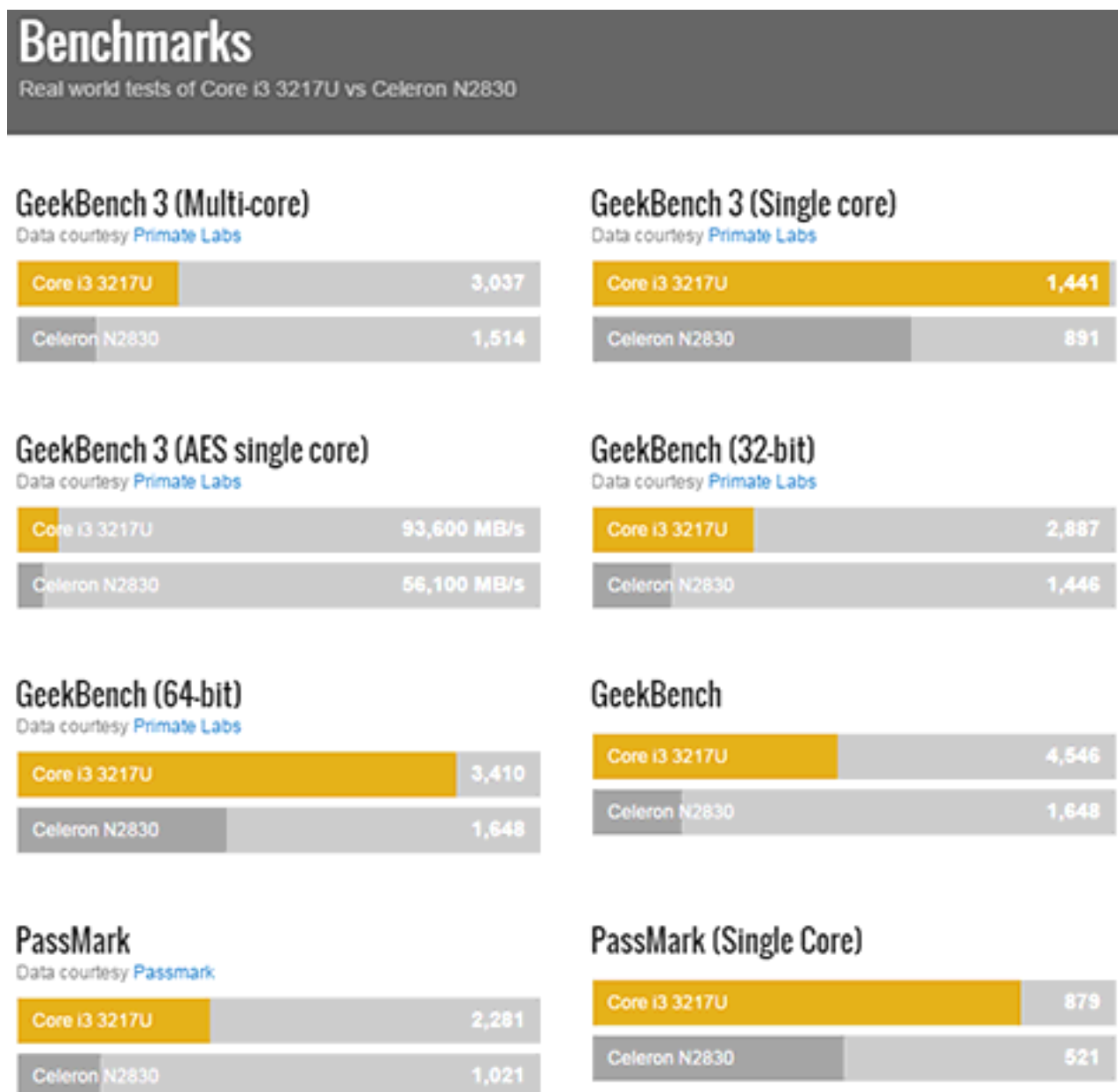
Benchmarks
Real world tests of Core i3 3217U vs Celeron N2830

GeekBench 3 (Multi-core)
Data courtesy Primate Labs

Core i3 3217U	3,037
Celeron N2830	1,514

GeekBench 3 (Single core)
Data courtesy Primate Labs

Core i3 3217U	1,441
Celeron N2830	891

GeekBench 3 (AES single core)
Data courtesy Primate Labs

Core i3 3217U	93,600 MB/s
Celeron N2830	56,100 MB/s

GeekBench (32-bit)
Data courtesy Primate Labs

Core i3 3217U	2,887
Celeron N2830	1,446

GeekBench (64-bit)
Data courtesy Primate Labs

Core i3 3217U	3,410
Celeron N2830	1,648

GeekBench

Core i3 3217U	4,546
Celeron N2830	1,648

PassMark
Data courtesy Passmark

Core i3 3217U	2,281
Celeron N2830	1,021

PassMark (Single Core)

Core i3 3217U	879
Celeron N2830	521

Chart courtesy of CPUBoss.com (http://cpuboss.com/cpus/Intel-Core-i5-3427U-vs-Intel-Celeron-847 [4])

Notice that even though the Celeron has a faster clock-speed, the i3 still out-performs in every test, sometimes by a lot! This is why on our recommendations for new computers [5] we advise an Intel
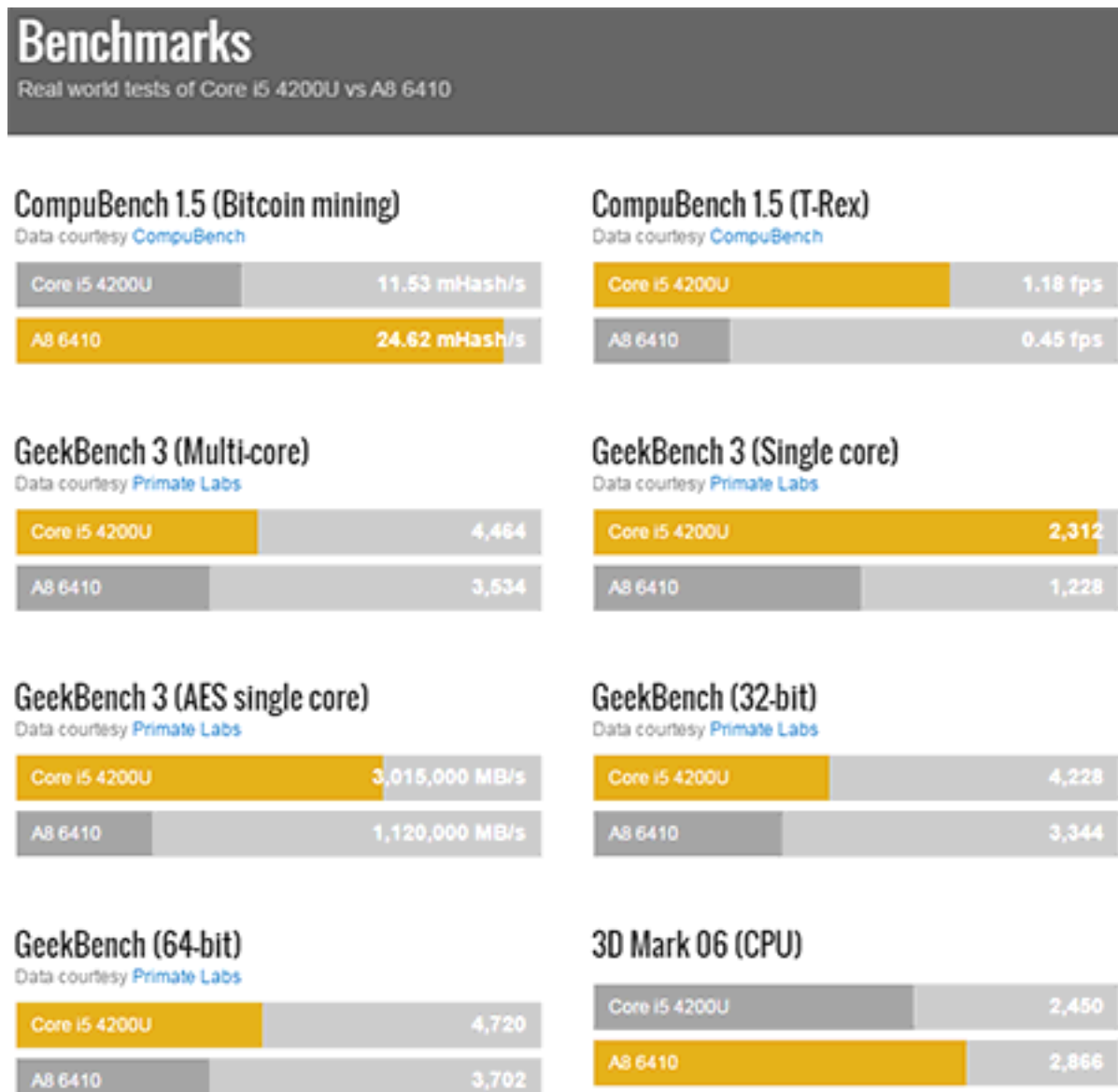
i3, i5 or i7 processor.

AMD vs. Intel

We love rooting for the underdog. In the CPU world, that's AMD. However the truth of the matter is that in most situations, the Intel processors demolish the AMD processors.

The AMD Processors generate more heat, and are far less efficient than the Intel Processors. Generally it takes twice as many AMD cores to do the same as a single Intel core.

The chart below compares a similar AMD and Intel CPU in terms of Clock Speed (Ghz), but the Intel has only 2 cores (2 brains) vs AMD's quad-core (twice as many brains).

Benchmarks
Real world tests of Core i5 4200U vs A8 6410

CompuBench 1.5 (Bitcoin mining)
Data courtesy CompuBench

Core i5 4200U	11.53 mHash/s
A8 6410	24.62 mHash/s

CompuBench 1.5 (T-Rex)
Data courtesy CompuBench

Core i5 4200U	1.18 fps
A8 6410	0.45 fps

GeekBench 3 (Multi-core)
Data courtesy Primate Labs

Core i5 4200U	4,464
A8 6410	3,534

GeekBench 3 (Single core)
Data courtesy Primate Labs

Core i5 4200U	2,312
A8 6410	1,228

GeekBench 3 (AES single core)
Data courtesy Primate Labs

Core i5 4200U	3,015,000 MB/s
A8 6410	1,120,000 MB/s

GeekBench (32-bit)
Data courtesy Primate Labs

Core i5 4200U	4,228
A8 6410	3,344

GeekBench (64-bit)
Data courtesy Primate Labs

Core i5 4200U	4,720
A8 6410	3,702

3D Mark 06 (CPU)

Core i5 4200U	2,450
A8 6410	2,866

*Chart courtesy of CPUBoss.com (http://cpuboss.com/cpus/Intel-Core-i5-4200U-vs-AMD-A8-6410 [6])

Notice despite having half the core's, the Intel still beats the AMD in most tests, and sometimes by a lot! Because of this, we recommend the Intel processors instead of AMD processors.

Conclusion

In conclusion – you get what you pay for. The CPU is the brain of the computer, so spend a little more on it! We recommend sticking with Intel processors, specifically the i3, i5 or i7 processors. Each of

those have many variations and subsets, but as long as it has that label in front of it you'll be good for general use. Each number up is more power; think of it as "good, better, best".

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