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Raspberry Pi 4 vs. Intel Comet Lake

Benchmarks for a future article.

Automated Executive Summary

Core i3 10100 had the most wins, coming in first place for 83% of the tests.

Based on the geometric mean of all complete results, the fastest (Core i3 10100) was 6.097x the speed of the slowest (rk3288 Asus C100PA Mainline 5.8). Pentium Gold G6400 was 0.746x the speed of Core i3 10100, Celeron G5900 was 0.779x the speed of Pentium Gold G6400, Raspberry Pi 4 was 0.311x the speed of Celeron G5900, rk3288 Asus C100PA Mainline 5.8 was 0.908x the speed of Raspberry Pi 4.

The results with the greatest spread from best to worst included:

PyPerformance (Benchmark: 2to3) at 221.788x
librsvg (Operation: SVG Files To PNG) at 18.246x
GNU Octave Benchmark at 16.278x
PolyBench-C (Test: Covariance Computation) at 14.306x
PolyBench-C (Test: Correlation Computation) at 14.295x
Numpy Benchmark at 14.15x
SQLite Speedtest (Timed Time - Size 1,000) at 14.131x
FLAC Audio Encoding (WAV To FLAC) at 13.693x

Aircrack-ng at 13.351x
GraphicsMagick (Operation: Rotate) at 13.341x.

Test Systems:

Raspberry Pi 4

Processor: ARMv7 Cortex-A72 @ 1.50GHz (4 Cores), Motherboard: BCM2711 Raspberry Pi 4 Model B Rev 1.1, Memory: 2048MB, Disk: 32GB SC32G, Graphics: V3D 4.2 2GB, Monitor: VA2431

OS: Raspbian 10, Kernel: 5.4.51-v7l+ (armv7l), Desktop: LXDE 0.10.0, Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, OpenGL: 2.1 Mesa 19.3.2, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1920x1080

Kernel Notes: snd_bcm2835.enable_compat_alsa=0 snd_bcm2835.enable_hdmi=1 snd_bcm2835.enable_headphones=1
Compiler Notes: --build=arm-linux-gnueabihf --disable-libitm --disable-libquadmath --disable-libquadmath-support --disable-sjlj-exceptions --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++ --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --program-prefix=arm-linux-gnueabihf- --target=arm-linux-gnueabihf --with-arch=armv6 --with-default-libstdcxx-abi=new --with-float=hard --with-fpu=vfp --with-gcc-major-version-only --with-target-system-zlib -v
Processor Notes: Scaling Governor: cpufreq-dt ondemand
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Raspbian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3

Core i3 10100

Processor: Intel Core i3-10100 @ 4.30GHz (4 Cores / 8 Threads), Motherboard: Gigabyte B460M DS3H (F2 BIOS), Chipset: Intel Device 9b63, Memory: 16GB, Disk: 500GB Western Digital WDS500G3X0C-00SJG0, Graphics: EFI VGA, Audio: Realtek ALC887-VD, Network: Realtek RTL8111/8168/8411

OS: Debian 10, Kernel: 4.19.0-9-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xcc
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Pentium Gold G6400

Processor: Intel Pentium Gold G6400 @ 4.00GHz (2 Cores / 4 Threads), Motherboard: Gigabyte B460M DS3H (F2 BIOS), Chipset: Intel Device 9b73, Memory: 16GB, Disk: 500GB Western Digital WDS500G3X0C-00SJG0, Graphics: EFI VGA, Audio: Realtek ALC887-VD, Network: Realtek RTL8111/8168/8411

OS: Debian 10, Kernel: 4.19.0-9-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie

--enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xcc
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

Celeron G5900

Processor: Intel Celeron G5900 @ 3.40GHz (2 Cores), Motherboard: Gigabyte B460M DS3H (F2 BIOS), Chipset: Intel Device 9b73, Memory: 16GB, Disk: 500GB Western Digital WDS500G3X0C-00SJG0, Graphics: EFI VGA, Audio: Realtek ALC887-VD, Network: Realtek RTL8111/8168/8411

OS: Debian 10, Kernel: 4.19.0-9-amd64 (x86_64), Display Server: X Server 1.20.4, Display Driver: modesetting 1.20.4, Compiler: GCC 8.3.0, File-System: ext4, Screen Resolution: 1024x768

Compiler Notes: --build=x86_64-linux-gnu --disable-vtable-verify --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,brig,d,fortran,objc,obj-c++ --enable-libmpx --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-multiarch --enable-multilib --enable-nls --enable-objc-gc=auto --enable-offload-targets=nvptx-none --enable-plugin --enable-shared --enable-threads=posix --host=x86_64-linux-gnu --program-prefix=x86_64-linux-gnu- --target=x86_64-linux-gnu --with-abi=m64 --with-arch-32=i686 --with-default-libstdcxx-abi=new --with-gcc-major-version-only --with-multilib-list=m32,m64,mx32 --with-target-system-zlib --with-tune=generic --without-cuda-driver -v
Processor Notes: Scaling Governor: intel_pstate powersave - CPU Microcode: 0xcc
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1deb10u1)
Python Notes: Python 2.7.16 + Python 3.7.3
Security Notes: itlb_multihit: KVM: Mitigation of Split huge pages + l1tf: Not affected + mds: Not affected + meltdown: Not affected + spec_store_bypass: Mitigation of SSB disabled via prctl and seccomp + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization + spectre_v2: Mitigation of Enhanced IBRS IBPB: conditional RSB filling + srbds: Not affected + tsx_async_abort: Not affected

rk3288 Asus C100PA Mainline 5.8

Processor: ARMv7 @ 1.80GHz (4 Cores), Motherboard: Rockchip (Device Tree) Google Minnie, Memory: 4096MB, Disk: 1000GB Elements 25A2 + 16GB SDW16G, Graphics: Mali T760 4GB

OS: Debian testing, Kernel: 5.8.0jan (armv7l), Desktop: KDE Plasma 5.17.5, Display Server: X Server 1.20.8, Display Driver: modesetting 1.20.8, OpenGL: 2.1 Mesa 20.1.4, Compiler: GCC 9.3.0, File-System: ext4, Screen Resolution: 1280x800

Compiler Notes: --build=arm-linux-gnueabihf --disable-libitm --disable-libquadmath --disable-libquadmath-support --disable-sjlj-exceptions --disable-werror --enable-bootstrap --enable-checking=release --enable-clocale=gnu --enable-default-pie --enable-gnu-unique-object --enable-languages=c,ada,c++,go,d,fortran,objc,obj-c++,gm2 --enable-libstdcxx-debug --enable-libstdcxx-time=yes --enable-link-mutex --enable-multiarch --enable-nls --enable-objc-gc=auto --enable-plugin --enable-shared --enable-threads=posix --host=arm-linux-gnueabihf --program-prefix=arm-linux-gnueabihf- --target=arm-linux-gnueabihf --with-arch=armv7-a --with-build-config=bootstrap-lto-lean --with-default-libstdcxx-abi=new --with-float=hard --with-fpu=vfpv3-d16 --with-gcc-major-version-only --with-mode=thumb --with-target-system-zlib=auto -v
Processor Notes: Scaling Governor: cpufreq-dt schedutil
Java Notes: OpenJDK Runtime Environment (build 11.0.8+10-post-Debian-1)
Python Notes: Python 2.7.18 + Python 3.8.5

	Raspberry Pi 4	Core i3 10100	Pentium Gold G6400	Celeron G5900	rk3288 Asus C100PA Mainline 5.8

Raspberry Pi 4 vs. Intel Comet Lake

LAMMPS Molecular Dynamics Simulator - Rhodopsin Protein (ns/day)	0.499	3.219	1.657	1.381	
Normalized	15.5%	100%	51.48%	42.9%	
Standard Deviation	0.2%	0.4%	0.6%	0.7%	
DaCapo Benchmark - H2 (msec)	14385	3146	3375	3616	19128
Normalized	21.87%	100%	93.21%	87%	16.45%
Standard Deviation	3.9%	5.8%	9.7%	2.7%	2.9%
DaCapo Benchmark - Jython (msec)	34367	4151	5482	6084	50290
Normalized	12.08%	100%	75.72%	68.23%	8.25%
Standard Deviation	2%	1.4%	6%	1.8%	2.2%
DaCapo Benchmark - Tradebeans (msec)	21087		4135		24233
Normalized	19.61%		100%		17.06%
Standard Deviation	0.7%				0.6%
TSCP - A.C.P (Nodes/s)	350771	1376258	1268492	1078690	282538
Normalized	25.49%	100%	92.17%	78.38%	20.53%
Standard Deviation	0.2%	0.1%	0.2%	0.2%	0.3%
GraphicsMagick - Swirl (Iterations/min)	34	187	94	65	29
Normalized	18.18%	100%	50.27%	34.76%	15.51%
Standard Deviation	1.7%	2.5%			2%
GraphicsMagick - Rotate (Iterations/min)	85	1134	1057	873	100
Normalized	7.5%	100%	93.21%	76.98%	8.82%
Standard Deviation		2.7%	0.1%	0.8%	
GraphicsMagick - Sharpen (Iterations/min)	15	60	30	25	12
Normalized	25%	100%	50%	41.67%	20%
Standard Deviation					2.9%
GraphicsMagick - Enhanced (Iterations/min)	16	92	45	37	11
Normalized	17.39%	100%	48.91%	40.22%	11.96%
GraphicsMagick - Resizing (Iterations/min)	48	437	246	197	55
Normalized	10.98%	100%	56.29%	45.08%	12.59%
Standard Deviation		0.3%	0.4%		1.8%
GraphicsMagick - Noise-Gaussian (Iterations/min)	16	117	55	39	18
Normalized	13.68%	100%	47.01%	33.33%	15.38%
Standard Deviation	25.4%				
GraphicsMagick - HWB Color Space (Iterations/min)	83	933	519	419	76
Normalized	8.9%	100%	55.63%	44.91%	8.15%
Standard Deviation		0.2%	0.1%	0.1%	
TTSIOD 3D Renderer - P.R.W.S.S.M (FPS)	25.4479	262.097	132.556	76.4398	29.6899
Normalized	9.71%	100%	50.58%	29.16%	11.33%
Standard Deviation	0.7%	0.3%	0.9%	0.3%	0.1%
Coremark - CoreMark Size 666 - I.P.S (Iterations/Sec)	33031	179882	88892	53412	31193
Normalized	18.36%	100%	49.42%	29.69%	17.34%

Raspberry Pi 4 vs. Intel Comet Lake

Standard Deviation	0%	1.1%	1.9%	0.1%	2.8%
7-Zip Compression - C.S.T	**3466**	**27500**	15033	7920	3515
Normalized	12.6%	100%	54.67%	28.8%	12.78%
Standard Deviation	0.1%	1.2%	0.2%	0.6%	1.4%
Timed GDB GNU Debugger Compilation - Time To Compile (sec)	**970.537**	**118.874**	178.803	274.528	859.339
Normalized	12.25%	100%	66.48%	43.3%	13.83%
Standard Deviation	0.5%	0.3%	0.1%	0.1%	0.2%
Timed MPlayer Compilation - Time To Compile (sec)	**543.837**	**69.218**	128.701	198.335	537.706
Normalized	12.73%	100%	53.78%	34.9%	12.87%
Standard Deviation	0%	0.1%	0%	0.1%	0.1%
Timed PHP Compilation - Time To Compile (sec)	**638.584**	**88.578**	143.935	220.076	605.265
Normalized	13.87%	100%	61.54%	40.25%	14.63%
Standard Deviation	0.2%	0.2%	0.1%	0.3%	0.1%
C-Ray - Total Time - 4.1.R.P.P (sec)	680.080	**157.068**	322.191	400.348	**1103**
Normalized	23.1%	100%	48.75%	39.23%	14.24%
Standard Deviation	4.3%	0%	0%	0%	0.7%
Smallpt - G.I.R.1.S (sec)	130.180	**22.802**	46.453	74.585	**186.387**
Normalized	17.52%	100%	49.09%	30.57%	12.23%
Standard Deviation	1.4%	0.1%	0.1%	0.1%	0.6%
Numpy Benchmark (Score)	**26.54**	**375.55**	336.12	282.42	35.49
Normalized	7.07%	100%	89.5%	75.2%	9.45%
Standard Deviation	0.1%	0.2%	0.1%	0.4%	0.3%
XZ Compression - C.u.1.0.3.s.i.i.C.L.9 (sec)	**416.907**	**42.488**	69.307	123.883	277.978
Normalized	10.19%	100%	61.3%	34.3%	15.28%
Standard Deviation	2.8%	0.3%	0.4%	0.1%	0.3%
OpenSSL - R.4.b.P (Signs/sec)	**97.6**	**1253**	389.3	315.0	101.7
Normalized	7.79%	100%	31.06%	25.14%	8.12%
Standard Deviation	0.1%	0.3%	0.1%	0.6%	2.9%
Aircrack-ng (k/s)	**1162**	**15519**	2813	2347	
Normalized	7.49%	100%	18.12%	15.12%	
Standard Deviation	0.6%	0.4%	0.3%	0%	
libjpeg-turbo tjbench - D.T (Megapixels/sec)	49.657148	**205.777836**	172.928584	147.209265	**44.228762**
Normalized	24.13%	100%	84.04%	71.54%	21.49%
Standard Deviation	0.4%	0.4%	0.5%	1%	0.7%
SQLite Speedtest - Timed Time - Size 1,000 (sec)	**766.550**	**54.246**	65.150	82.015	595.495
Normalized	7.08%	100%	83.26%	66.14%	9.11%
Standard Deviation	0.5%	0.6%	2.3%	0%	1.3%
GEGL - Crop (sec)	**50.874**	**8.527**	9.509	10.893	45.992
Normalized	16.76%	100%	89.67%	78.28%	18.54%
Standard Deviation	2.7%	0.9%	1.5%	1.1%	5.5%
GEGL - Scale (sec)	**36.875**	**5.478**	6.236	7.229	35.735
Normalized	14.86%	100%	87.84%	75.78%	15.33%
Standard Deviation	0.5%	1.1%	1.3%	0.1%	0.3%
GEGL - Cartoon (sec)	**647.548**	**105.900**	117.134	137.544	597.039
Normalized	16.35%	100%	90.41%	76.99%	17.74%
Standard Deviation	0.8%	0.3%	0.3%	0.1%	0.2%

Raspberry Pi 4 vs. Intel Comet Lake

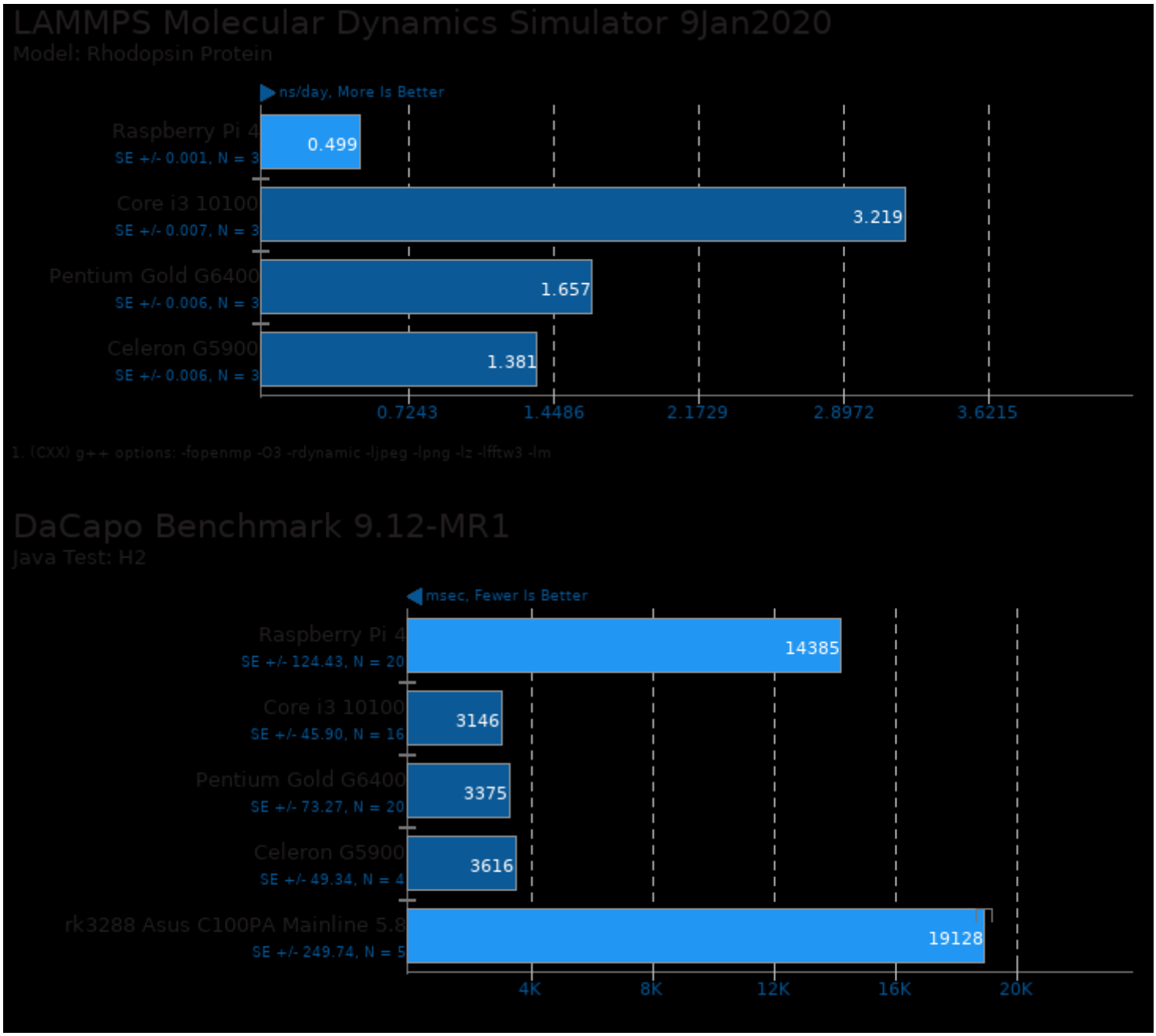
GEGL - Reflect (sec)	**14.988**	31.140	33.538	39.431	**151.242**
Normalized	100%	48.13%	44.69%	38.01%	9.91%
Standard Deviation	0.7%	0.4%	0.2%	0.3%	0.2%
GEGL - Antialias (sec)	**214.859**	**40.701**	47.341	56.741	191.124
Normalized	18.94%	100%	85.97%	71.73%	21.3%
Standard Deviation	0.5%	0.1%	0.5%	0.1%	0.1%
GEGL - Tile Glass (sec)	**161.312**	**30.744**	33.043	38.373	151.369
Normalized	19.06%	100%	93.04%	80.12%	20.31%
Standard Deviation	1.2%	0.2%	0.6%	0.1%	0.1%
GEGL - Wavelet Blur (sec)	**326.606**	**62.372**	68.478	79.504	275.793
Normalized	19.1%	100%	91.08%	78.45%	22.62%
Standard Deviation	0.7%	0.3%	0.3%	0%	0%
GEGL - Color Enhance (sec)	**341.548**	**59.441**	64.276	75.070	331.259
Normalized	17.4%	100%	92.48%	79.18%	17.94%
Standard Deviation	0.5%	0.1%	0.1%	0.1%	0.1%
GEGL - Rotate 90 Degrees (sec)	**246.618**	**41.734**	47.592	56.293	238.824
Normalized	16.92%	100%	87.69%	74.14%	17.47%
Standard Deviation	0.3%	0.2%	0.4%	0.1%	0.2%
GIMP - resize (sec)	**4.576**	8.728	10.648	**13.147**	
Normalized	100%	52.43%	42.98%	34.81%	
Standard Deviation	23.2%	0.5%	0.1%	1.7%	
GIMP - rotate (sec)	**4.389**	17.599	18.878	**22.125**	
Normalized	100%	24.94%	23.25%	19.84%	
Standard Deviation	8.9%	0%	0.2%	0.1%	
GIMP - auto-levels (sec)	**4.291**	20.780	23.198	**27.685**	
Normalized	100%	20.65%	18.5%	15.5%	
Standard Deviation	0.5%	0.5%	0.1%	0.1%	
GIMP - unsharp-mask (sec)	**4.345**	24.968	26.371	**31.529**	
Normalized	100%	17.4%	16.48%	13.78%	
Standard Deviation	1.9%	0.1%	0.1%	0.1%	
Hugin - P.P.A.S.T (sec)	**471.413**	**68.367**	96.509	140.394	418.813
Normalized	14.5%	100%	70.84%	48.7%	16.32%
Standard Deviation	0.4%	0.6%	0.5%	0.2%	8.5%
Inkscape - SVG Files To PNG (sec)	**137.212**	**24.347**	25.719	30.616	
Normalized	17.74%	100%	94.67%	79.52%	
Standard Deviation	0.8%	0.1%	0.2%	0.2%	
OCRMyPDF - P.6.P.P.D (sec)	**376.428**	**44.347**	89.362	121.326	
Normalized	11.78%	100%	49.63%	36.55%	
Standard Deviation	0.3%	0.1%	0.1%	0.1%	
GNU Octave Benchmark (sec)	**100.389**	**6.167**	6.605	7.633	
Normalized	6.14%	100%	93.37%	80.79%	
Standard Deviation	0.5%	0.4%	1.1%	1%	
RawTherapee - T.B.T (sec)	748.022	**104.108**	147.977	213.383	**751.231**
Normalized	13.92%	100%	70.35%	48.79%	13.86%
Standard Deviation	0.3%	0%	0%	0.1%	10.6%
librsvg - SVG Files To PNG (sec)	77.222	**13.551**	13.878	16.452	**247.250**
Normalized	17.55%	100%	97.64%	82.37%	5.48%
Standard Deviation	2.2%	0.3%	0.1%	0.2%	0.8%
PyBench - T.F.A.T.T	5235	**945**	1020	1199	**5883**
Normalized	18.05%	100%	92.65%	78.82%	16.06%
Standard Deviation	0.2%		0.5%	0.5%	0.1%
PHPBench - P.B.S (Score)	102546	**729845**	668540	568837	**79058**
Normalized	14.05%	100%	91.6%	77.94%	10.83%
Standard Deviation	0.5%	0.1%	0.3%	0.1%	0.1%

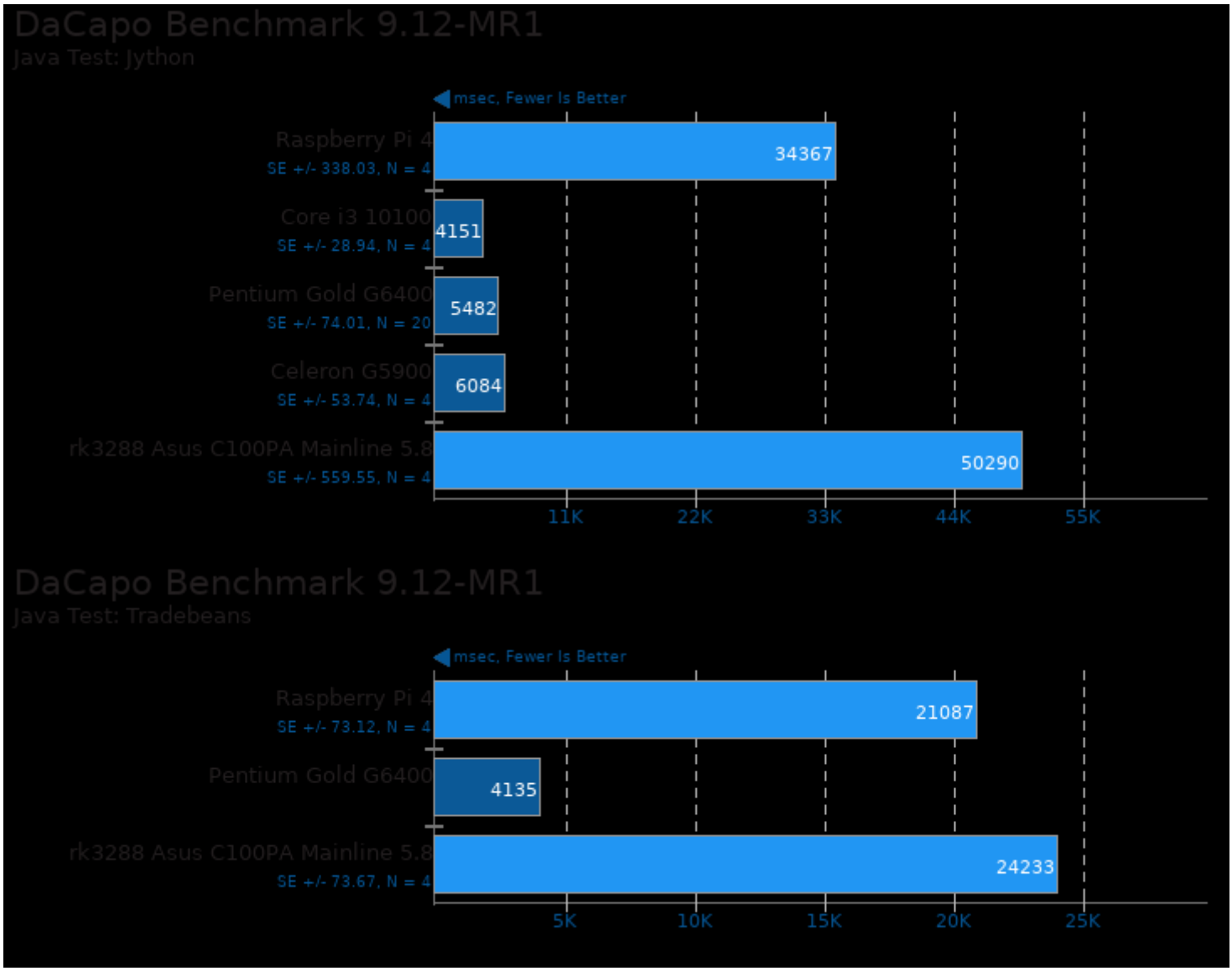
Raspberry Pi 4 vs. Intel Comet Lake

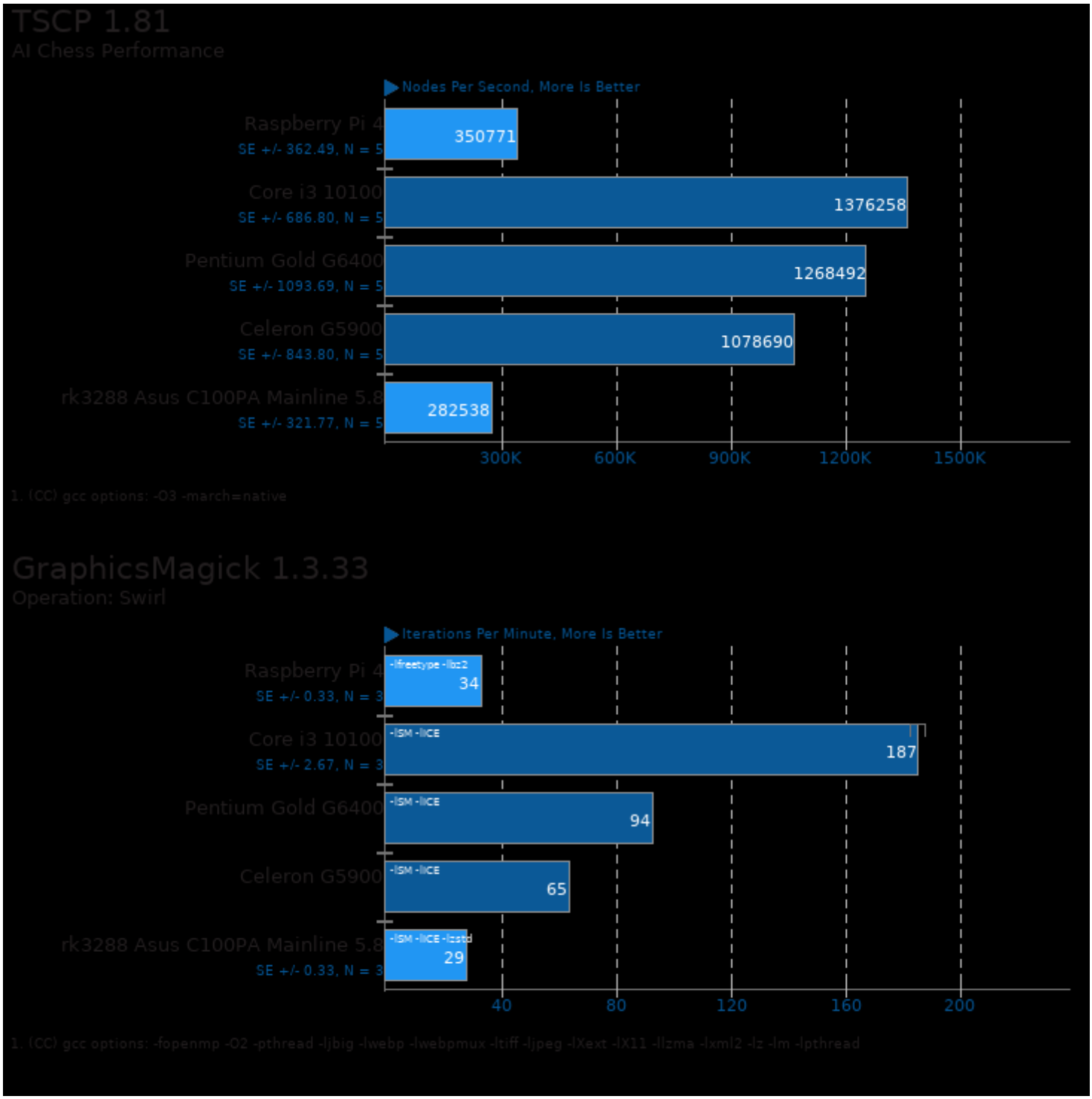
Scikit-Learn (sec)	79.112	**27.067**	29.554	34.693	**80.272**
Normalized	34.21%	100%	91.58%	78.02%	33.72%
Standard Deviation	0.4%	0.3%	0.1%	0.1%	2.8%
Tesseract OCR - T.T.O.7.I (sec)	**136.504**	**25.010**	30.871	54.798	
Normalized	18.32%	100%	81.01%	45.64%	
Standard Deviation	0.1%	0.2%	0.1%	0%	
PolyBench-C - C.C (sec)	**31.015**			**2.168**	17.148
Normalized	6.99%			100%	12.64%
Standard Deviation	0.1%			0.3%	0.7%
PolyBench-C - C.C (sec)	**31.021**			**2.170**	17.071
Normalized	7%			100%	12.71%
Standard Deviation	0.1%			0.4%	0.2%
PolyBench-C - 3.M.M (sec)	24.910	**3.338**	3.832	4.446	**31.028**
Normalized	13.4%	100%	87.11%	75.08%	10.76%
Standard Deviation	0%	0.1%	0.1%	0.1%	0.4%
Timed HMMer Search - P.D.S (sec)	53.889	**7.438**	12.846	19.579	**60.125**
Normalized	13.8%	100%	57.9%	37.99%	12.37%
Standard Deviation	1.4%	1.5%	0.9%	0.2%	1.1%
Timed MAFFT Alignment - M.S.A (sec)	**22.514**	**3.855**	6.593	9.417	21.589
Normalized	17.12%	100%	58.47%	40.94%	17.86%
Standard Deviation	3%	6.6%	1.2%	0.4%	6.8%
AOBench - 2048 x 2048 - Total Time (sec)	123.692	**32.747**	35.179	41.546	**171.943**
Normalized	26.47%	100%	93.09%	78.82%	19.05%
Standard Deviation	0%	0%	0%	2.7%	0.3%
FLAC Audio Encoding - WAV To FLAC (sec)	109.371	**8.420**	9.456	11.108	**115.298**
Normalized	7.7%	100%	89.04%	75.8%	7.3%
Standard Deviation	1.1%	0.2%	0.1%	0.1%	1.3%
LAME MP3 Encoding - WAV To MP3 (sec)	41.587	**8.122**	8.667	10.181	**45.744**
Normalized	19.53%	100%	93.71%	79.78%	17.76%
Standard Deviation	0.2%	0.1%	0%	0.2%	0.2%
Perl Benchmarks - Pod2html	0.61497660	**0.10872912**	0.11884498	0.14005805	**0.72314832**
Normalized	17.68%	100%	91.49%	77.63%	15.04%
Standard Deviation	0.5%	0.2%	0.4%	0.3%	0.3%
Perl Benchmarks - Interpreter	0.00714413	0.00108894	**0.00075872**	0.00101531	**0.00801654**
Normalized	10.62%	69.68%	100%	74.73%	9.46%
Standard Deviation	6%	22%	0.2%	0.4%	1.7%
LibreOffice - 2.D.T.P (sec)	**5.751**	7.510	8.064	**9.739**	
Normalized	100%	76.58%	71.32%	59.05%	
Standard Deviation		2.7%	1.4%	1.8%	
PyPerformance - 2to3 (Milliseconds)	**1.79**	304	328	**397**	1.88
Normalized	100%	0.59%	0.55%	0.45%	95.21%
Standard Deviation	0%				0.3%
PyPerformance - float (Milliseconds)	629	**95.7**	104	123	**660**
Normalized	15.21%	100%	92.02%	77.8%	14.5%
Standard Deviation		0.1%			0.3%

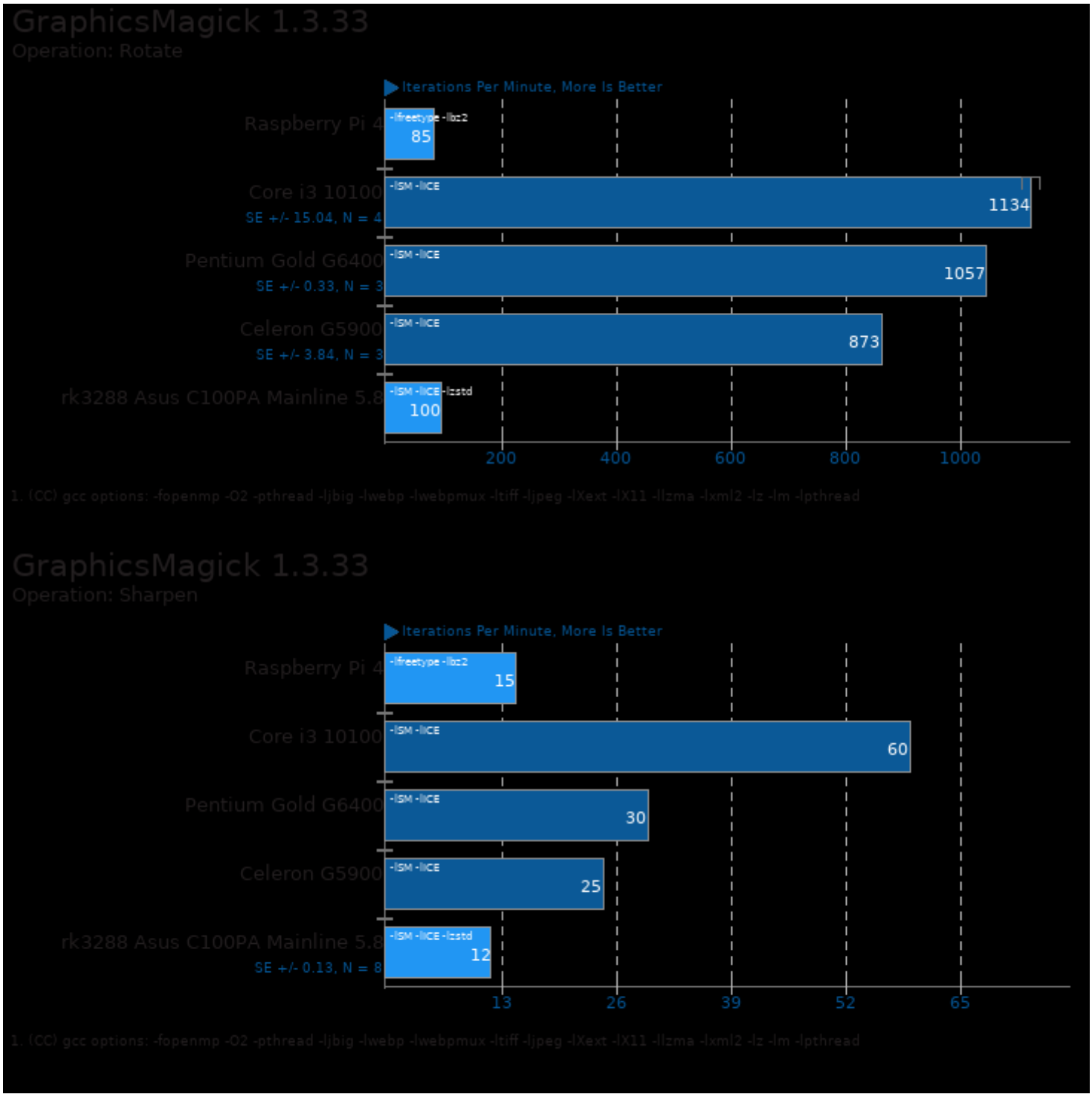
Raspberry Pi 4 vs. Intel Comet Lake

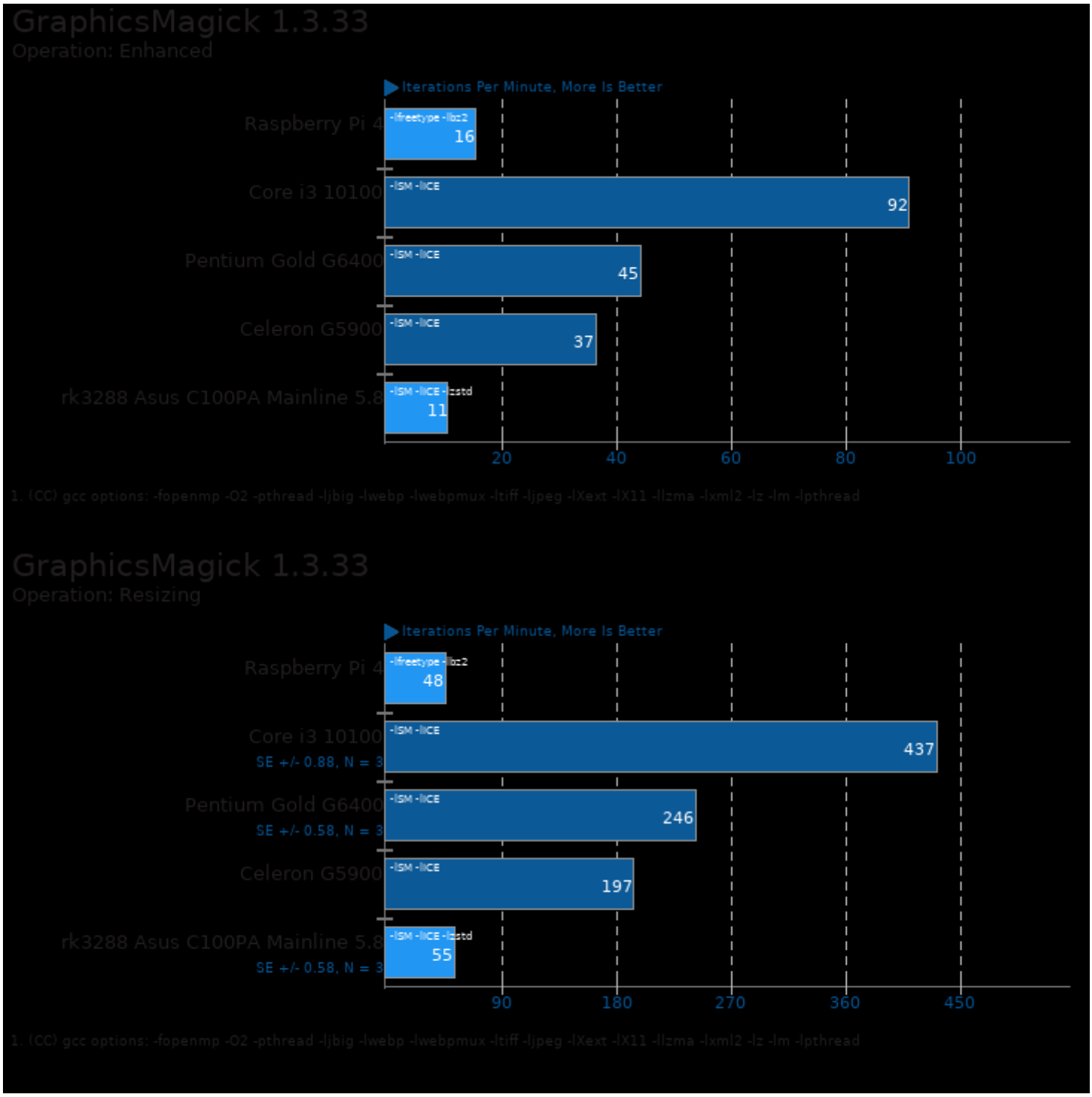
PyPerformance - pathlib (Milliseconds)	142	17.9	19.5	23.6	122
Normalized	12.61%	100%	91.79%	75.85%	14.67%
Standard Deviation		0%	0.3%	0%	
PyPerformance - json_loads (Milliseconds)	144	23.6	25.5	30.1	148
Normalized	16.39%	100%	92.55%	78.41%	15.95%
Standard Deviation	0.7%	0.2%	0.2%	0.2%	
PyPerformance - regex_compile (Milliseconds)	962	167	180	212	929
Normalized	17.36%	100%	92.78%	78.77%	17.98%
Standard Deviation	0.1%				0.2%
PyPerformance - python_startup (Milliseconds)	42.5	7.49	7.96	9.8	42.3
Normalized	17.62%	100%	94.1%	76.43%	17.71%
Standard Deviation	0.1%	0.2%	0%	0%	0.2%
Timed Apache Compilation - Time To Compile (sec)	180.753	24.444	37.116	54.742	182.695
Normalized	13.52%	100%	65.86%	44.65%	13.38%
Standard Deviation	0.6%	0.2%	0.1%	0.1%	0.4%
GIMP - resize (sec)					67.402
Standard Deviation					2.9%
GIMP - rotate (sec)					85.905
Standard Deviation					0.3%
GIMP - auto-levels (sec)					96.044
Standard Deviation					0.1%
GIMP - unsharp-mask (sec)					122.032
Standard Deviation					0.1%
OCRMyPDF - P.6.P.P.D (sec)					399.479
Standard Deviation					0.7%
GNU Octave Benchmark (sec)					58.668
Standard Deviation					2%
Tesseract OCR - T.T.O.7.I (sec)					135.703
Standard Deviation					0.5%

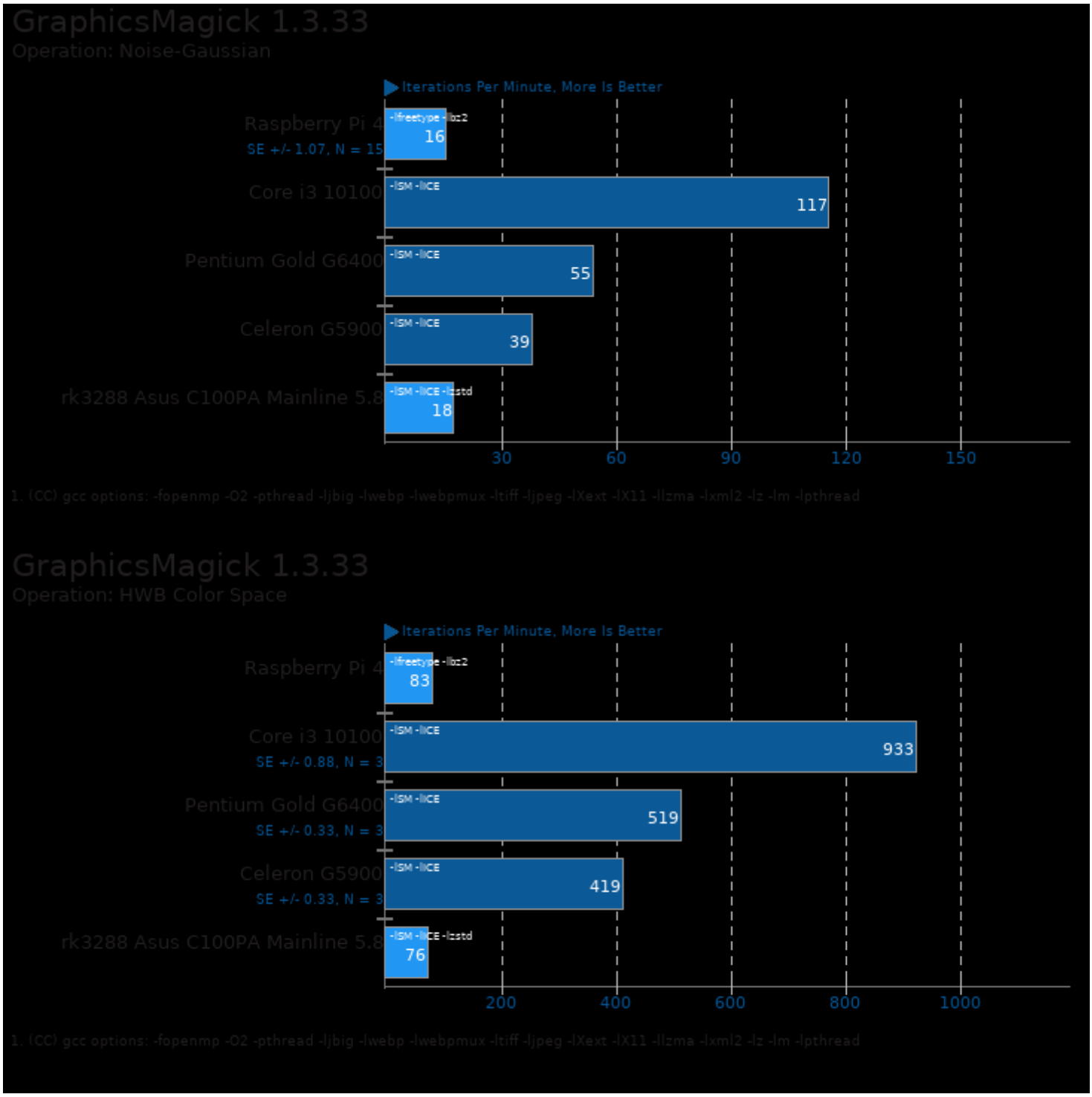

LAMMPS Molecular Dynamics Simulator 9Jan2020
Model: Rhodopsin Protein
ns/day, More Is Better
Raspberry Pi 4
SE +/- 0.001, N = 3
0.499
Core i3 10100
SE +/- 0.007, N = 3
3.219
Pentium Gold G6400
SE +/- 0.006, N = 3
1.657
Celeron G5900
SE +/- 0.006, N = 3
1.381
0.7243
1.4486
2.1729
2.8972
3.6215
1. (CXX) g++ options: -fopenmp -O3 -rdynamic -ljpeg -lpng -lz -lfftw3 -lm
DaCapo Benchmark 9.12-MR1
Java Test: H2
msec, Fewer Is Better
Raspberry Pi 4
SE +/- 124.43, N = 20
14385
Core i3 10100
SE +/- 45.90, N = 16
3146
Pentium Gold G6400
SE +/- 73.27, N = 20
3375
Celeron G5900
SE +/- 49.34, N = 4
3616
rk3288 Asus C100PA Mainline 5.8
SE +/- 249.74, N = 5
19128
4K
8K
12K
16K
20K

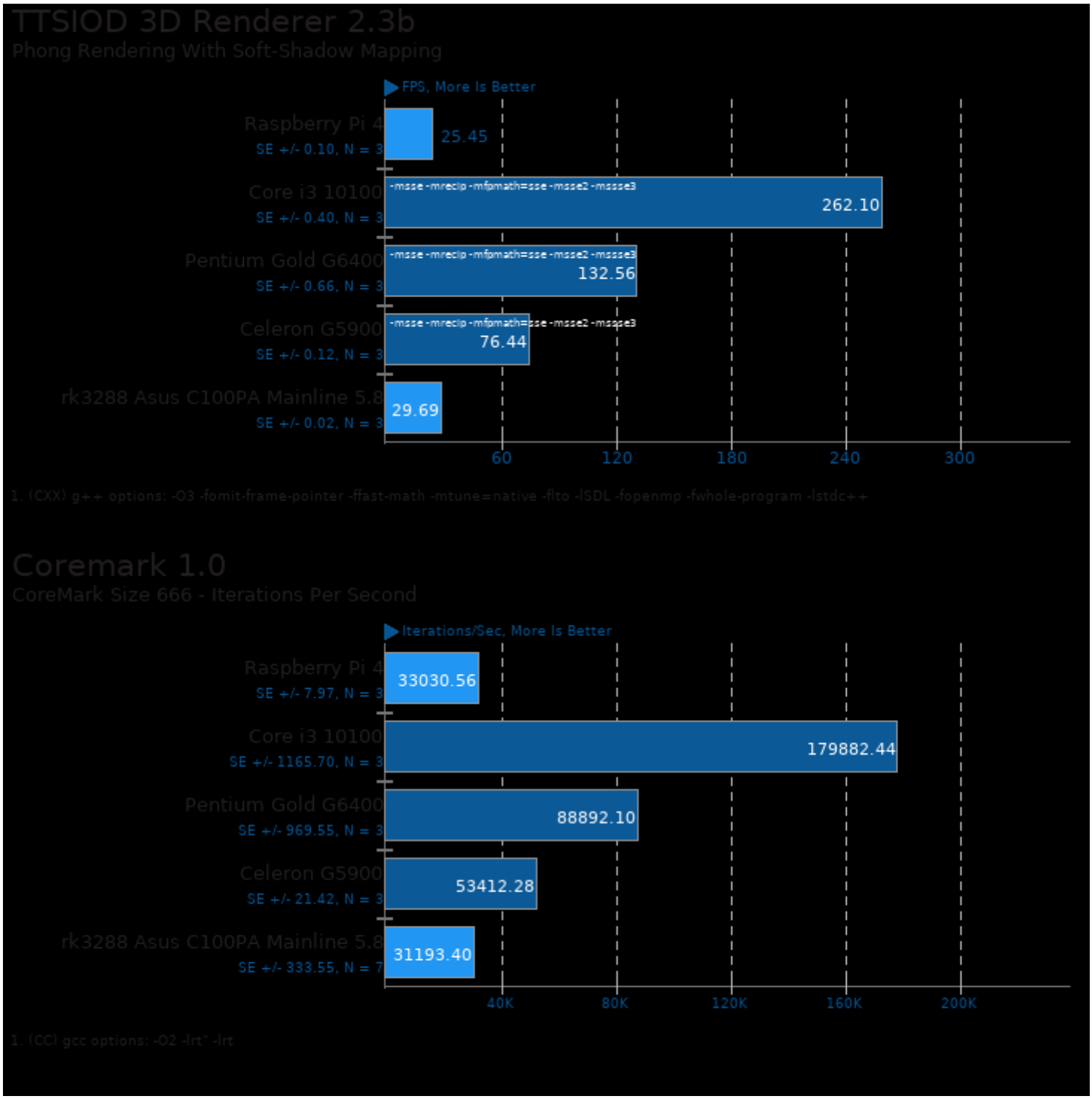

DaCapo Benchmark 9.12-MR1
Java Test: Jython
msec, Fewer Is Better
Raspberry Pi 4
SE +/- 338.03, N = 4
34367
Core i3 10100
SE +/- 28.94, N = 4
4151
Pentium Gold G6400
SE +/- 74.01, N = 20
5482
Celeron G5900
SE +/- 53.74, N = 4
6084
rk3288 Asus C100PA Mainline 5.8
SE +/- 559.55, N = 4
50290
11K
22K
33K
44K
55K
DaCapo Benchmark 9.12-MR1
Java Test: Tradebeans
msec, Fewer Is Better
Raspberry Pi 4
SE +/- 73.12, N = 4
21087
Pentium Gold G6400
4135
rk3288 Asus C100PA Mainline 5.8
SE +/- 73.67, N = 4
24233
5K
10K
15K
20K
25K

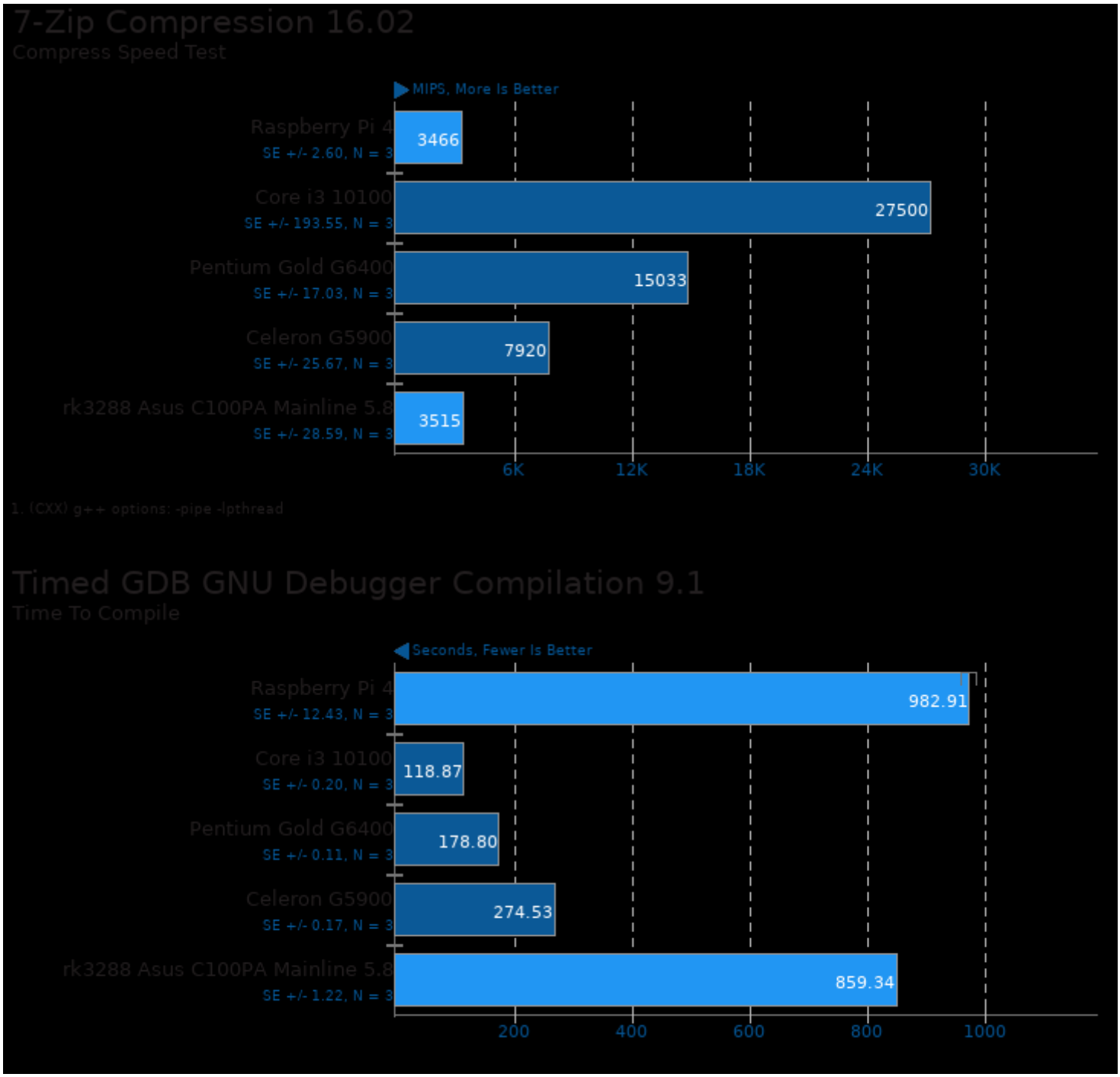

TSCP 1.81
AI Chess Performance
Nodes Per Second, More Is Better
Raspberry Pi 4
SE +/- 362.49, N = 5
350771
Core i3 10100
SE +/- 686.80, N = 5
1376258
Pentium Gold G6400
SE +/- 1093.69, N = 5
1268492
Celeron G5900
SE +/- 843.80, N = 5
1078690
rk3288 Asus C100PA Mainline 5.8
SE +/- 321.77, N = 5
282538
300K
600K
900K
1200K
1500K
1. (CC) gcc options: -O3 -march=native
GraphicsMagick 1.3.33
Operation: Swirl
Iterations Per Minute, More Is Better
Raspberry Pi 4
SE +/- 0.33, N = 3
34
Core i3 10100
SE +/- 2.67, N = 3
187
Pentium Gold G6400
94
Celeron G5900
65
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.33, N = 3
29
40
80
120
160
200
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

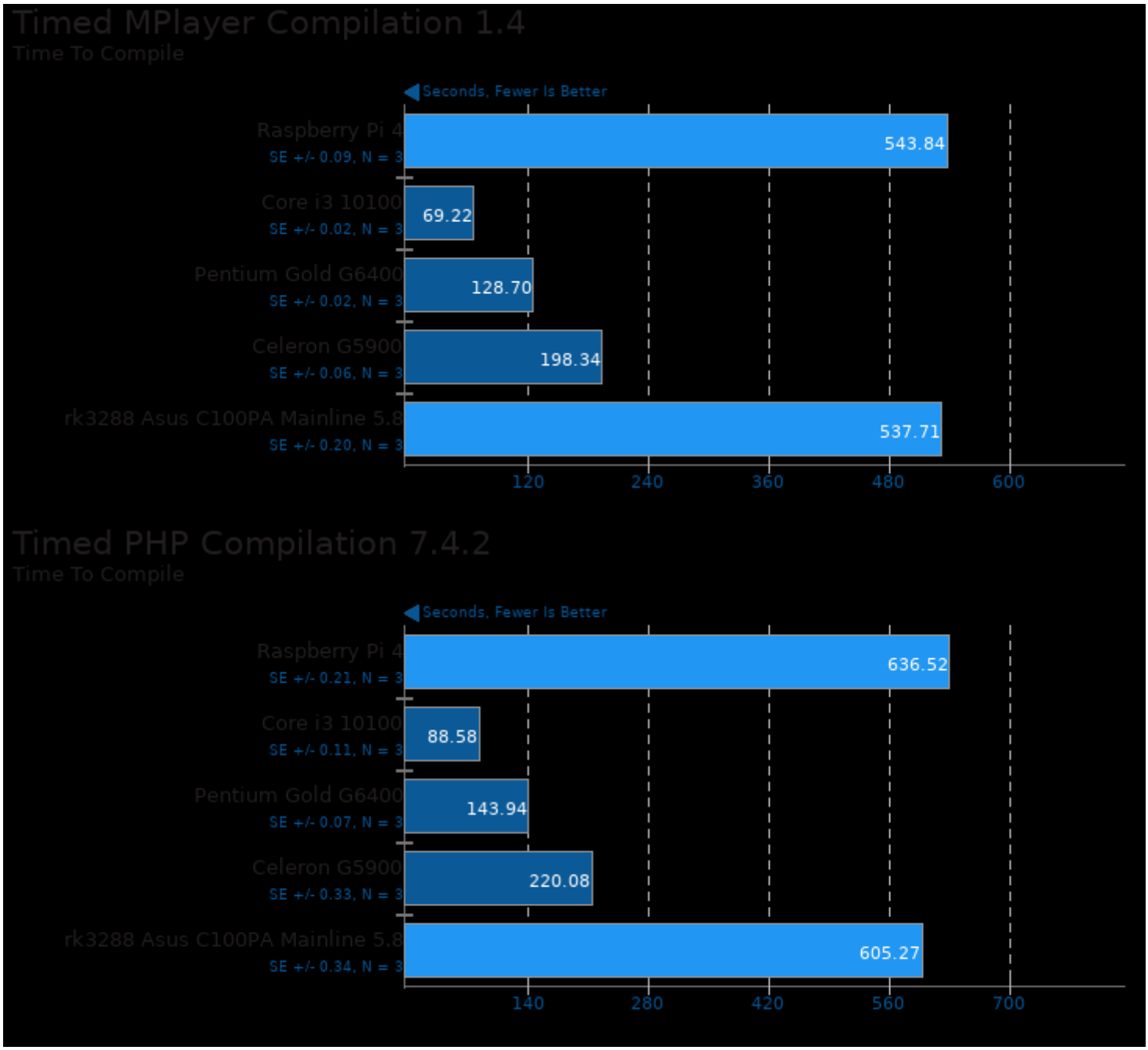

GraphicsMagick 1.3.33
Operation: Rotate
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -llzma
85
Core i3 10100
-lSM -lICE
1134
SE +/- 15.04, N = 4
Pentium Gold G6400
-lSM -lICE
1057
SE +/- 0.33, N = 3
Celeron G5900
-lSM -lICE
873
SE +/- 3.84, N = 3
rk3288 Asus C100PA Mainline 5.8
-lSM -lICE -lzstd
100
200
400
600
800
1000
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Sharpen
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -llzma
15
Core i3 10100
-lSM -lICE
60
Pentium Gold G6400
-lSM -lICE
30
Celeron G5900
-lSM -lICE
25
rk3288 Asus C100PA Mainline 5.8
-lSM -lICE -lzstd
12
SE +/- 0.13, N = 8
13
26
39
52
65
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

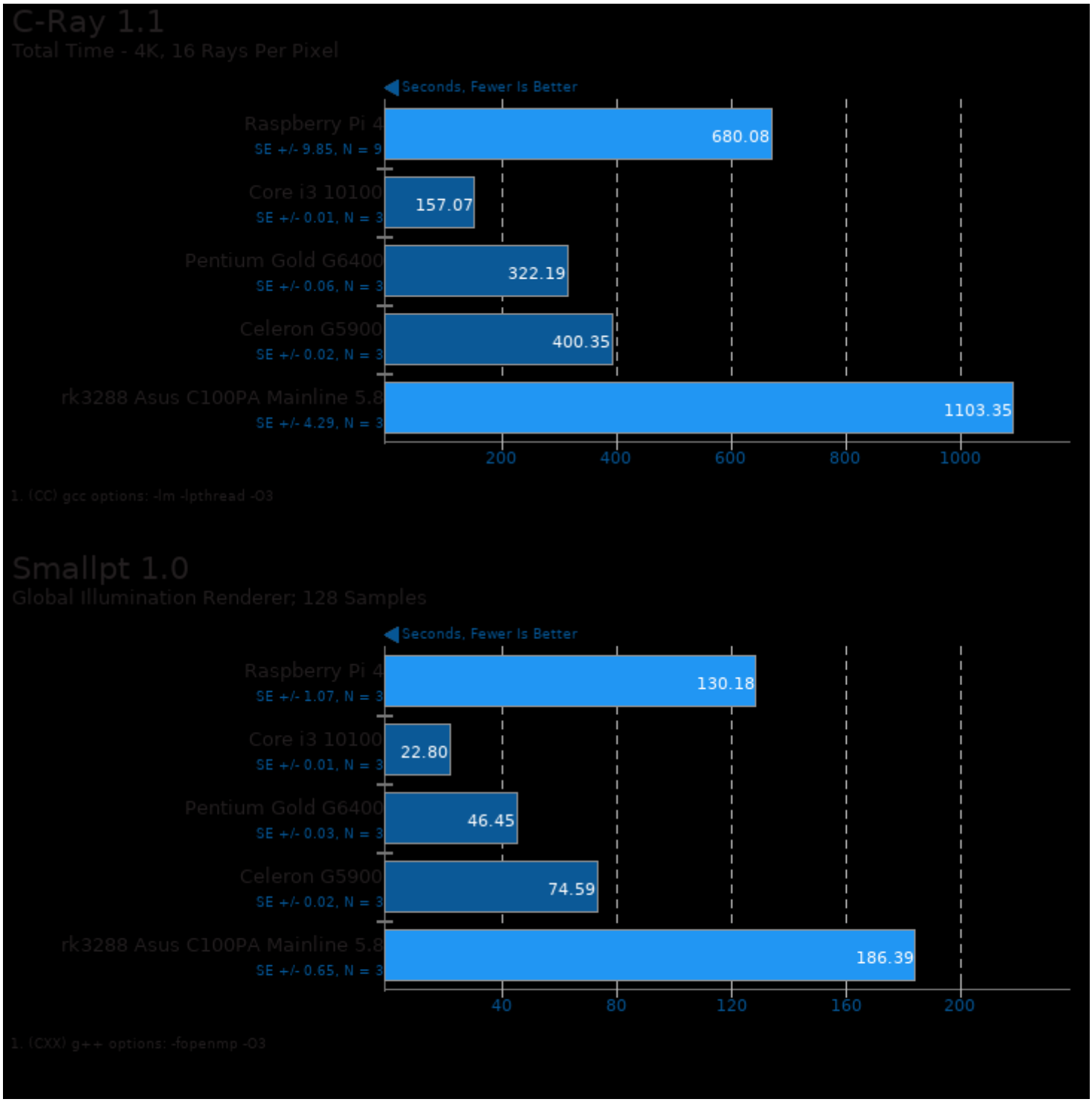

GraphicsMagick 1.3.33
Operation: Enhanced
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
16
Core i3 10100
-ISM -lICE
92
Pentium Gold G6400
-ISM -lICE
45
Celeron G5900
-ISM -lICE
37
rk3288 Asus C100PA Mainline 5.8
-ISM -lICE -lzstd
11
20
40
60
80
100
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: Resizing
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -lbz2
48
Core i3 10100
SE +/- 0.88, N = 3
-ISM -lICE
437
Pentium Gold G6400
SE +/- 0.58, N = 3
-ISM -lICE
246
Celeron G5900
-ISM -lICE
197
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.58, N = 3
-ISM -lICE -lzstd
55
90
180
270
360
450
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

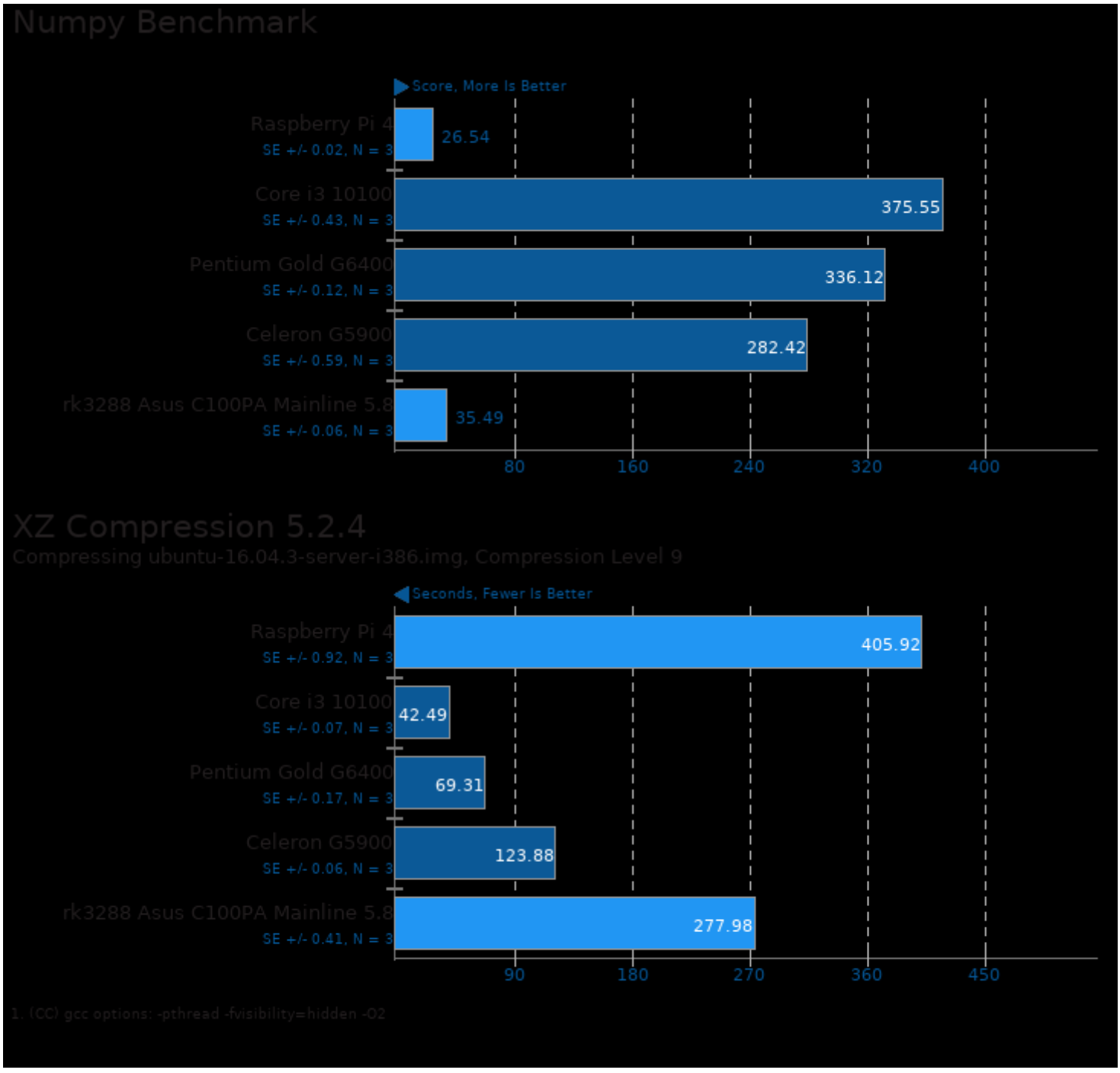

GraphicsMagick 1.3.33
Operation: Noise-Gaussian
Iterations Per Minute, More Is Better
Raspberry Pi 4
SE +/- 1.07, N = 15
-lfreetype -llzma
16
Core i3 10100
-lSM -lICE
117
Pentium Gold G6400
-lSM -lICE
55
Celeron G5900
-lSM -lICE
39
rk3288 Asus C100PA Mainline 5.8
-lSM -lICE -lzstd
18
30
60
90
120
150
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread
GraphicsMagick 1.3.33
Operation: HWB Color Space
Iterations Per Minute, More Is Better
Raspberry Pi 4
-lfreetype -llzma
83
Core i3 10100
SE +/- 0.88, N = 3
-lSM -lICE
933
Pentium Gold G6400
SE +/- 0.33, N = 3
-lSM -lICE
519
Celeron G5900
SE +/- 0.33, N = 3
-lSM -lICE
419
rk3288 Asus C100PA Mainline 5.8
-lSM -lICE -lzstd
76
200
400
600
800
1000
1. (CC) gcc options: -fopenmp -O2 -pthread -ljbig -lwebp -lwebpmux -ltiff -ljpeg -lXext -lX11 -llzma -lxml2 -lz -lm -lpthread

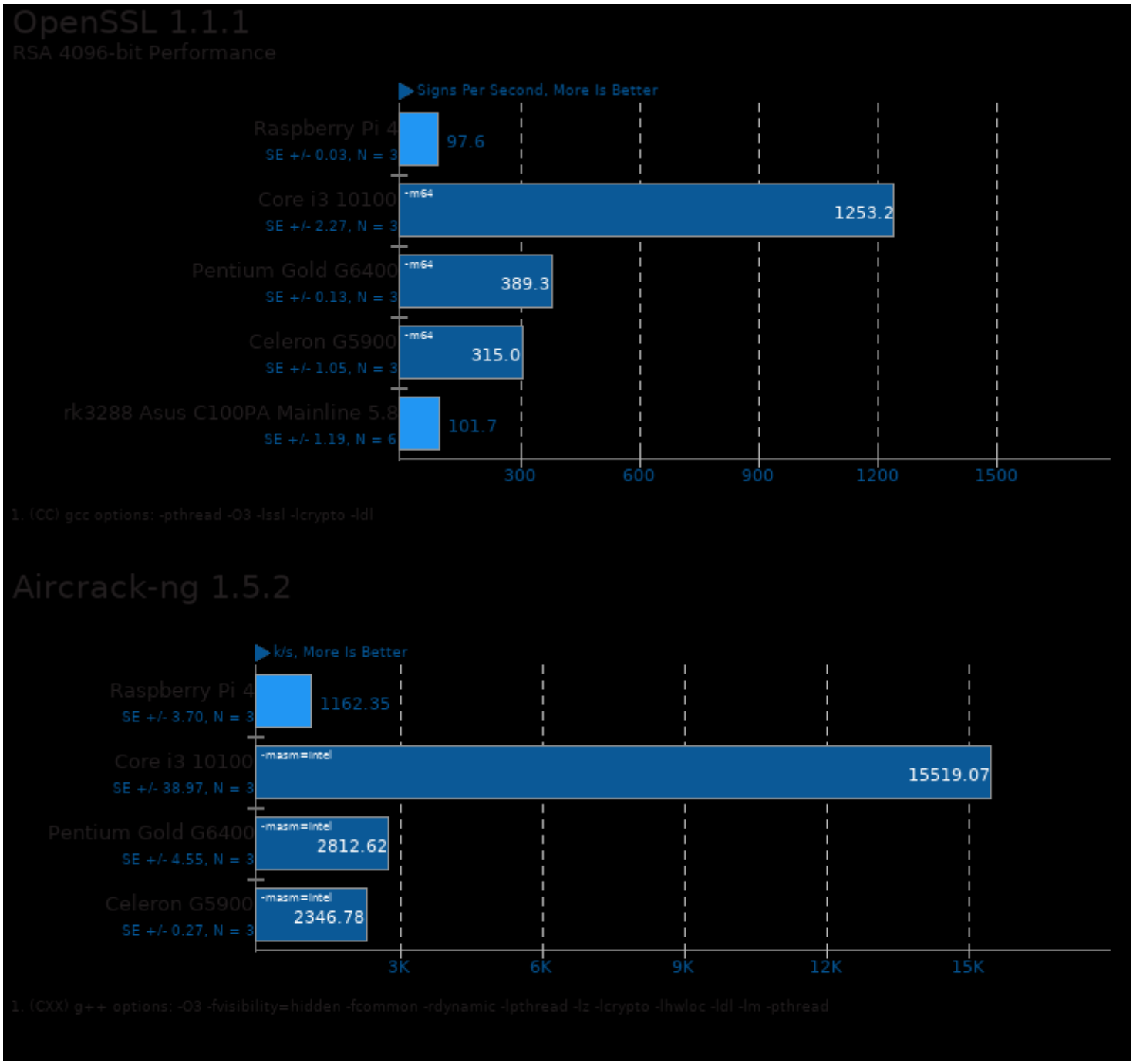

TTSIOD 3D Renderer 2.3b
Phong Rendering With Soft-Shadow Mapping
FPS, More Is Better
Raspberry Pi 4
SE +/- 0.10, N = 3
25.45
Core i3 10100
SE +/- 0.40, N = 3
-msse -mrecip -mfpmath=sse -msse2 -mssse3
262.10
Pentium Gold G6400
SE +/- 0.66, N = 3
-msse -mrecip -mfpmath=sse -msse2 -mssse3
132.56
Celeron G5900
SE +/- 0.12, N = 3
-msse -mrecip -mfpmath=sse -msse2 -mssse3
76.44
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.02, N = 3
29.69
60
120
180
240
300
1. (CXX) g++ options: -O3 -fomit-frame-pointer -ffast-math -mtune=native -flto -lSDL -fopenmp -fwhole-program -lstdc++
Coremark 1.0
CoreMark Size 666 - Iterations Per Second
Iterations/Sec, More Is Better
Raspberry Pi 4
SE +/- 7.97, N = 3
33030.56
Core i3 10100
SE +/- 1165.70, N = 3
179882.44
Pentium Gold G6400
SE +/- 969.55, N = 3
88892.10
Celeron G5900
SE +/- 21.42, N = 3
53412.28
rk3288 Asus C100PA Mainline 5.8
SE +/- 333.55, N = 7
31193.40
40K
80K
120K
160K
200K
1. (CC) gcc options: -O2 -lrt -lrt

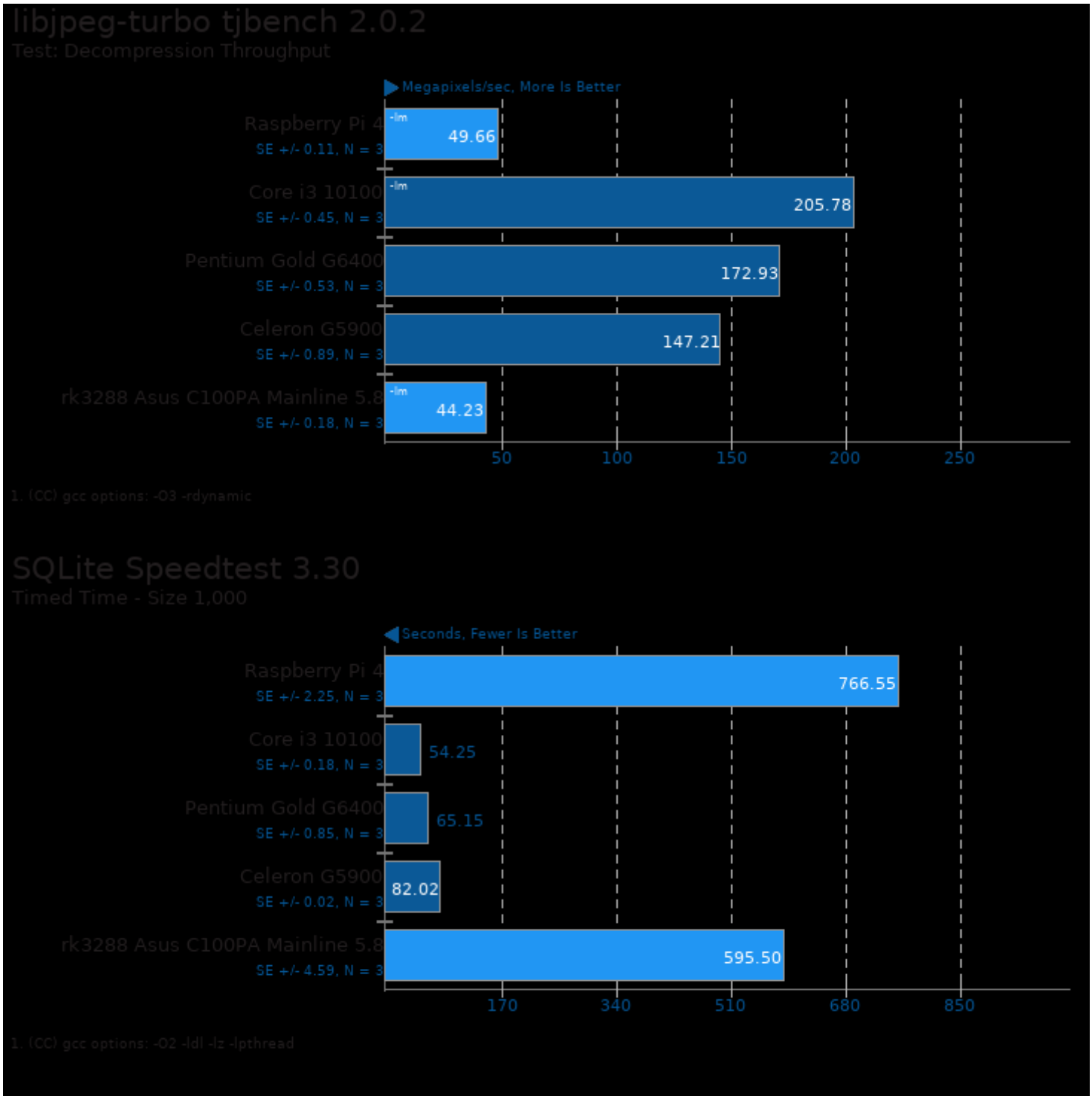

7-Zip Compression 16.02
Compress Speed Test
MIPS, More Is Better
Raspberry Pi 4
SE +/- 2.60, N = 3
3466
Core i3 10100
SE +/- 193.55, N = 3
27500
Pentium Gold G6400
SE +/- 17.03, N = 3
15033
Celeron G5900
SE +/- 25.67, N = 3
7920
rk3288 Asus C100PA Mainline 5.8
SE +/- 28.59, N = 3
3515
6K
12K
18K
24K
30K
1. (CXX) g++ options: -pipe -lpthread
Timed GDB GNU Debugger Compilation 9.1
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 12.43, N = 3
982.91
Core i3 10100
SE +/- 0.20, N = 3
118.87
Pentium Gold G6400
SE +/- 0.11, N = 3
178.80
Celeron G5900
SE +/- 0.17, N = 3
274.53
rk3288 Asus C100PA Mainline 5.8
SE +/- 1.22, N = 3
859.34
200
400
600
800
1000

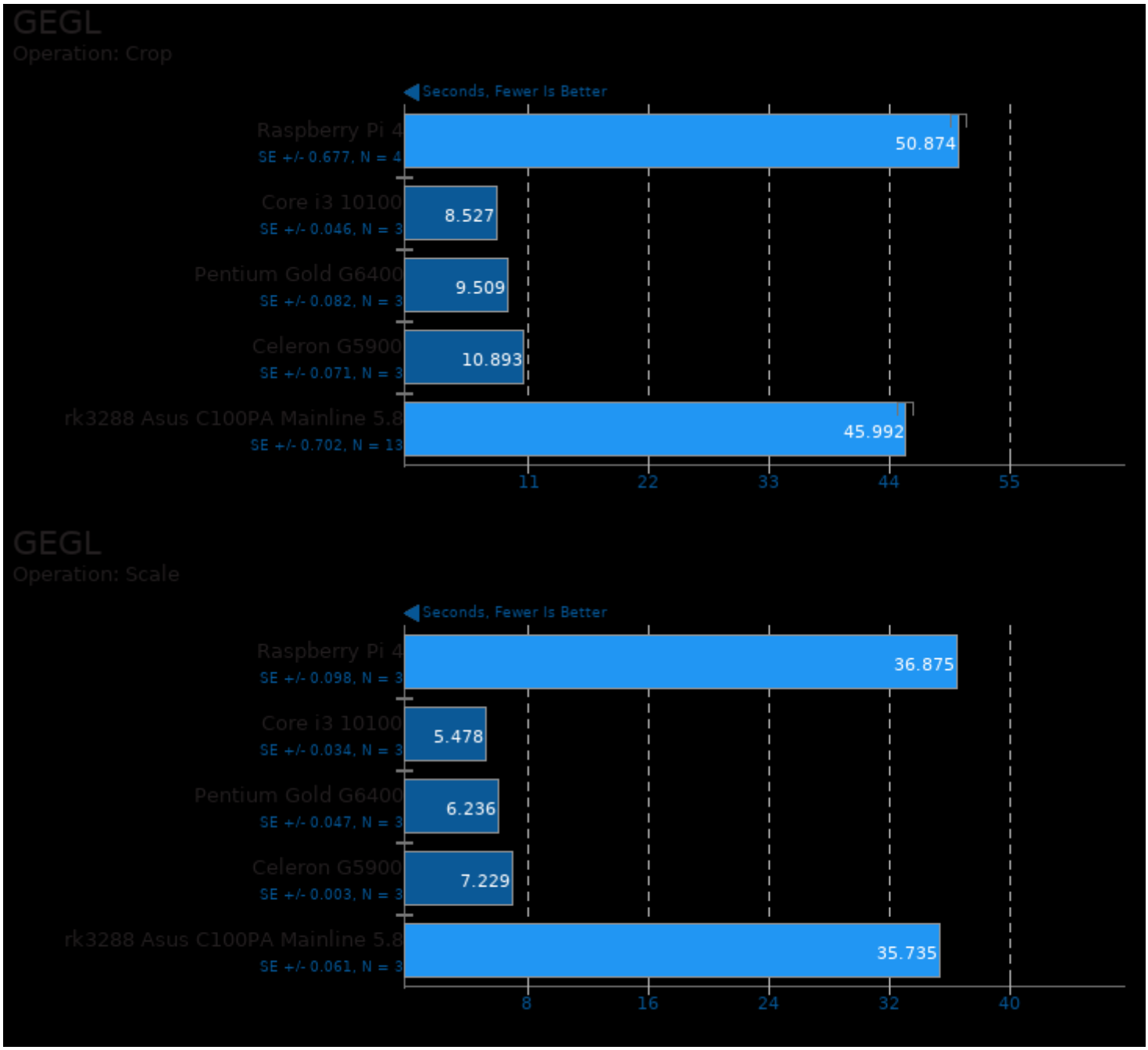

Timed MPlayer Compilation 1.4
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.09, N = 3
543.84
Core i3 10100
SE +/- 0.02, N = 3
69.22
Pentium Gold G6400
SE +/- 0.02, N = 3
128.70
Celeron G5900
SE +/- 0.06, N = 3
198.34
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.20, N = 3
537.71
120
240
360
480
600
Timed PHP Compilation 7.4.2
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.21, N = 3
636.52
Core i3 10100
SE +/- 0.11, N = 3
88.58
Pentium Gold G6400
SE +/- 0.07, N = 3
143.94
Celeron G5900
SE +/- 0.33, N = 3
220.08
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.34, N = 3
605.27
140
280
420
560
700

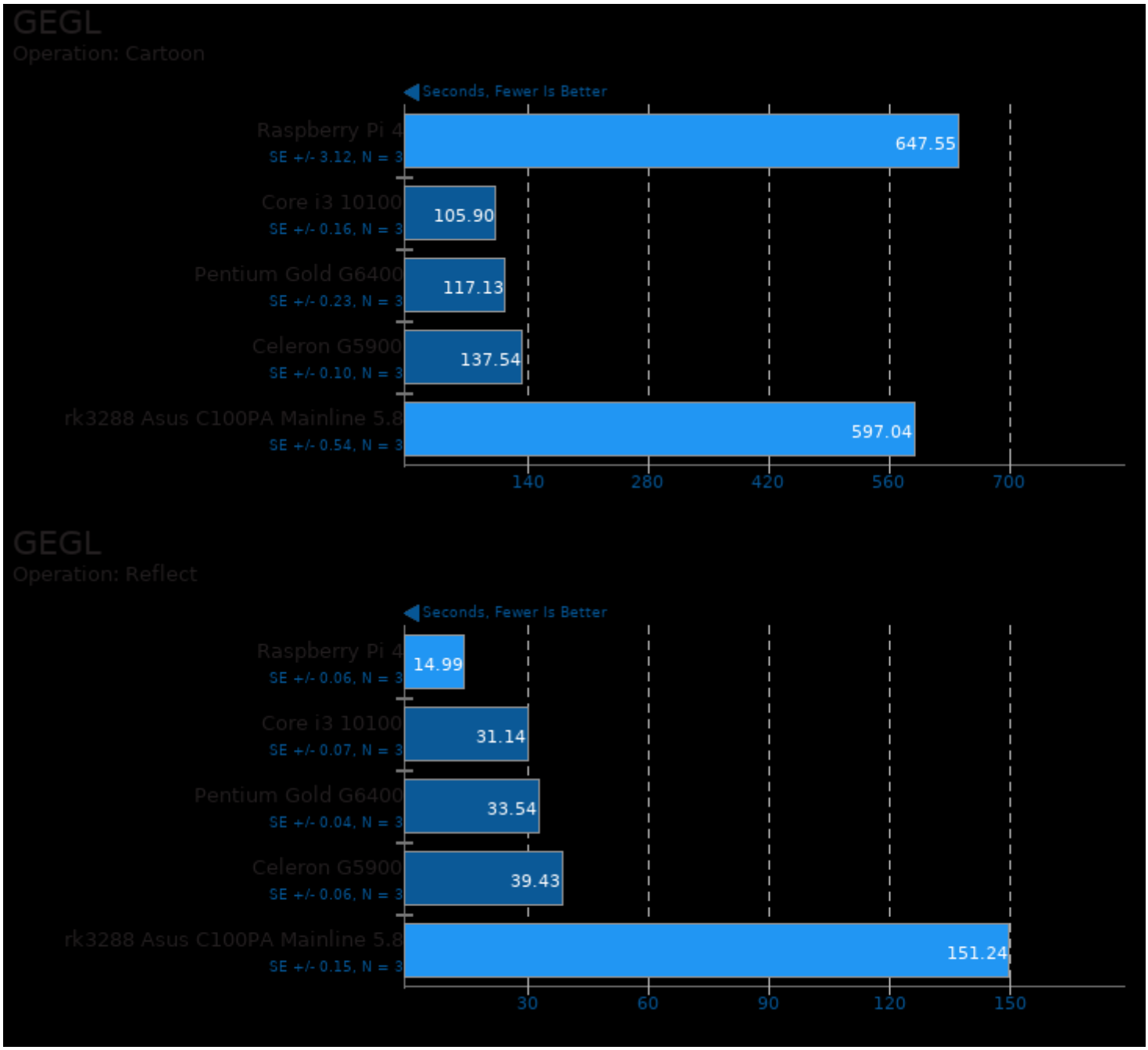

C-Ray 1.1
Total Time - 4K, 16 Rays Per Pixel
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 9.85, N = 9
680.08
Core i3 10100
SE +/- 0.01, N = 3
157.07
Pentium Gold G6400
SE +/- 0.06, N = 3
322.19
Celeron G5900
SE +/- 0.02, N = 3
400.35
rk3288 Asus C100PA Mainline 5.8
SE +/- 4.29, N = 3
1103.35
200
400
600
800
1000
1. (CC) gcc options: -lm -lpthread -O3
Smallpt 1.0
Global Illumination Renderer; 128 Samples
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.07, N = 3
130.18
Core i3 10100
SE +/- 0.01, N = 3
22.80
Pentium Gold G6400
SE +/- 0.03, N = 3
46.45
Celeron G5900
SE +/- 0.02, N = 3
74.59
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.65, N = 3
186.39
40
80
120
160
200
1. (CXX) g++ options: -fopenmp -O3

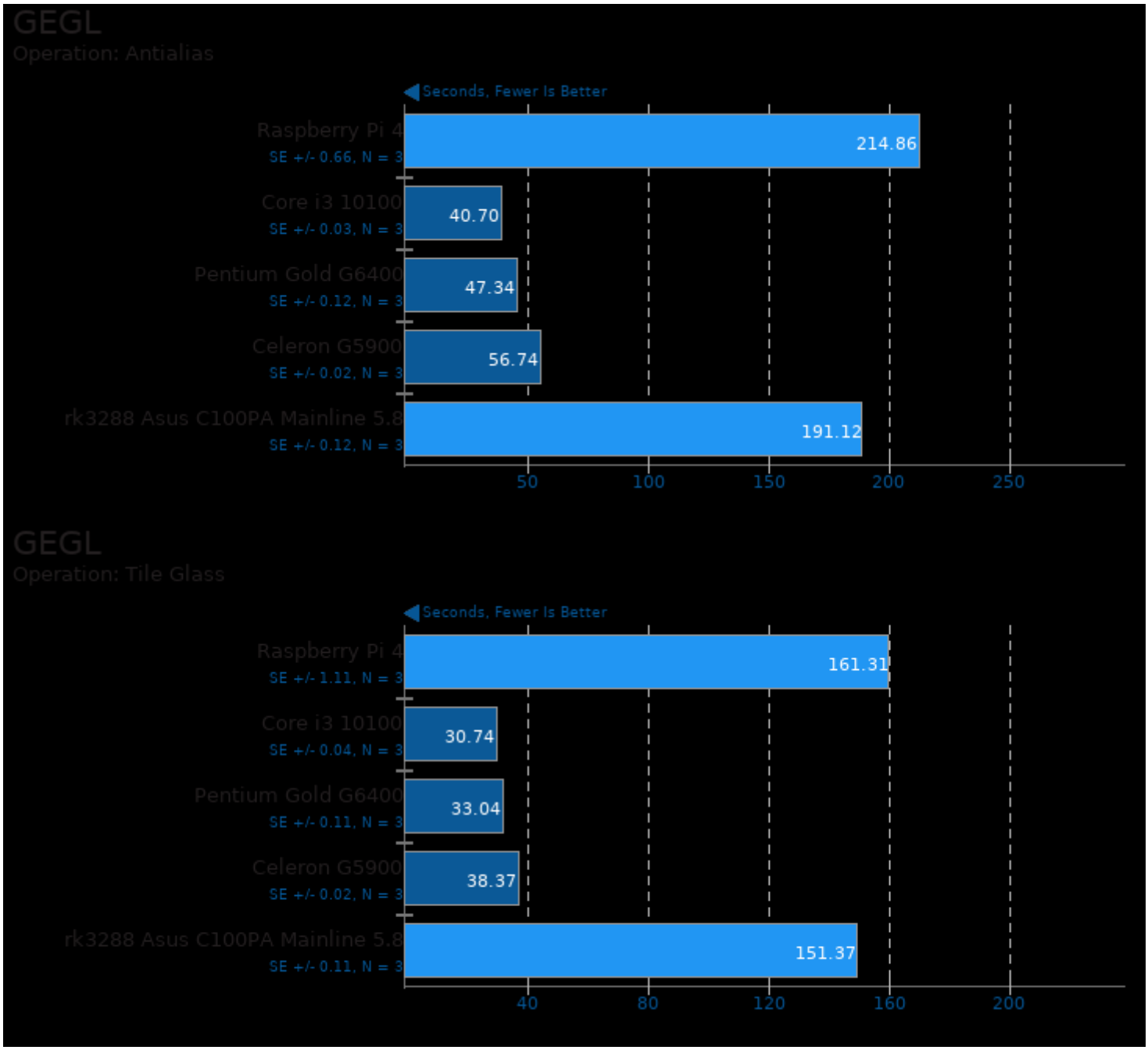

Numpy Benchmark
Score, More Is Better
Raspberry Pi 4
SE +/- 0.02, N = 3
26.54
Core i3 10100
SE +/- 0.43, N = 3
375.55
Pentium Gold G6400
SE +/- 0.12, N = 3
336.12
Celeron G5900
SE +/- 0.59, N = 3
282.42
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.06, N = 3
35.49
80
160
240
320
400
XZ Compression 5.2.4
Compressing ubuntu-16.04.3-server-i386.img, Compression Level 9
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.92, N = 3
405.92
Core i3 10100
SE +/- 0.07, N = 3
42.49
Pentium Gold G6400
SE +/- 0.17, N = 3
69.31
Celeron G5900
SE +/- 0.06, N = 3
123.88
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.41, N = 3
277.98
90
180
270
360
450
1. (CC) gcc options: -pthread -fvisibility=hidden -O2

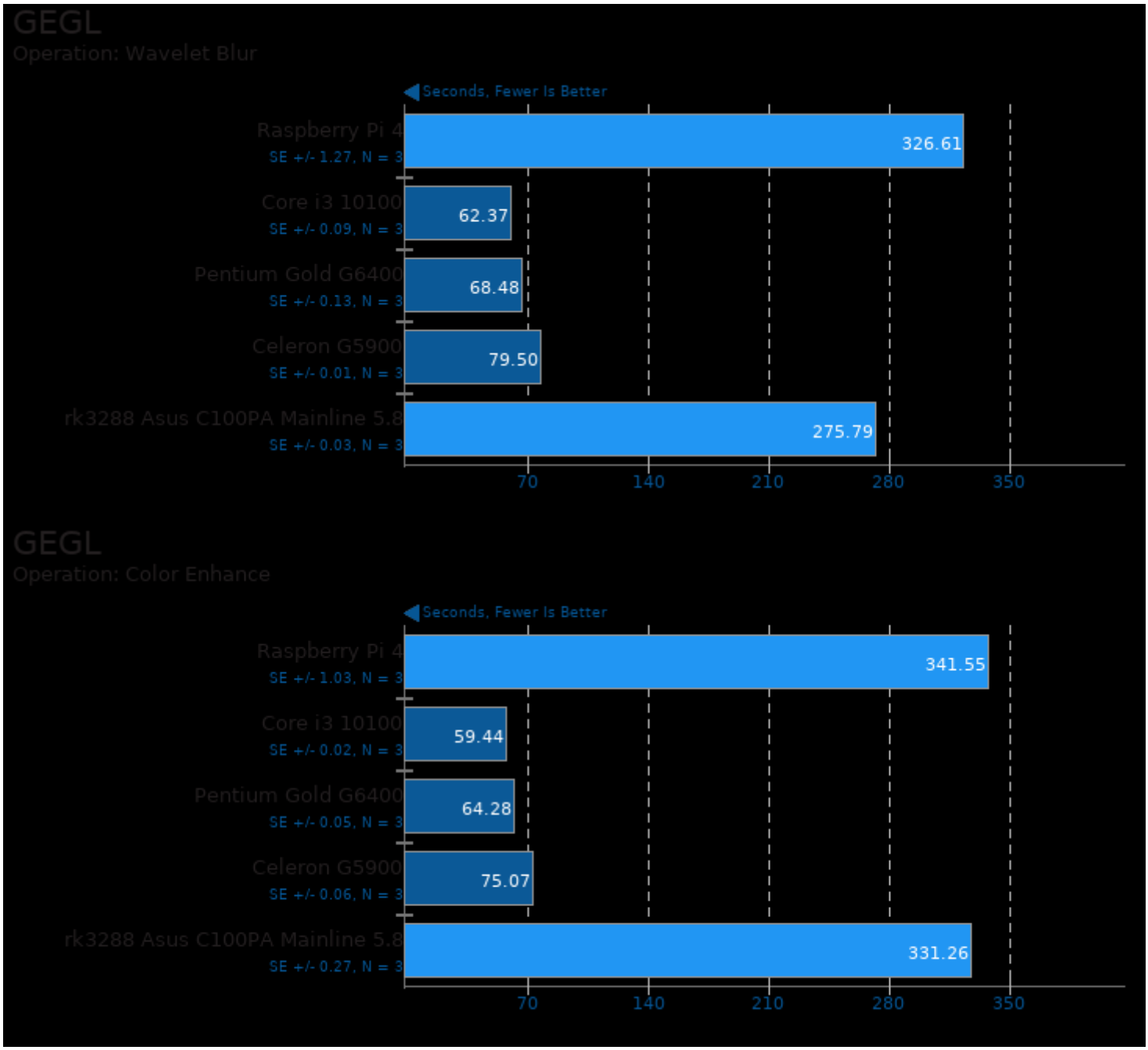

OpenSSL 1.1.1
RSA 4096-bit Performance
Signs Per Second, More Is Better
Raspberry Pi 4
SE +/- 0.03, N = 3
97.6
Core i3 10100
SE +/- 2.27, N = 3
-m64
1253.2
Pentium Gold G6400
SE +/- 0.13, N = 3
-m64
389.3
Celeron G5900
SE +/- 1.05, N = 3
-m64
315.0
rk3288 Asus C100PA Mainline 5.8
SE +/- 1.19, N = 6
101.7
300
600
900
1200
1500
1. (CC) gcc options: -pthread -O3 -lssl -lcrypto -ldl
Aircrack-ng 1.5.2
k/s, More Is Better
Raspberry Pi 4
SE +/- 3.70, N = 3
1162.35
Core i3 10100
SE +/- 38.97, N = 3
-masm=intel
15519.07
Pentium Gold G6400
SE +/- 4.55, N = 3
-masm=intel
2812.62
Celeron G5900
SE +/- 0.27, N = 3
-masm=intel
2346.78
3K
6K
9K
12K
15K
1. (CXX) g++ options: -O3 -fvisibility=hidden -fcommon -rdynamic -lpthread -lz -lcrypto -lhwloc -ldl -lm -pthread


libjpeg-turbo tjbench 2.0.2
Test: Decompression Throughput
Megapixels/sec, More Is Better
Raspberry Pi 4
SE +/- 0.11, N = 3
-ilm
49.66
Core i3 10100
SE +/- 0.45, N = 3
-ilm
205.78
Pentium Gold G6400
SE +/- 0.53, N = 3
172.93
Celeron G5900
SE +/- 0.89, N = 3
147.21
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.18, N = 3
-ilm
44.23
50
100
150
200
250
1. (CC) gcc options: -O3 -rdynamic
SQLite Speedtest 3.30
Timed Time - Size 1,000
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 2.25, N = 3
766.55
Core i3 10100
SE +/- 0.18, N = 3
54.25
Pentium Gold G6400
SE +/- 0.85, N = 3
65.15
Celeron G5900
SE +/- 0.02, N = 3
82.02
rk3288 Asus C100PA Mainline 5.8
SE +/- 4.59, N = 3
595.50
170
340
510
680
850
1. (CC) gcc options: -O2 -ldl -lz -lpthread


GEGL
Operation: Crop
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.677, N = 4
50.874
Core i3 10100
SE +/- 0.046, N = 3
8.527
Pentium Gold G6400
SE +/- 0.082, N = 3
9.509
Celeron G5900
SE +/- 0.071, N = 3
10.893
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.702, N = 13
45.992
11
22
33
44
55
GEGL
Operation: Scale
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.098, N = 3
36.875
Core i3 10100
SE +/- 0.034, N = 3
5.478
Pentium Gold G6400
SE +/- 0.047, N = 3
6.236
Celeron G5900
SE +/- 0.003, N = 3
7.229
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.061, N = 3
35.735
8
16
24
32
40

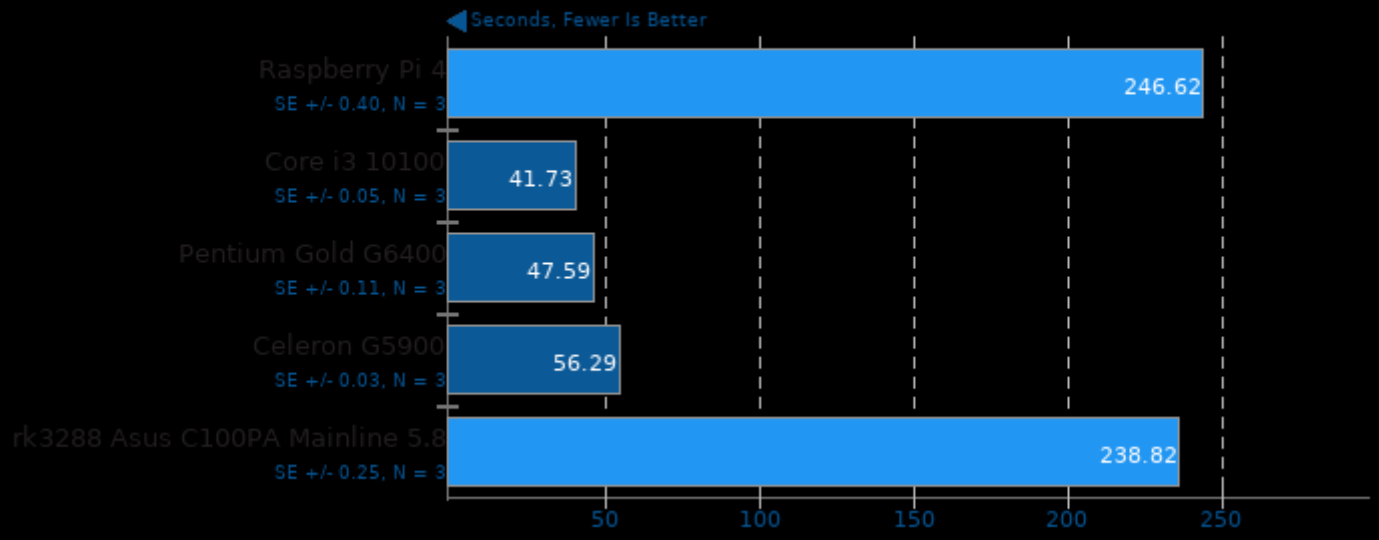

GEGL
Operation: Cartoon
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 3.12, N = 3
647.55
Core i3 10100
SE +/- 0.16, N = 3
105.90
Pentium Gold G6400
SE +/- 0.23, N = 3
117.13
Celeron G5900
SE +/- 0.10, N = 3
137.54
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.54, N = 3
597.04
140
280
420
560
700
GEGL
Operation: Reflect
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.06, N = 3
14.99
Core i3 10100
SE +/- 0.07, N = 3
31.14
Pentium Gold G6400
SE +/- 0.04, N = 3
33.54
Celeron G5900
SE +/- 0.06, N = 3
39.43
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.15, N = 3
151.24
30
60
90
120
150


GEGL
Operation: Antialias
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.66, N = 3
214.86
Core i3 10100
SE +/- 0.03, N = 3
40.70
Pentium Gold G6400
SE +/- 0.12, N = 3
47.34
Celeron G5900
SE +/- 0.02, N = 3
56.74
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.12, N = 3
191.12
50
100
150
200
250
GEGL
Operation: Tile Glass
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.11, N = 3
161.31
Core i3 10100
SE +/- 0.04, N = 3
30.74
Pentium Gold G6400
SE +/- 0.11, N = 3
33.04
Celeron G5900
SE +/- 0.02, N = 3
38.37
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.11, N = 3
151.37
40
80
120
160
200


GEGL
Operation: Wavelet Blur
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.27, N = 3
326.61
Core i3 10100
SE +/- 0.09, N = 3
62.37
Pentium Gold G6400
SE +/- 0.13, N = 3
68.48
Celeron G5900
SE +/- 0.01, N = 3
79.50
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.03, N = 3
275.79
70
140
210
280
350
GEGL
Operation: Color Enhance
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.03, N = 3
341.55
Core i3 10100
SE +/- 0.02, N = 3
59.44
Pentium Gold G6400
SE +/- 0.05, N = 3
64.28
Celeron G5900
SE +/- 0.06, N = 3
75.07
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.27, N = 3
331.26
70
140
210
280
350

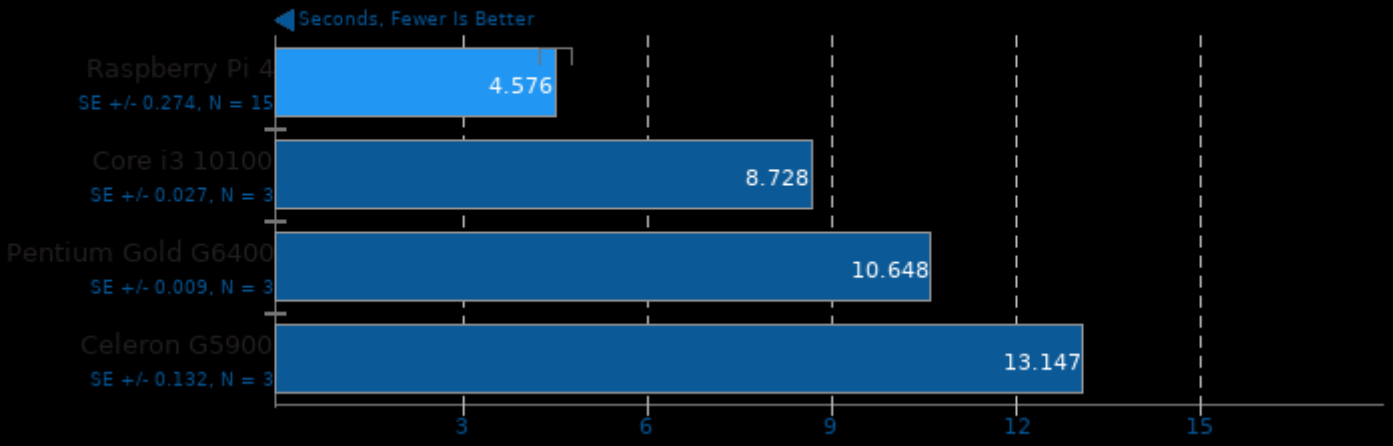
GEGL

Operation: Rotate 90 Degrees



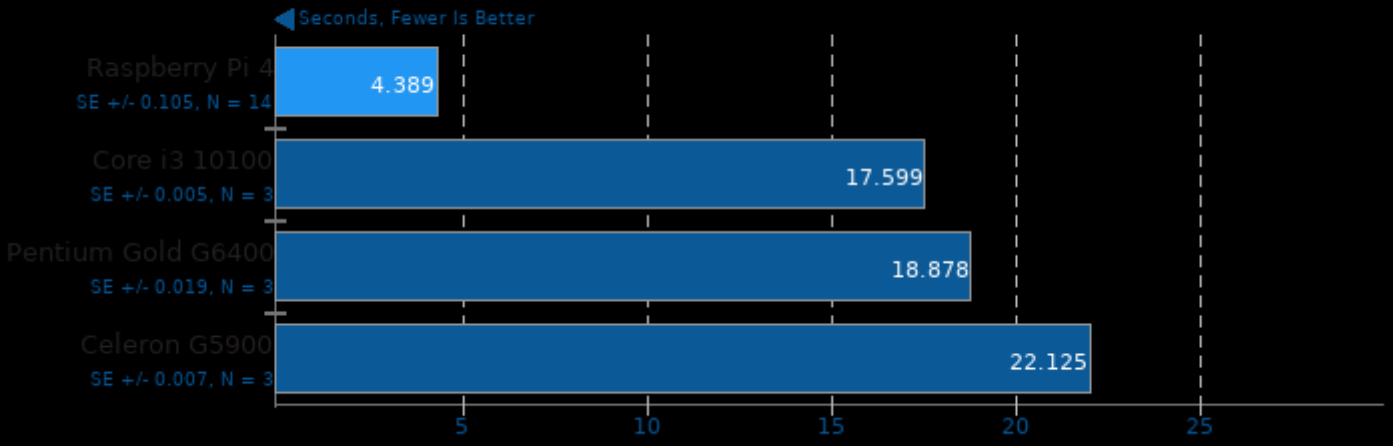
GIMP 2.10.8

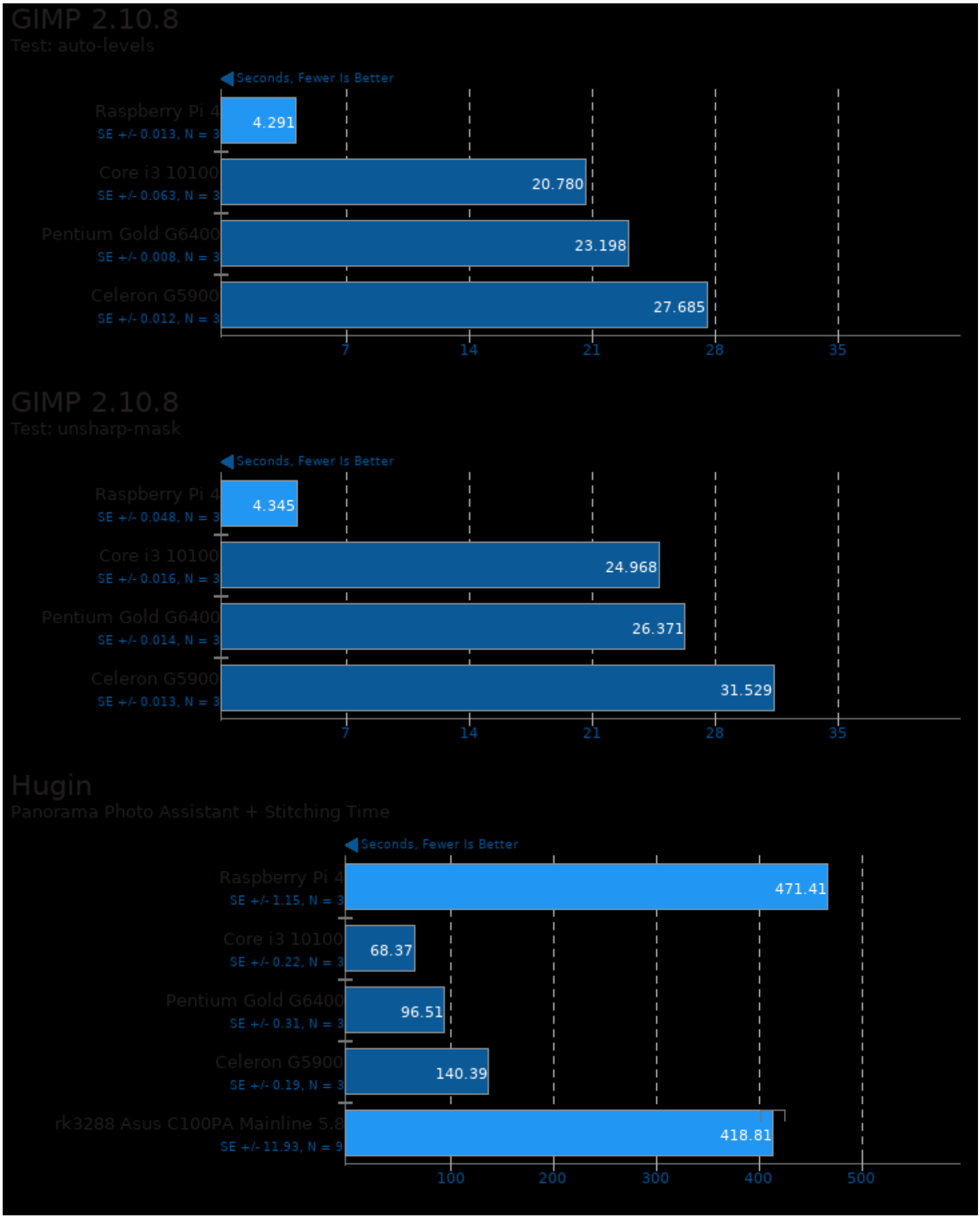
Test: resize

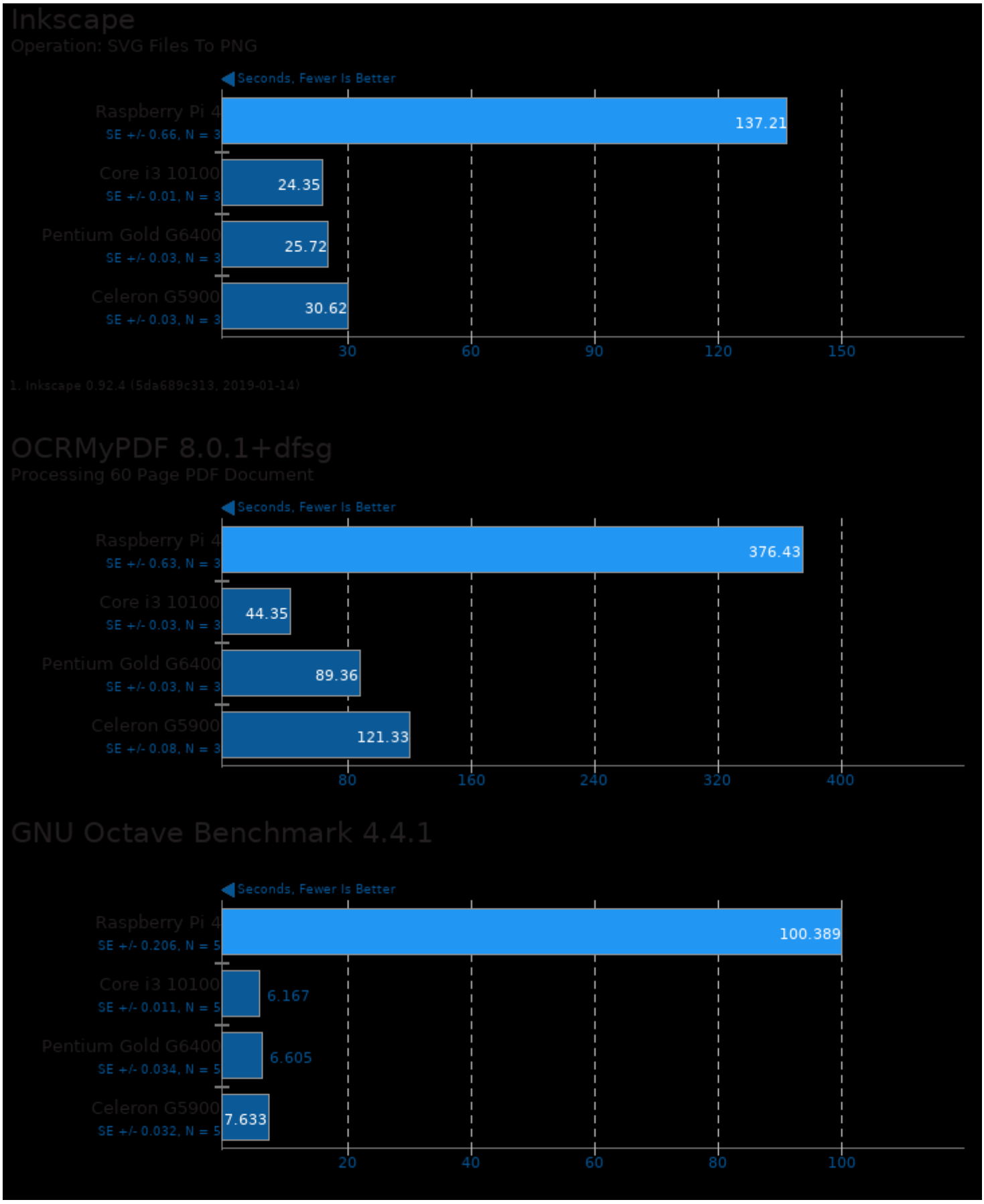


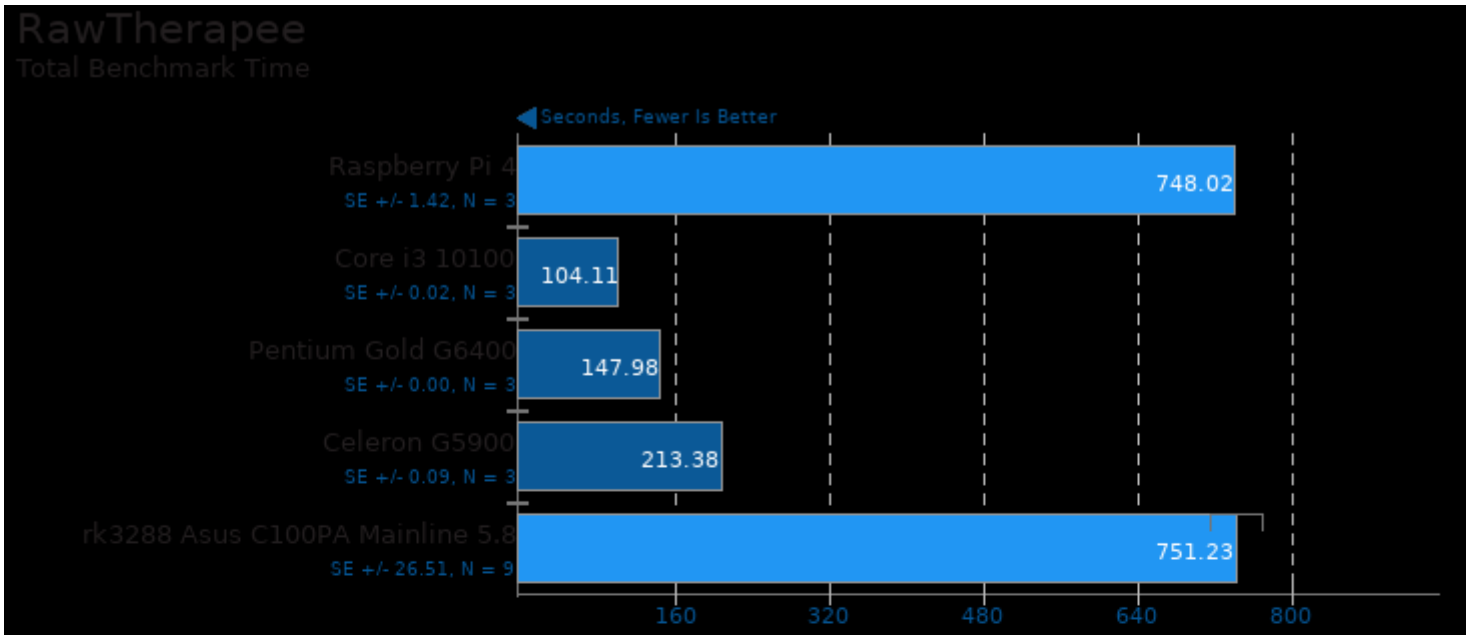
GIMP 2.10.8

Test: rotate




GIMP 2.10.8
Test: auto-levels
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.013, N = 3
4.291
Core i3 10100
SE +/- 0.063, N = 3
20.780
Pentium Gold G6400
SE +/- 0.008, N = 3
23.198
Celeron G5900
SE +/- 0.012, N = 3
27.685
7
14
21
28
35
GIMP 2.10.8
Test: unsharp-mask
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.048, N = 3
4.345
Core i3 10100
SE +/- 0.016, N = 3
24.968
Pentium Gold G6400
SE +/- 0.014, N = 3
26.371
Celeron G5900
SE +/- 0.013, N = 3
31.529
7
14
21
28
35
Hugin
Panorama Photo Assistant + Stitching Time
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 1.15, N = 3
471.41
Core i3 10100
SE +/- 0.22, N = 3
68.37
Pentium Gold G6400
SE +/- 0.31, N = 3
96.51
Celeron G5900
SE +/- 0.19, N = 3
140.39
rk3288 Asus C100PA Mainline 5.8
SE +/- 11.93, N = 9
418.81
100
200
300
400
500


Inkscape
Operation: SVG Files To PNG
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.66, N = 3
137.21
Core i3 10100
SE +/- 0.01, N = 3
24.35
Pentium Gold G6400
SE +/- 0.03, N = 3
25.72
Celeron G5900
SE +/- 0.03, N = 3
30.62
30
60
90
120
150
1. Inkscape 0.92.4 (5da689c313, 2019-01-14)
OCRMyPDF 8.0.1+dfsg
Processing 60 Page PDF Document
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.63, N = 3
376.43
Core i3 10100
SE +/- 0.03, N = 3
44.35
Pentium Gold G6400
SE +/- 0.03, N = 3
89.36
Celeron G5900
SE +/- 0.08, N = 3
121.33
80
160
240
320
400
GNU Octave Benchmark 4.4.1
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.206, N = 5
100.389
Core i3 10100
SE +/- 0.011, N = 5
6.167
Pentium Gold G6400
SE +/- 0.034, N = 5
6.605
Celeron G5900
SE +/- 0.032, N = 5
7.633
20
40
60
80
100



1. Raspberry Pi 4: RawTherapee, version 5.5, command line.
An advanced, cross-platform program for developing raw photos.

Website: http://www.rawtherapee.com/
Documentation: http://rawpedia.rawtherapee.com/
Forum: https://discuss.pixls.us/c/software/rawtherapee
Code and bug reports: https://github.com/Beep6581/RawTherapee

Symbols:
<Chevrons> indicate parameters you can change.
[Square brackets] mean the parameter is optional.
The pipe symbol | indicates a choice of one or the other.
The dash symbol - denotes a range of possible values from one to the other.

Usage:
rawtherapee-cli -c <dir>|<files> Convert files in batch with default parameters.
rawtherapee-cli <other options> -c <dir>|<files> Convert files in batch with your own settings.

Options:
rawtherapee-cli[-o <output>|-O <output>] [-q] [-a] [-s|-S] [-p <one.pp3> [-p <two.pp3> ...]] [-d] [-j[1-100] -js<1-3> | -t[z] -b<8|16|16f|32> | -n -b<8

-c <files> Specify one or more input files or folders.
When specifying folders, Rawtherapee will look for image file types which comply
with the selected extensions (see also '-a').
-c must be the last option.

-o <file>|<dir> Set output file or folder.
Saves output file alongside input file if -o is not specified.

-O <file>|<dir> Set output file or folder and copy pp3 file into it.

-q Quick-start mode. Does not load cached files to speedup start time.

-a Process all supported image file types when specifying a folder, even those
not currently selected in Preferences > File Browser > Parsed Extensions.

-s Use the existing sidecar file to pull the processing parameters,
and save the output to a new one with the pp3 file in the same folder.
If the sidecar file does not exist, neutral values will be used.

-S Like -s but skip if the sidecar file does not exist.

-p <file.pp3> Specify processing profile to be used for all conversions.
Options specified after this will override the "-p <file.pp3>" options as you like,
each will be built on top of the previous one, as explained below.
Use the default raw or non-raw processing profile as setup in
Preferences > Image Processing > Default Processing Profile

-d Specify output to be JPEG (default, if -t and -n are not set).

-j[1-100] Optionally specify compression 1-100 (default value: 92).

-js<1-3> Specify the JPEG chroma subsampling parameter, where:
1 = Best compression: 2x2, 1x1, 1x1 (4:2:0)
Chroma halved vertically and horizontally.
2 = Balanced (default): 2x1, 1x1, 1x1 (4:2:2)
Chroma halved horizontally.
3 = Best quality: 1x1, 1x1, 1x1 (4:4:4)

-t[z] Specify one or more input files or folders.
When specifying folders, Rawtherapee will look for image file types which comply
with the selected extensions (see also '-a').
Specify TIFF output as deflate-compressed.

-b<8|16|16f|32> Specify bit depth per channel.
8 = 8 bit integer. Applies to JPEG, PNG and TIFF. Default for JPEG and PNG.
16 = 16 bit integer. Applies to TIFF and PNG. Default for TIFF.
16f = 16 bit float. Applies to TIFF.
32 = 32 bit float. Applies to TIFF.

-n Do not overwrite if output file already exists.

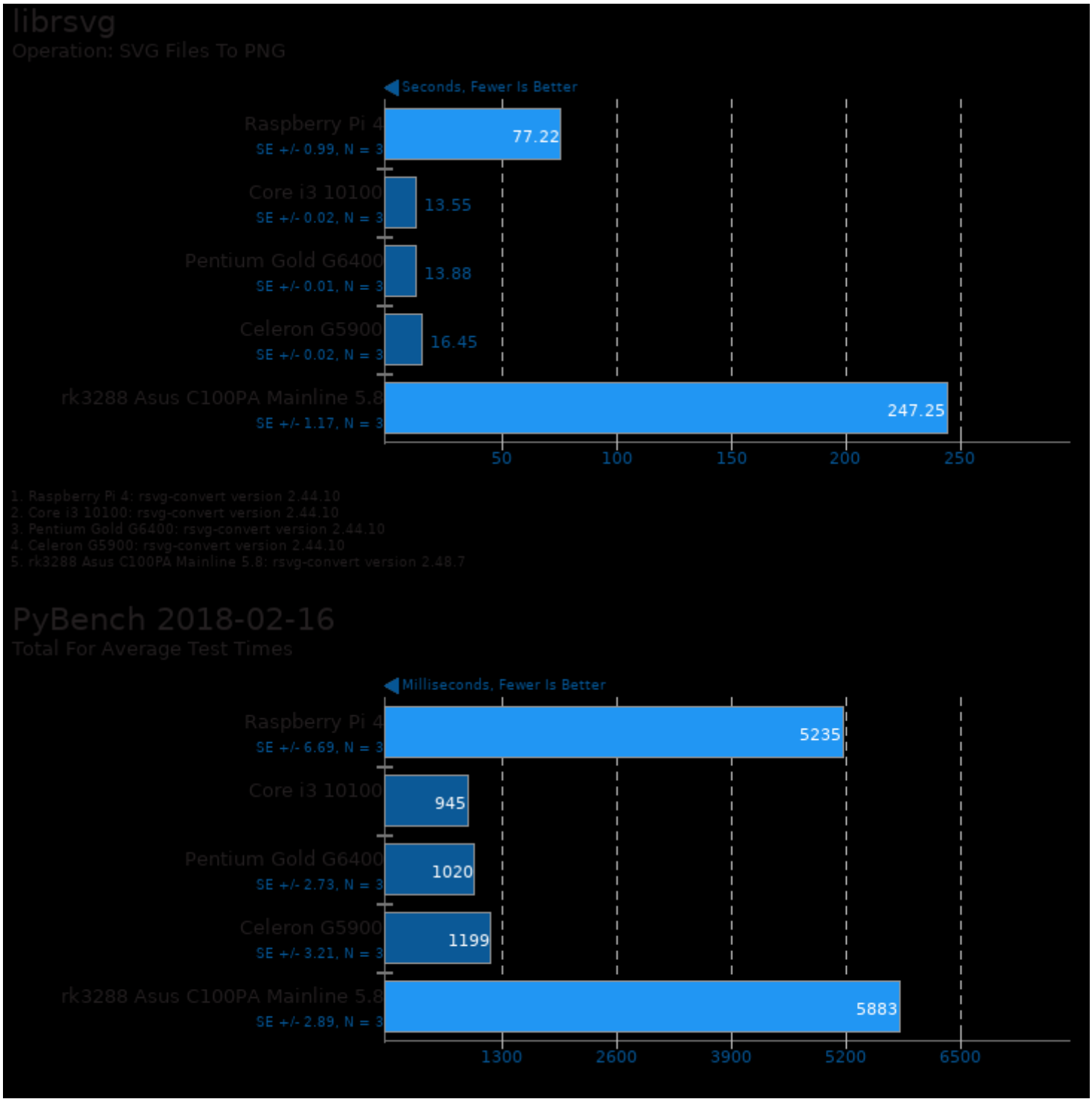
-Z Specify output to be compressed PNG.

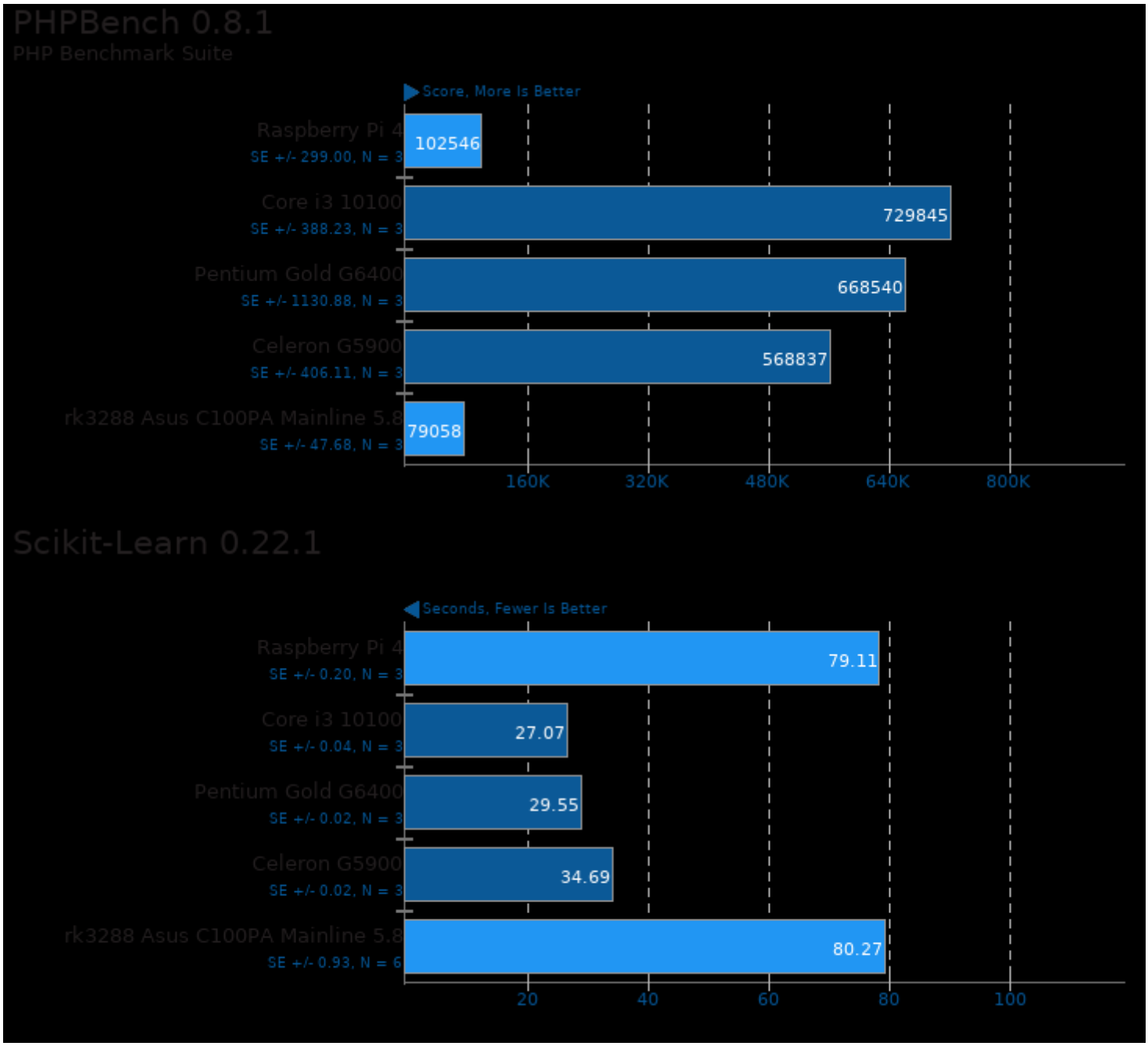
2. Core i3 10100: RawTherapee, version 5.5, command line.
An advanced, cross-platform program for developing raw photos.

Website: http://www.rawtherapee.com/
Documentation: http://rawpedia.rawtherapee.com/
Forum: https://discuss.pixls.us/c/software/rawtherapee
Code and bug reports: https://github.com/Beep6581/RawTherapee

3. Pentium Gold G6400: RawTherapee, version 5.5, command line.
An advanced, cross-platform program for developing raw photos.

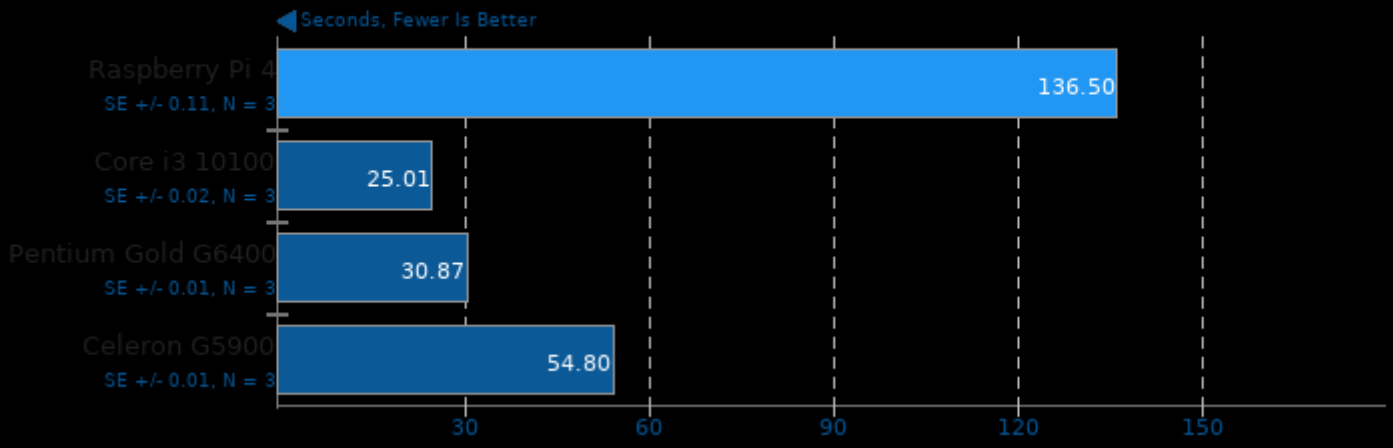
Website: http://www.rawtherapee.com/
Documentation: http://rawpedia.rawtherapee.com/
Forum: https://discuss.pixls.us/c/software/rawtherapee
Code and bug reports: https://github.com/Beep6581/RawTherapee


librsvg
Operation: SVG Files To PNG
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.99, N = 3
77.22
Core i3 10100
SE +/- 0.02, N = 3
13.55
Pentium Gold G6400
SE +/- 0.01, N = 3
13.88
Celeron G5900
SE +/- 0.02, N = 3
16.45
rk3288 Asus C100PA Mainline 5.8
SE +/- 1.17, N = 3
247.25
50
100
150
200
250
1. Raspberry Pi 4: rsvg-convert version 2.44.10
2. Core i3 10100: rsvg-convert version 2.44.10
3. Pentium Gold G6400: rsvg-convert version 2.44.10
4. Celeron G5900: rsvg-convert version 2.44.10
5. rk3288 Asus C100PA Mainline 5.8: rsvg-convert version 2.48.7
PyBench 2018-02-16
Total For Average Test Times
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 6.69, N = 3
5235
Core i3 10100
945
Pentium Gold G6400
SE +/- 2.73, N = 3
1020
Celeron G5900
SE +/- 3.21, N = 3
1199
rk3288 Asus C100PA Mainline 5.8
SE +/- 2.89, N = 3
5883
1300
2600
3900
5200
6500


PHPBench 0.8.1
PHP Benchmark Suite
Score, More Is Better
Raspberry Pi 4
SE +/- 299.00, N = 3
102546
Core i3 10100
SE +/- 388.23, N = 3
729845
Pentium Gold G6400
SE +/- 1130.88, N = 3
668540
Celeron G5900
SE +/- 406.11, N = 3
568837
rk3288 Asus C100PA Mainline 5.8
SE +/- 47.68, N = 3
79058
160K
320K
480K
640K
800K
Scikit-Learn 0.22.1
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.20, N = 3
79.11
Core i3 10100
SE +/- 0.04, N = 3
27.07
Pentium Gold G6400
SE +/- 0.02, N = 3
29.55
Celeron G5900
SE +/- 0.02, N = 3
34.69
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.93, N = 6
80.27
20
40
60
80
100

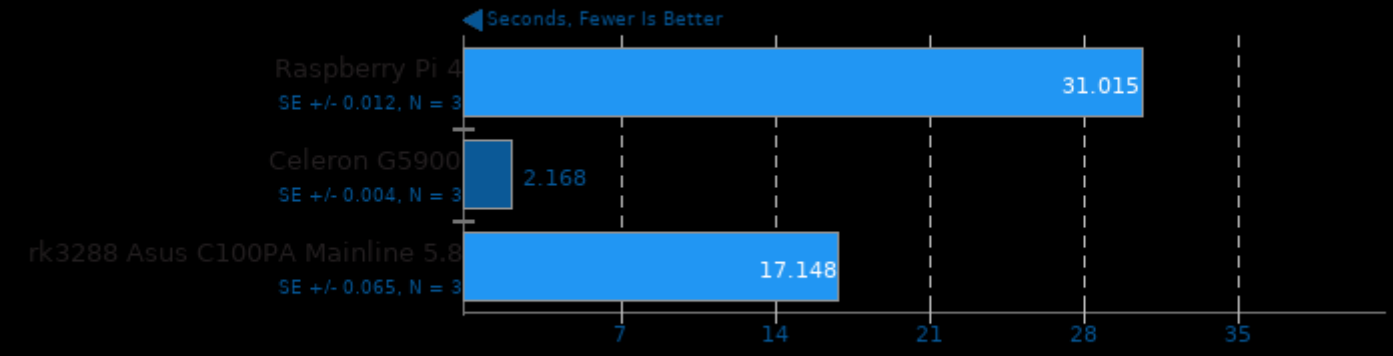
Tesseract OCR 4.0.0

Time To OCR 7 Images



PolyBench-C 4.2

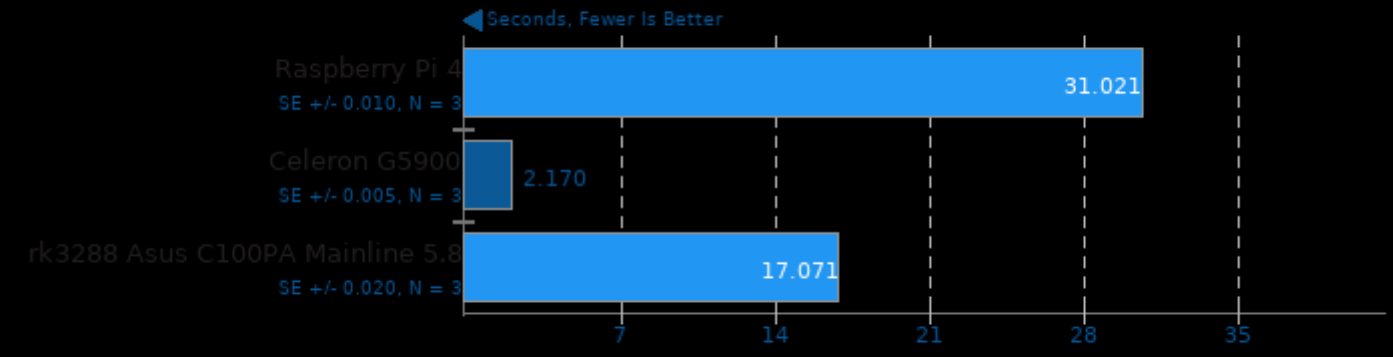
Test: Covariance Computation



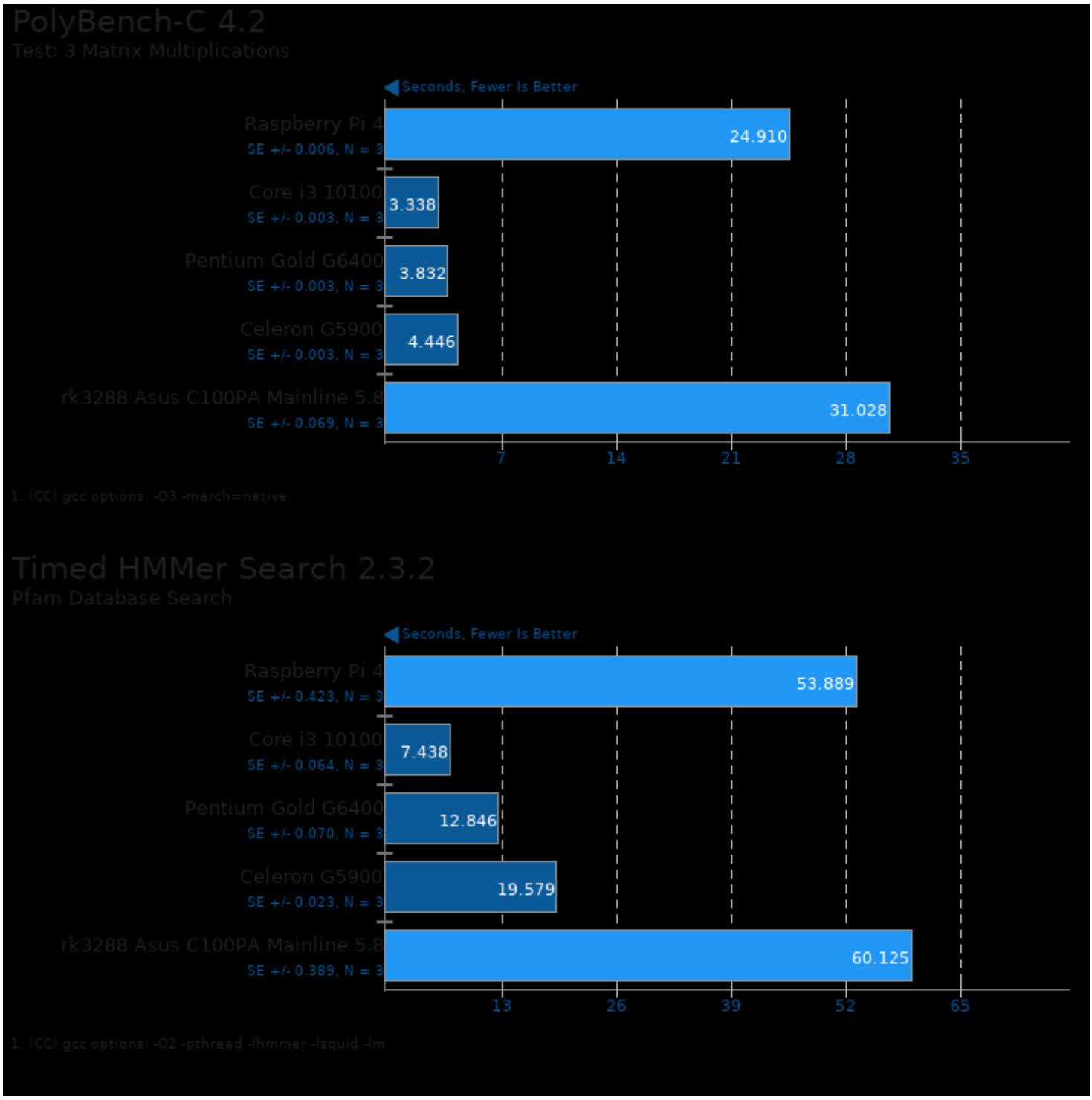
1. (CC) gcc options: -O3 -march=native

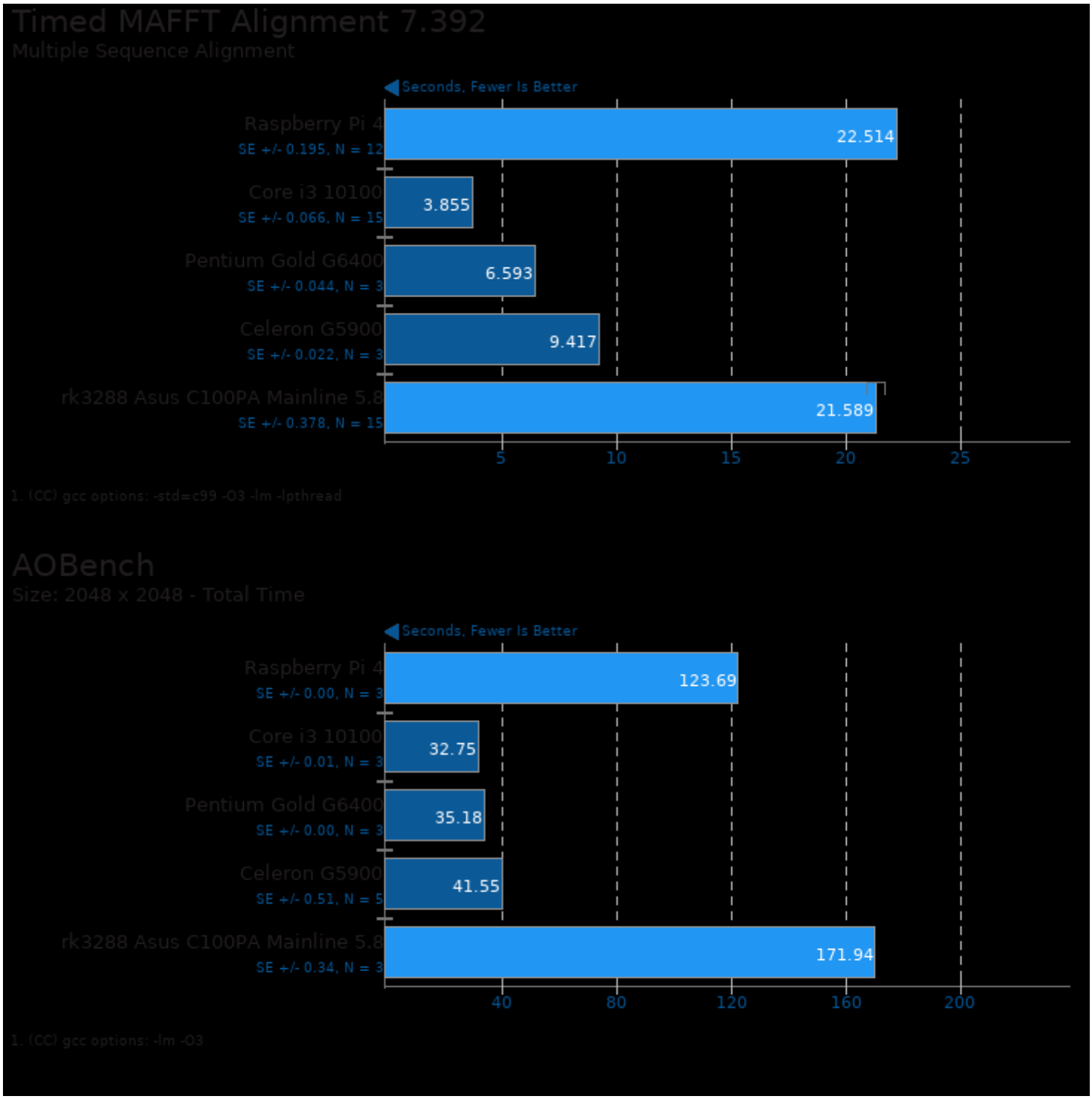
PolyBench-C 4.2

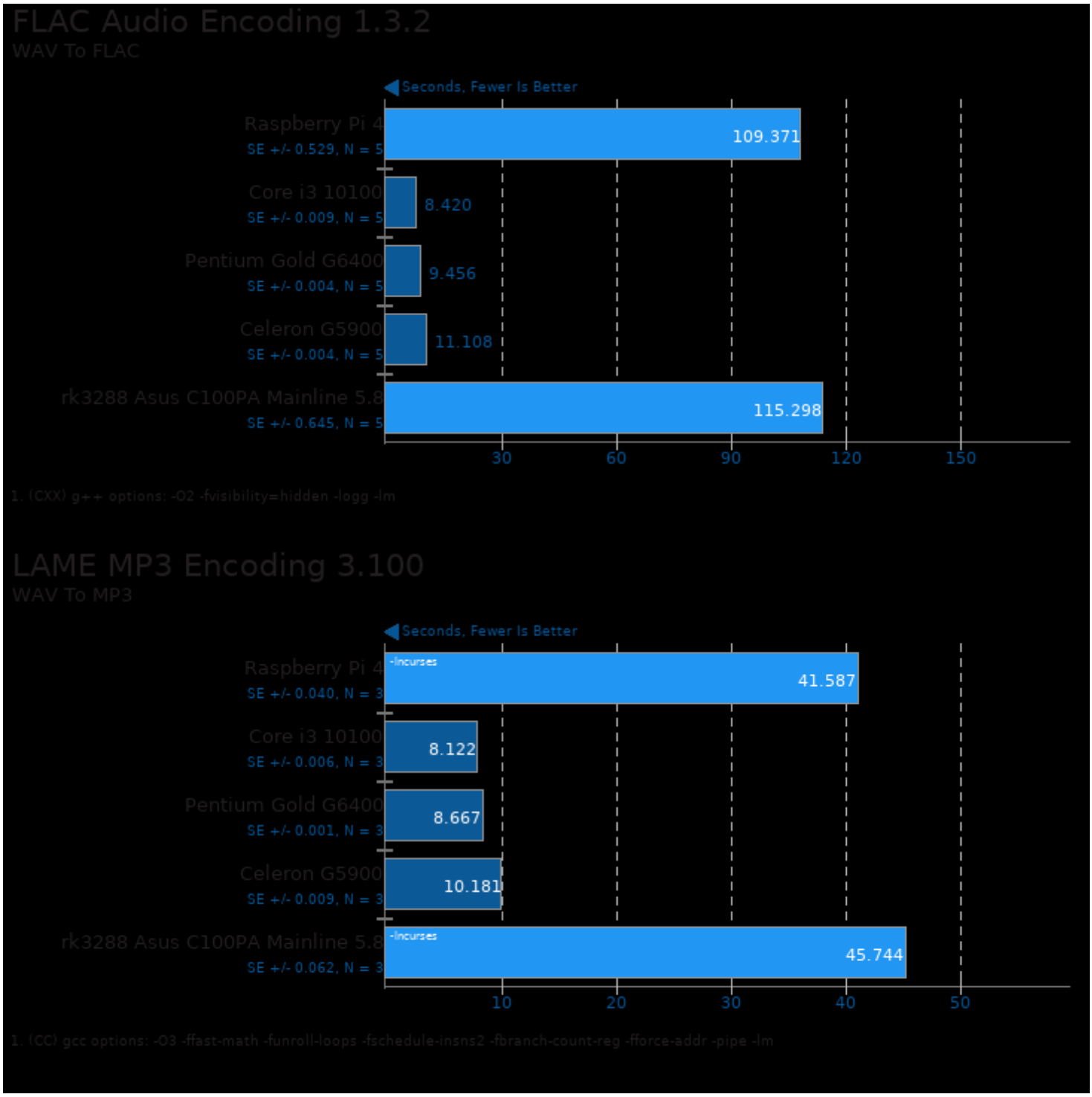
Test: Correlation Computation

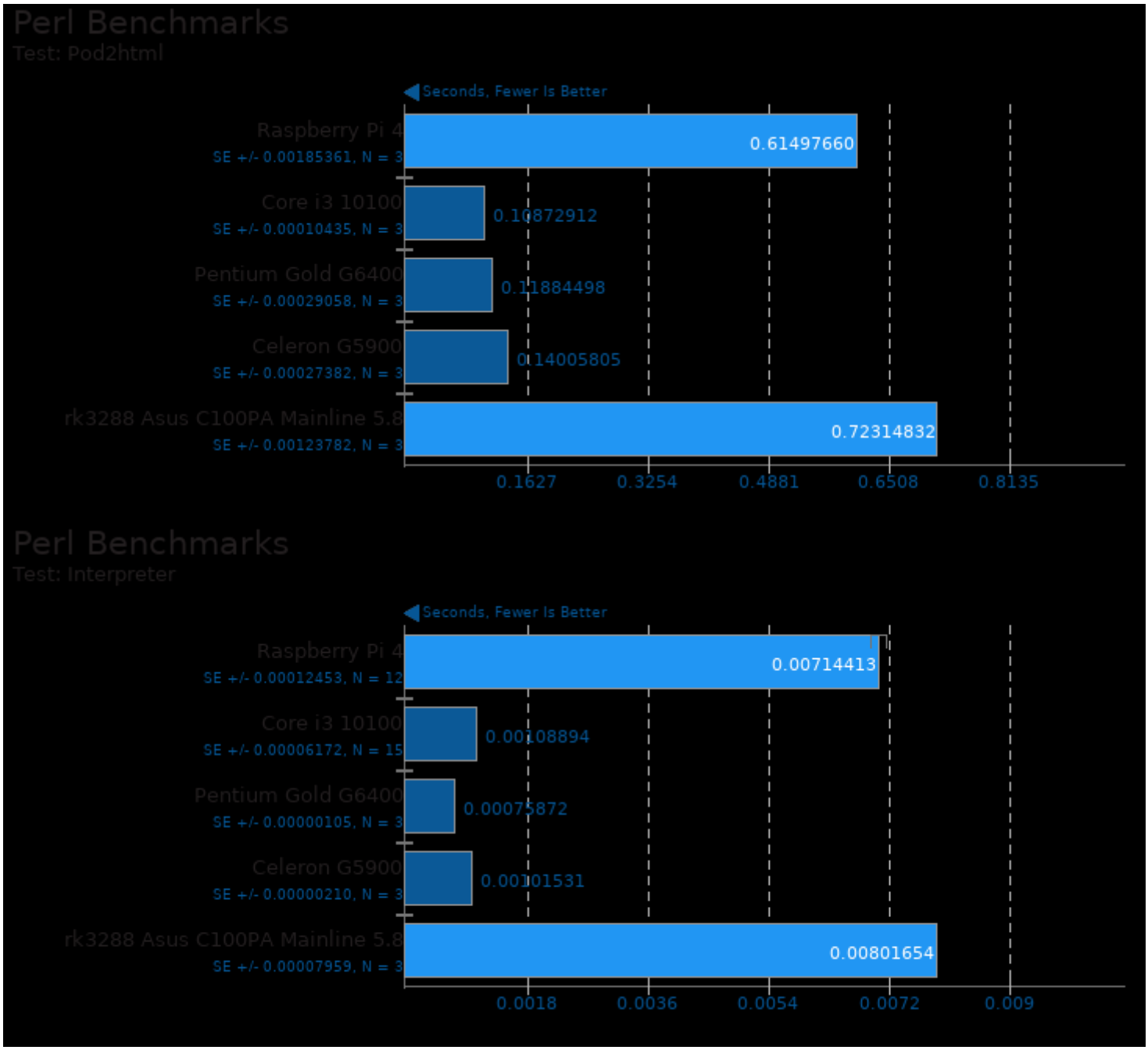


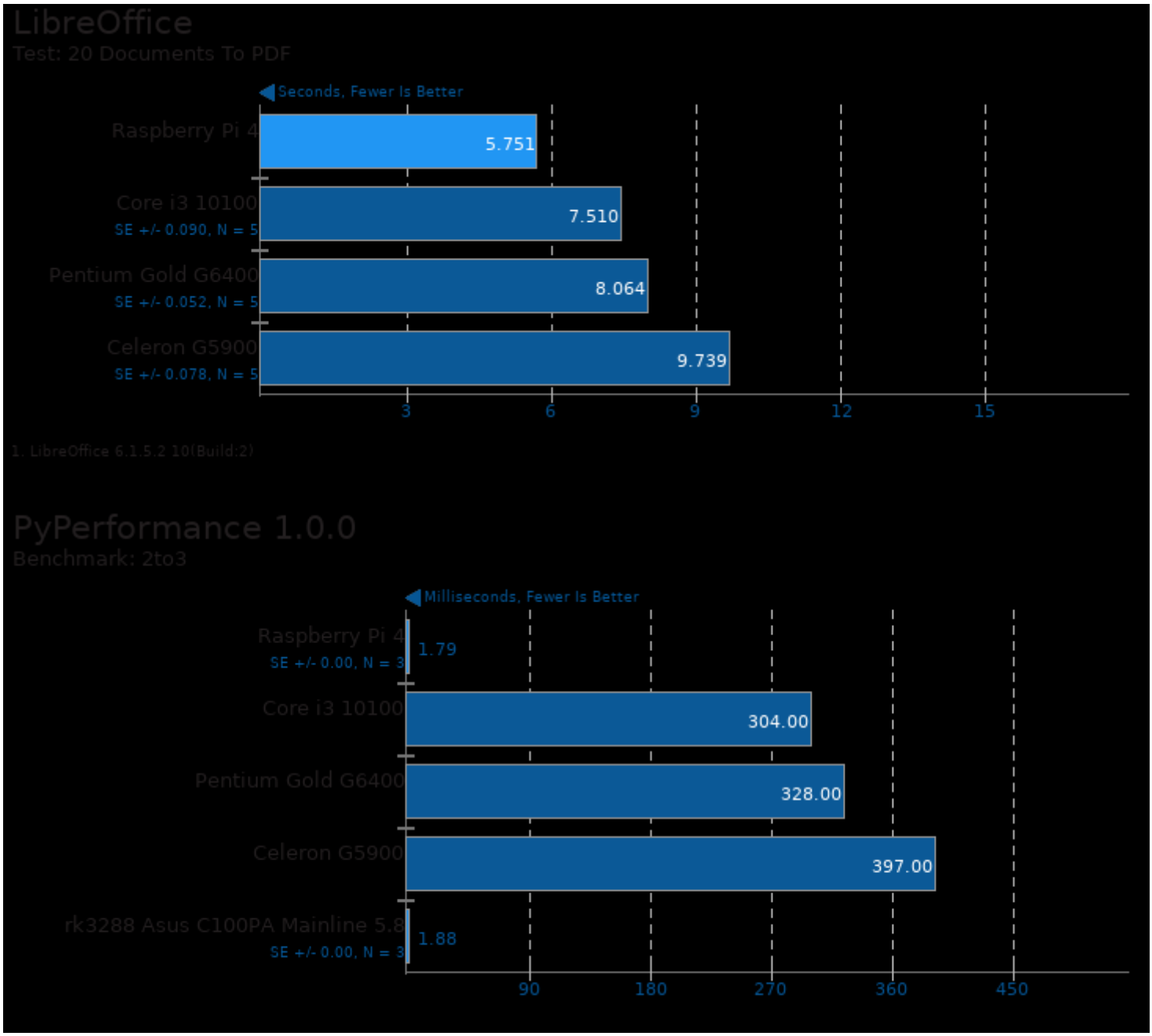
1. (CC) gcc options: -O3 -march=native

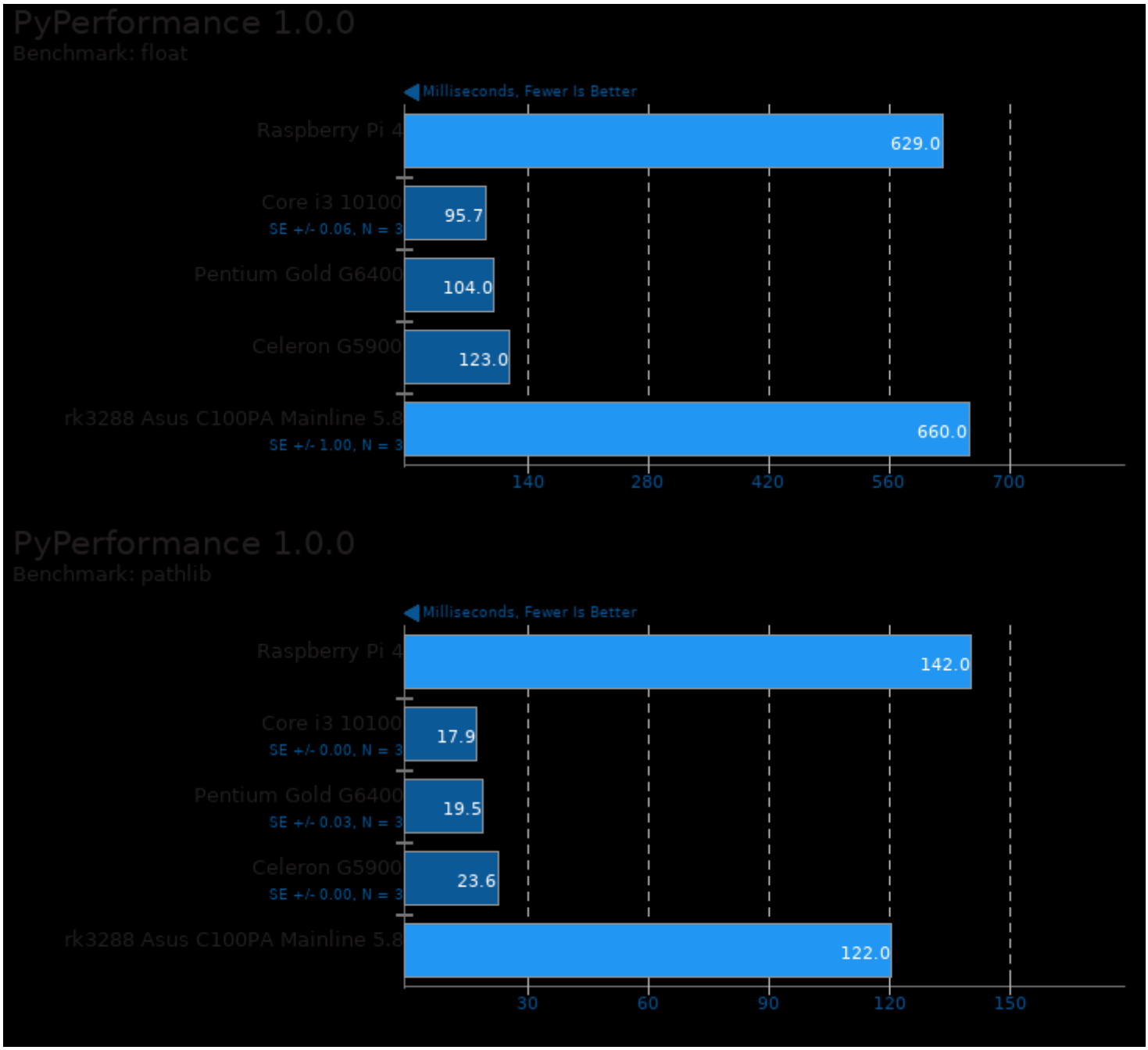

PolyBench-C 4.2
Test: 3 Matrix Multiplications
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.006, N = 3
24.910
Core i3 10100
SE +/- 0.003, N = 3
3.338
Pentium Gold G6400
SE +/- 0.003, N = 3
3.832
Celeron G5900
SE +/- 0.003, N = 3
4.446
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.069, N = 3
31.028
7
14
21
28
35
1. (CC) gcc options: -O3 -march=native
Timed HMMer Search 2.3.2
Pfam Database Search
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.423, N = 3
53.889
Core i3 10100
SE +/- 0.064, N = 3
7.438
Pentium Gold G6400
SE +/- 0.070, N = 3
12.846
Celeron G5900
SE +/- 0.023, N = 3
19.579
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.389, N = 3
60.125
13
26
39
52
65
1. (CC) gcc options: -O2 -pthread -lhmmer -lsquid -lm


Timed MAFFT Alignment 7.392
Multiple Sequence Alignment
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.195, N = 12
22.514
Core i3 10100
SE +/- 0.066, N = 15
3.855
Pentium Gold G6400
SE +/- 0.044, N = 3
6.593
Celeron G5900
SE +/- 0.022, N = 3
9.417
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.378, N = 15
21.589
5
10
15
20
25
1. (CC) gcc options: -std=c99 -O3 -lm -lpthread
AOBench
Size: 2048 x 2048 - Total Time
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00, N = 3
123.69
Core i3 10100
SE +/- 0.01, N = 3
32.75
Pentium Gold G6400
SE +/- 0.00, N = 3
35.18
Celeron G5900
SE +/- 0.51, N = 5
41.55
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.34, N = 3
171.94
40
80
120
160
200
1. (CC) gcc options: -lm -O3

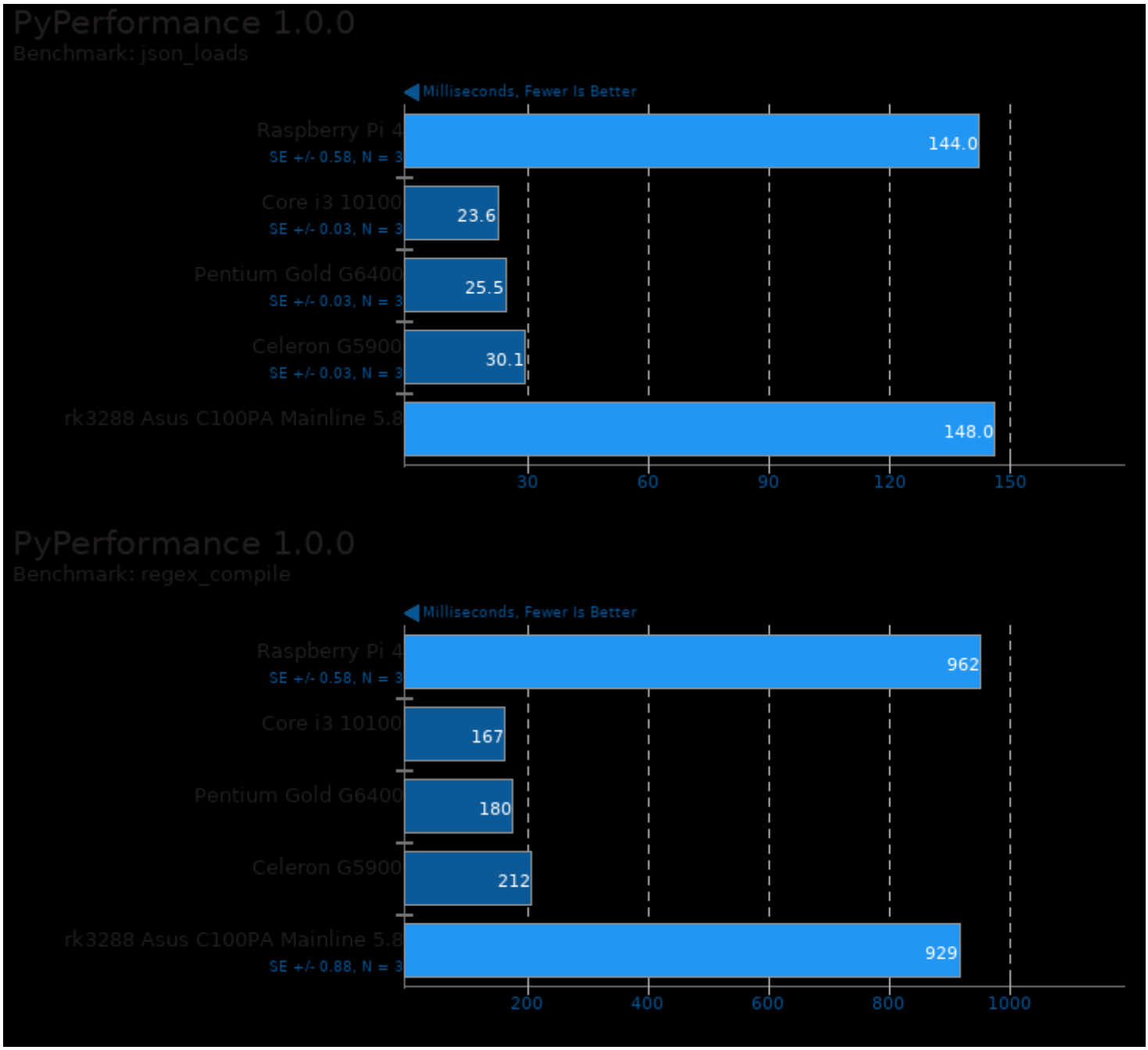

FLAC Audio Encoding 1.3.2
WAV To FLAC
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.529, N = 5
109.371
Core i3 10100
SE +/- 0.009, N = 5
8.420
Pentium Gold G6400
SE +/- 0.004, N = 5
9.456
Celeron G5900
SE +/- 0.004, N = 5
11.108
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.645, N = 5
115.298
30
60
90
120
150
1. (CXX) g++ options: -O2 -fvisibility=hidden -logg -lm
LAME MP3 Encoding 3.100
WAV To MP3
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.040, N = 3
-lncurses
41.587
Core i3 10100
SE +/- 0.006, N = 3
8.122
Pentium Gold G6400
SE +/- 0.001, N = 3
8.667
Celeron G5900
SE +/- 0.009, N = 3
10.181
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.062, N = 3
-lncurses
45.744
10
20
30
40
50
1. (CC) gcc options: -O3 -ffast-math -funroll-loops -fschedule-insns2 -fbranch-count-reg -fforce-addr -pipe -lm

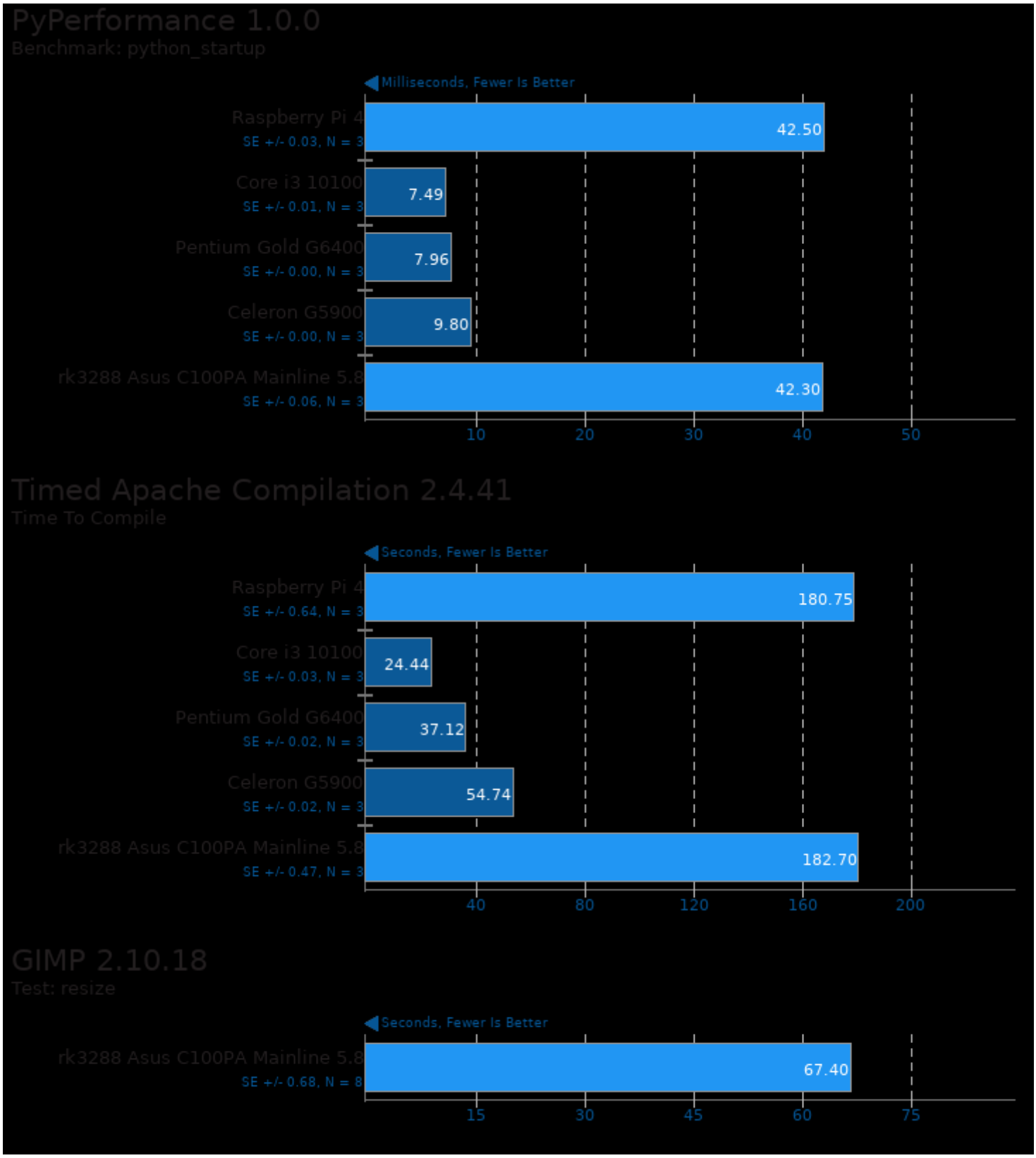

Perl Benchmarks
Test: Pod2html
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00185361, N = 3
0.61497660
Core i3 10100
SE +/- 0.00010435, N = 3
0.10872912
Pentium Gold G6400
SE +/- 0.00029058, N = 3
0.11884498
Celeron G5900
SE +/- 0.00027382, N = 3
0.14005805
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.00123782, N = 3
0.72314832
0.1627
0.3254
0.4881
0.6508
0.8135
Perl Benchmarks
Test: Interpreter
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00012453, N = 12
0.00714413
Core i3 10100
SE +/- 0.00006172, N = 15
0.00108894
Pentium Gold G6400
SE +/- 0.00000105, N = 3
0.00075872
Celeron G5900
SE +/- 0.00000210, N = 3
0.00101531
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.00007959, N = 3
0.00801654
0.0018
0.0036
0.0054
0.0072
0.009


LibreOffice
Test: 20 Documents To PDF
Seconds, Fewer Is Better
Raspberry Pi 4
5.751
Core i3 10100
SE +/- 0.090, N = 5
7.510
Pentium Gold G6400
SE +/- 0.052, N = 5
8.064
Celeron G5900
SE +/- 0.078, N = 5
9.739
3
6
9
12
15
1. LibreOffice 6.1.5.2 10(Build:2)
PyPerformance 1.0.0
Benchmark: 2to3
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.00, N = 3
1.79
Core i3 10100
304.00
Pentium Gold G6400
328.00
Celeron G5900
397.00
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.00, N = 3
1.88
90
180
270
360
450


PyPerformance 1.0.0
Benchmark: float
Milliseconds, Fewer Is Better
Raspberry Pi 4
629.0
Core i3 10100
SE +/- 0.06, N = 3
95.7
Pentium Gold G6400
104.0
Celeron G5900
123.0
rk3288 Asus C100PA Mainline 5.8
SE +/- 1.00, N = 3
660.0
140
280
420
560
700

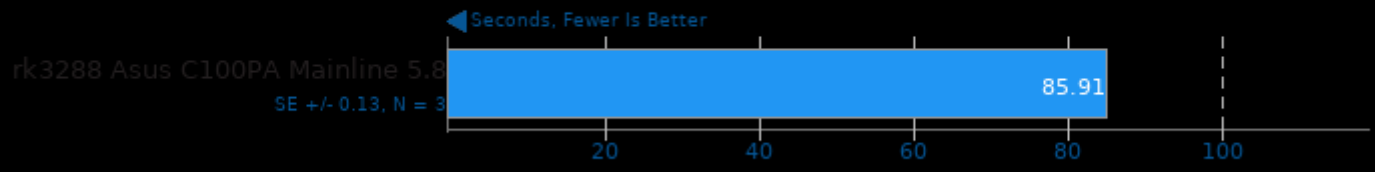
PyPerformance 1.0.0
Benchmark: pathlib
Milliseconds, Fewer Is Better
Raspberry Pi 4
142.0
Core i3 10100
SE +/- 0.00, N = 3
17.9
Pentium Gold G6400
SE +/- 0.03, N = 3
19.5
Celeron G5900
SE +/- 0.00, N = 3
23.6
rk3288 Asus C100PA Mainline 5.8
122.0
30
60
90
120
150


PyPerformance 1.0.0
Benchmark: json_loads
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.58, N = 3
144.0
Core i3 10100
SE +/- 0.03, N = 3
23.6
Pentium Gold G6400
SE +/- 0.03, N = 3
25.5
Celeron G5900
SE +/- 0.03, N = 3
30.1
rk3288 Asus C100PA Mainline 5.8
148.0
30
60
90
120
150
PyPerformance 1.0.0
Benchmark: regex_compile
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.58, N = 3
962
Core i3 10100
167
Pentium Gold G6400
180
Celeron G5900
212
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.88, N = 3
929
200
400
600
800
1000


PyPerformance 1.0.0
Benchmark: python_startup
Milliseconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.03, N = 3
42.50
Core i3 10100
SE +/- 0.01, N = 3
7.49
Pentium Gold G6400
SE +/- 0.00, N = 3
7.96
Celeron G5900
SE +/- 0.00, N = 3
9.80
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.06, N = 3
42.30
10
20
30
40
50
Timed Apache Compilation 2.4.41
Time To Compile
Seconds, Fewer Is Better
Raspberry Pi 4
SE +/- 0.64, N = 3
180.75
Core i3 10100
SE +/- 0.03, N = 3
24.44
Pentium Gold G6400
SE +/- 0.02, N = 3
37.12
Celeron G5900
SE +/- 0.02, N = 3
54.74
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.47, N = 3
182.70
40
80
120
160
200
GIMP 2.10.18
Test: resize
Seconds, Fewer Is Better
rk3288 Asus C100PA Mainline 5.8
SE +/- 0.68, N = 8
67.40
15
30
45
60
75

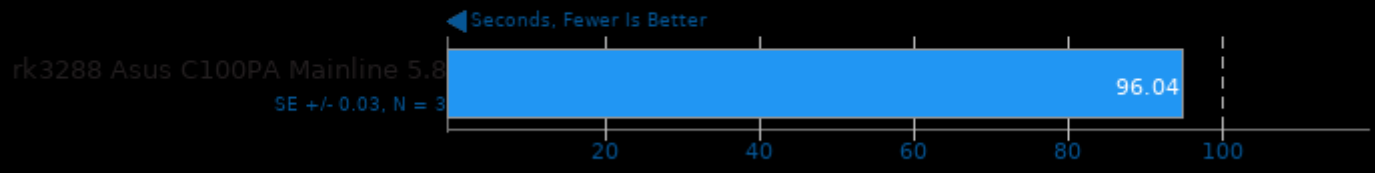
GIMP 2.10.18

Test: rotate



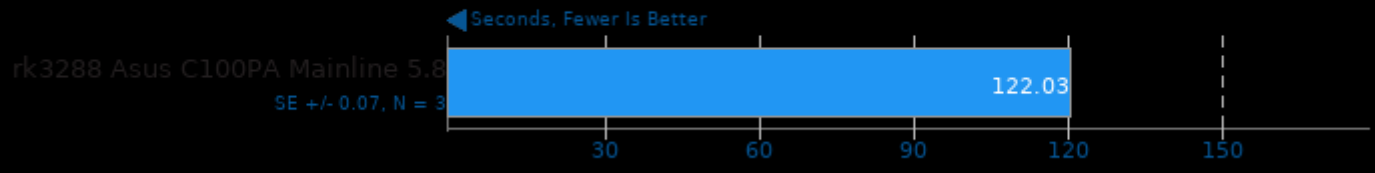
GIMP 2.10.18

Test: auto-levels



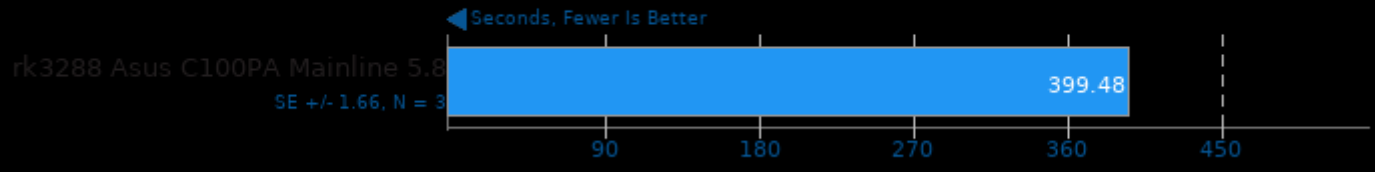
GIMP 2.10.18

Test: unsharp-mask

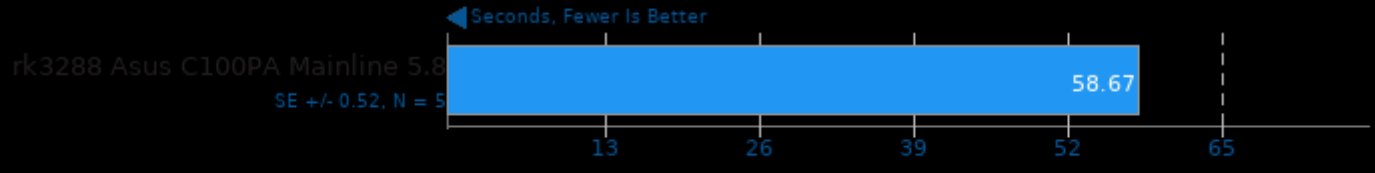


OCRMyPDF 10.3.1+dfsg

Processing 60 Page PDF Document

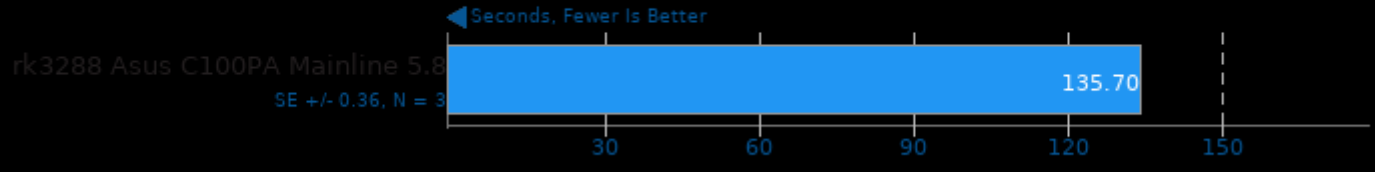


GNU Octave Benchmark 5.2.0

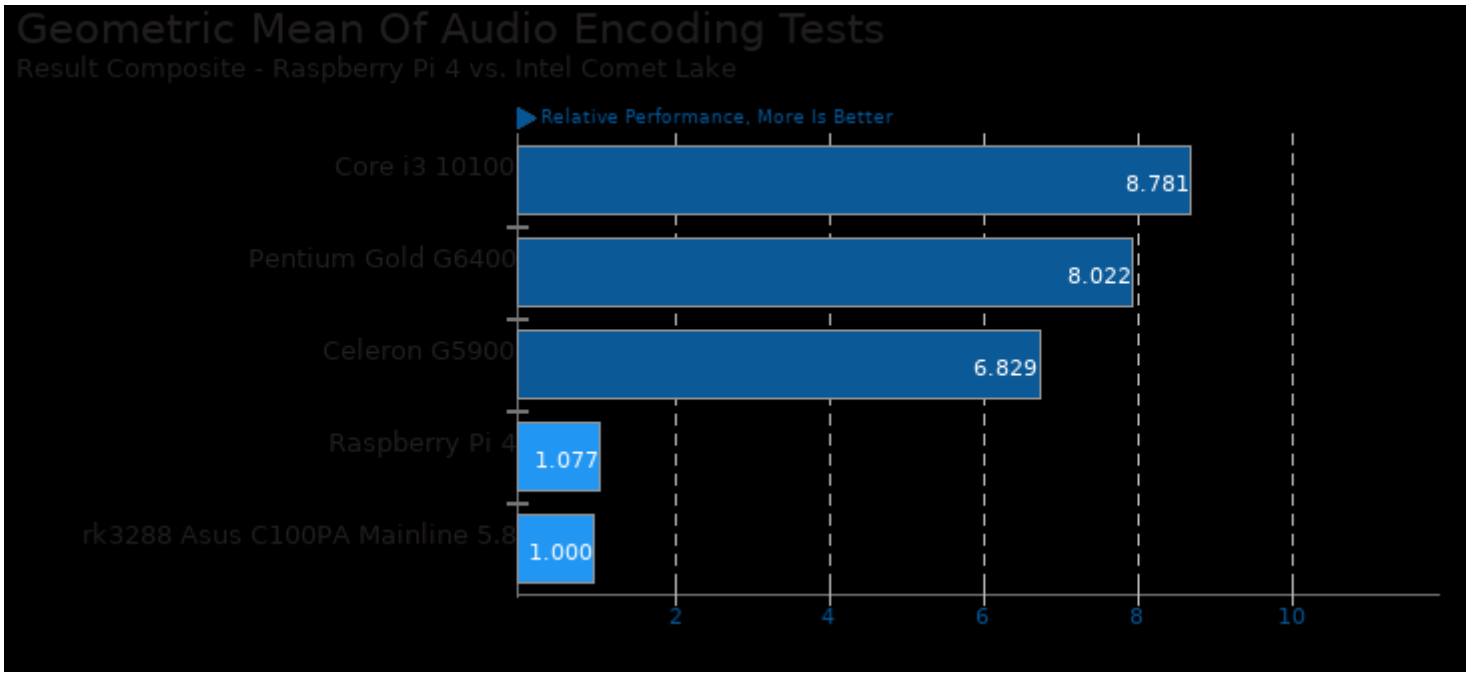


Tesseract OCR 4.1.1

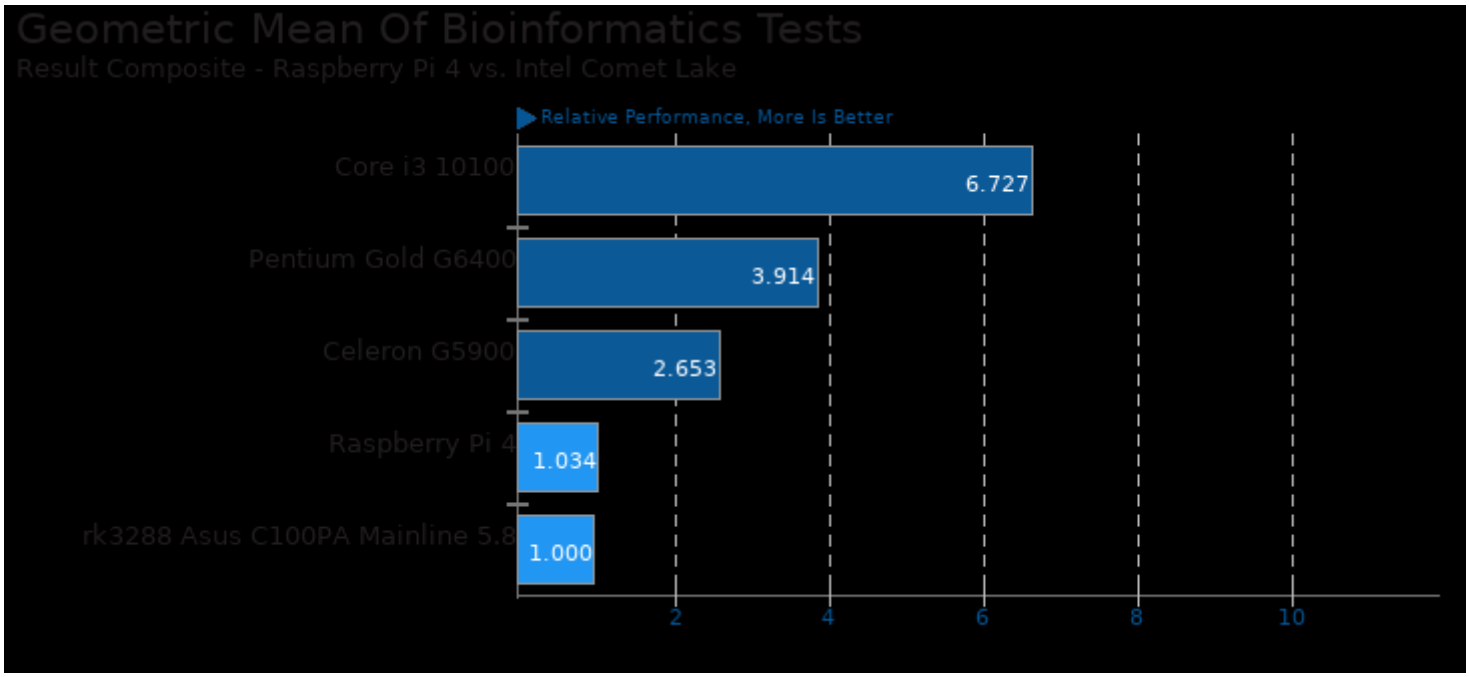
Time To OCR 7 Images



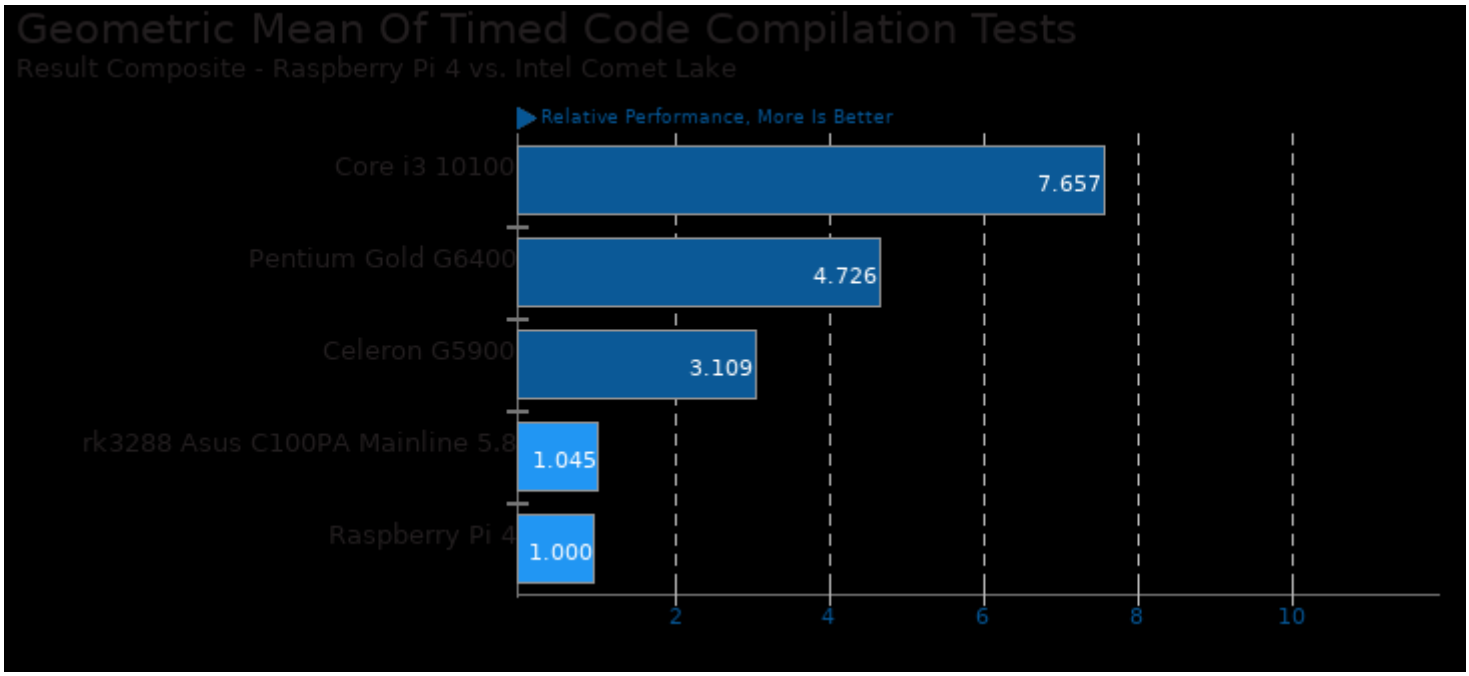
These geometric means are based upon test groupings / test suites for this result file.



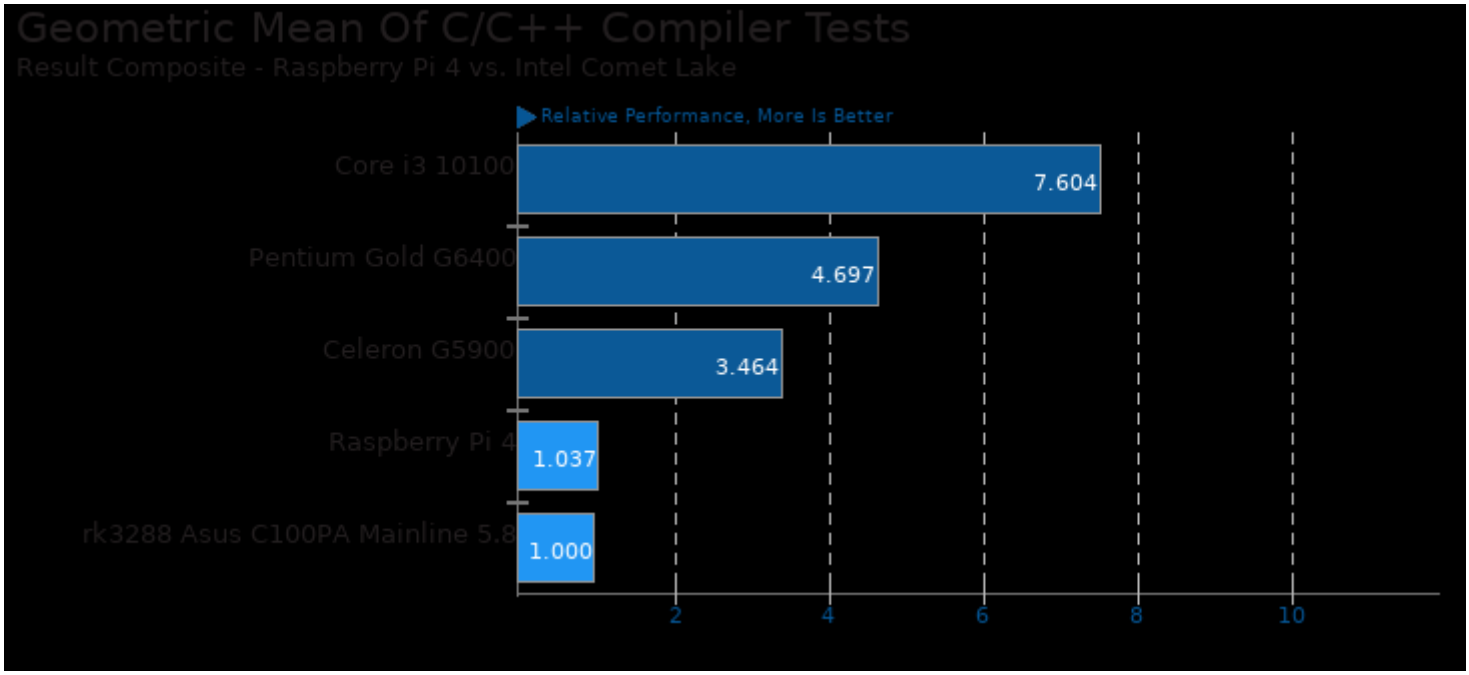
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac



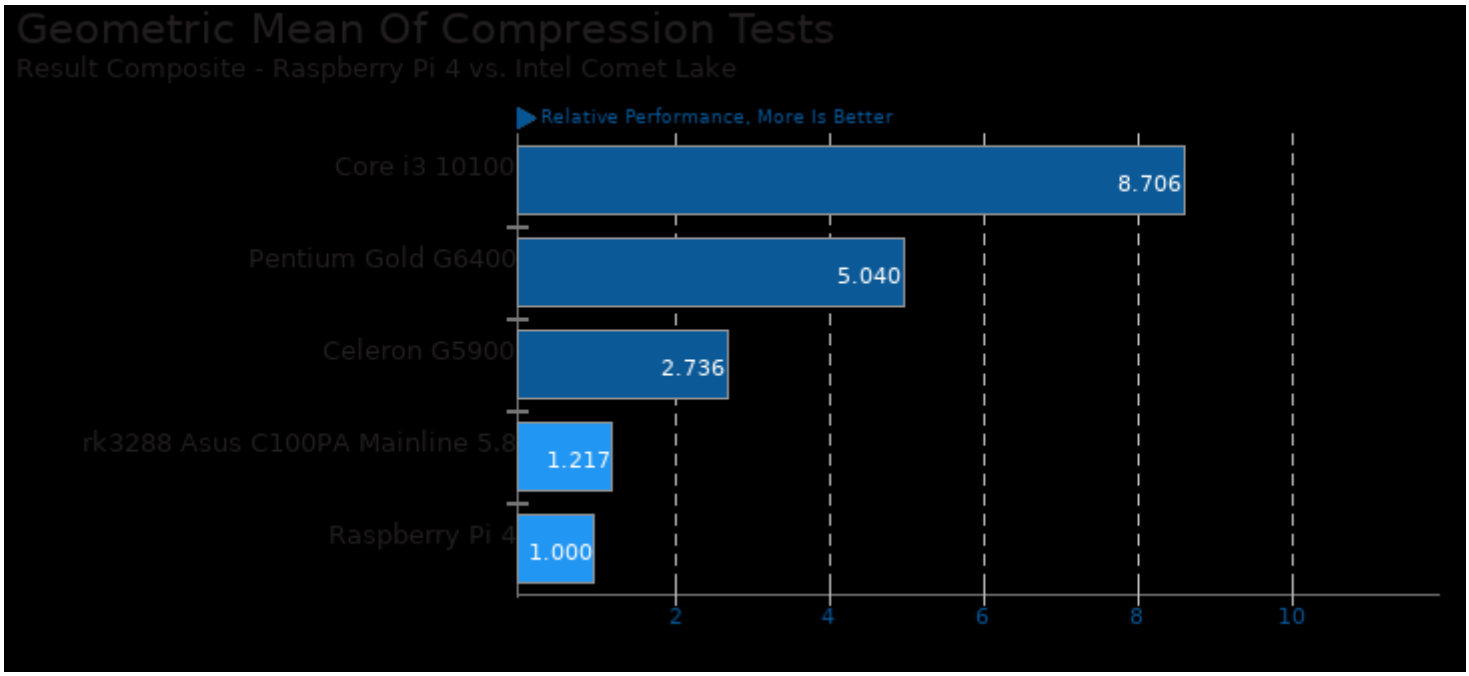
Geometric mean based upon tests: pts/hmmer and pts/mafft



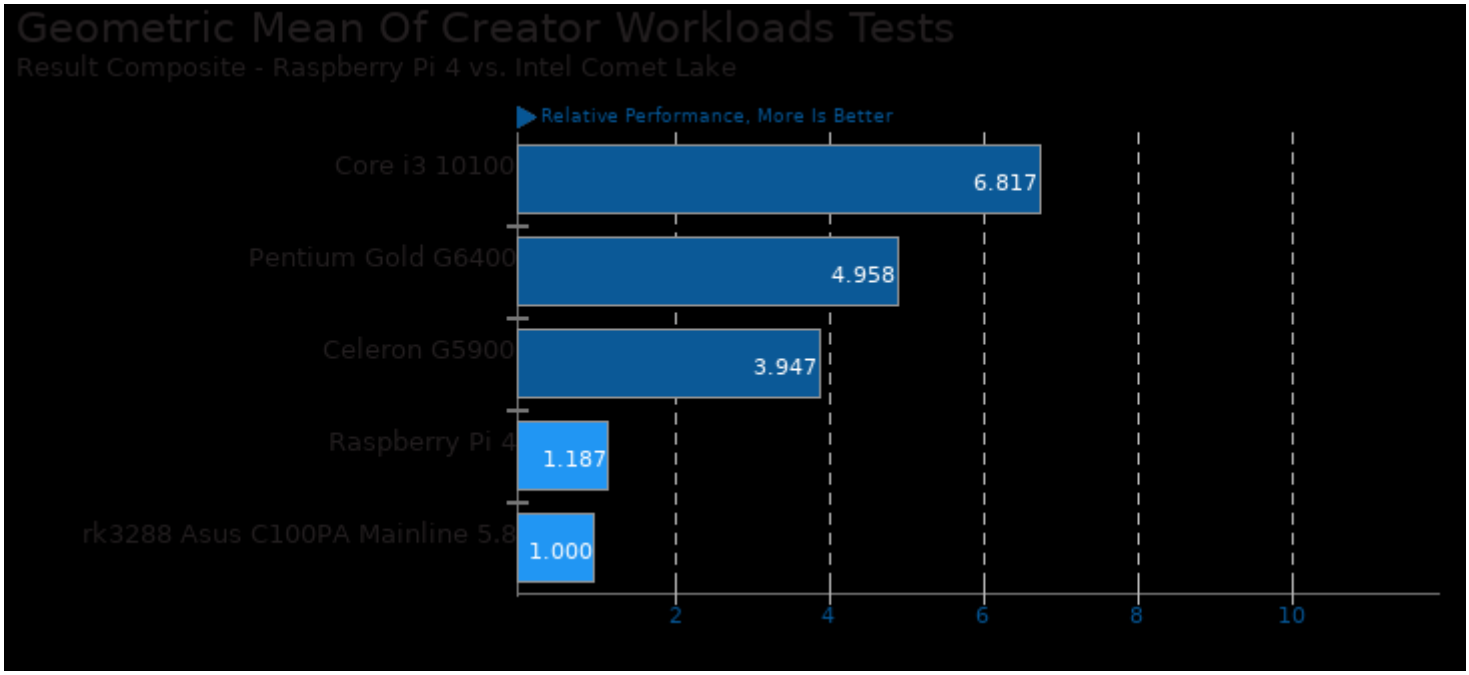
Geometric mean based upon tests: pts/build-apache, pts/build-php, pts/build-gdb and pts/build-mplayer



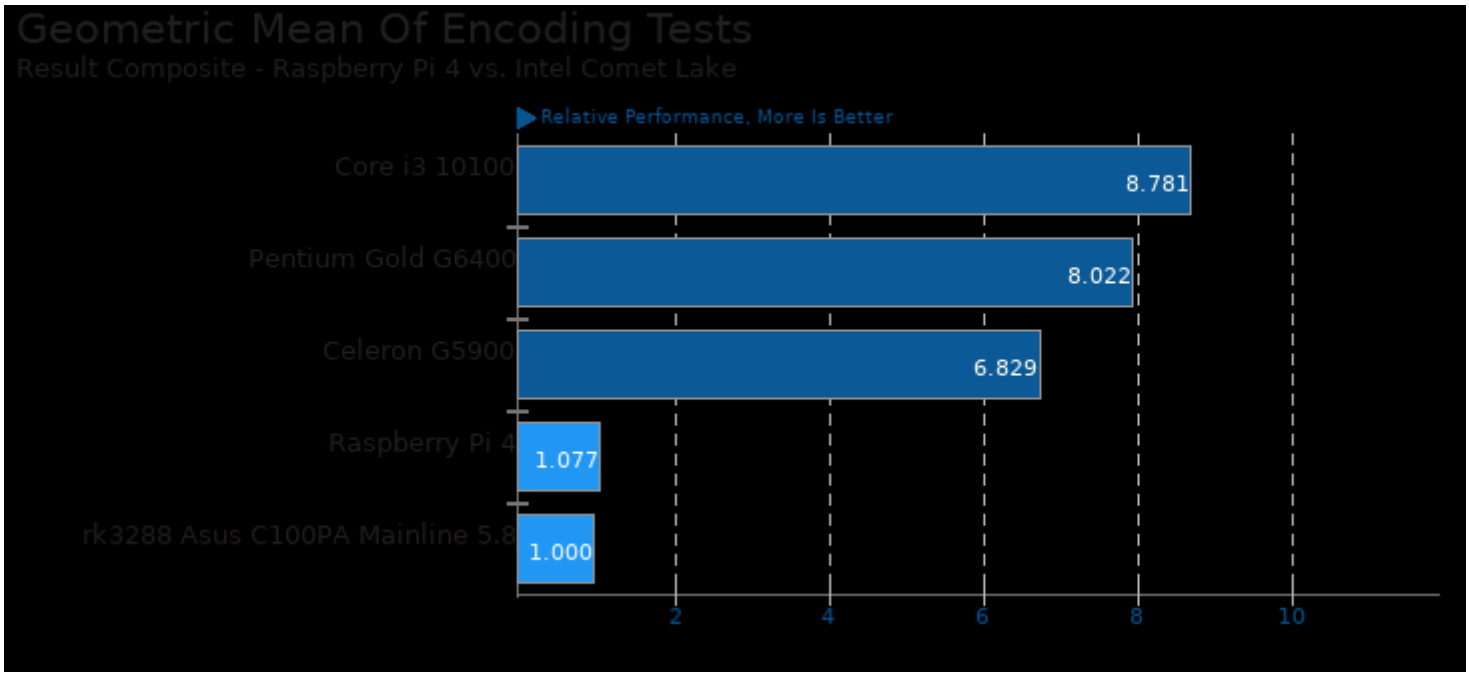
Geometric mean based upon tests: pts/mafft, pts/aobench, pts/tscp, pts/graphics-magick, pts/hmmer, pts/build-php, pts/c-ray, pts/compress-7zip, pts/encode-mp3, pts/encode-flac, pts/sqlite-speedtest, pts/compress-xz, pts/openssl, pts/lammps, pts/aircrack-ng, pts/build-gdb, pts/build-apache and pts/build-mplayer



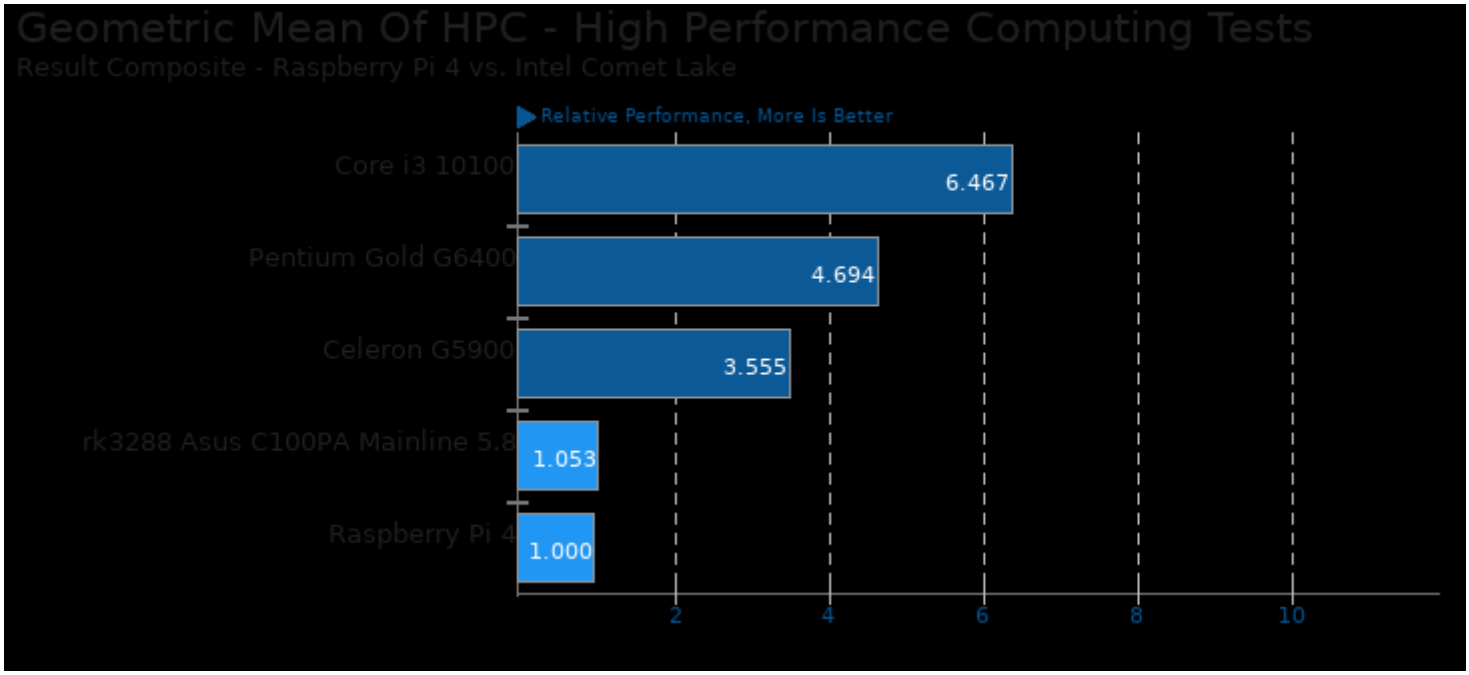
Geometric mean based upon tests: pts/compress-7zip and pts/compress-xz



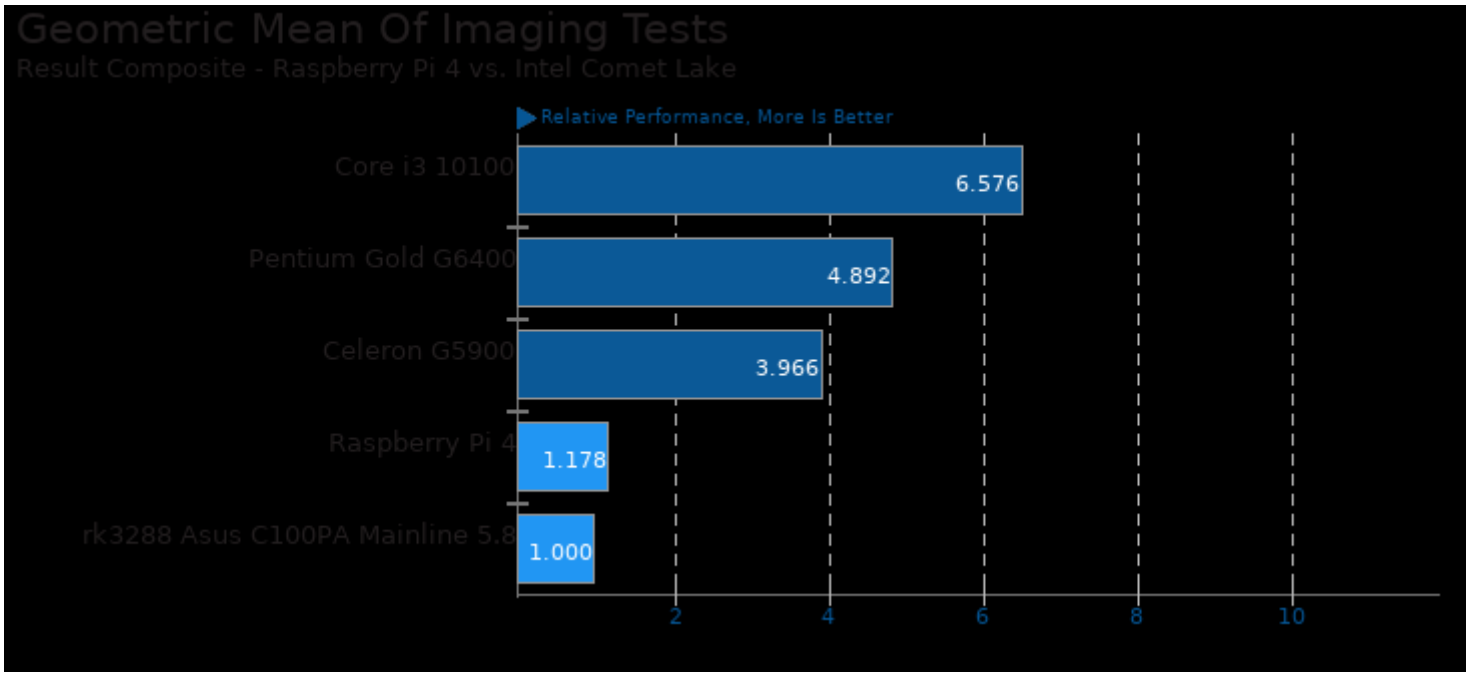
Geometric mean based upon tests: pts/c-ray, pts/aobench, pts/smallpt, pts/ttsiod-renderer, system/tesseract-ocr, system/ocrmypdf, pts/encode-mp3, pts/encode-flac, pts/graphics-magick, system/inkscape, system/rawtherapee, pts/tjbench, system/gimp, system/hugin, system/rsvg and system/gegl



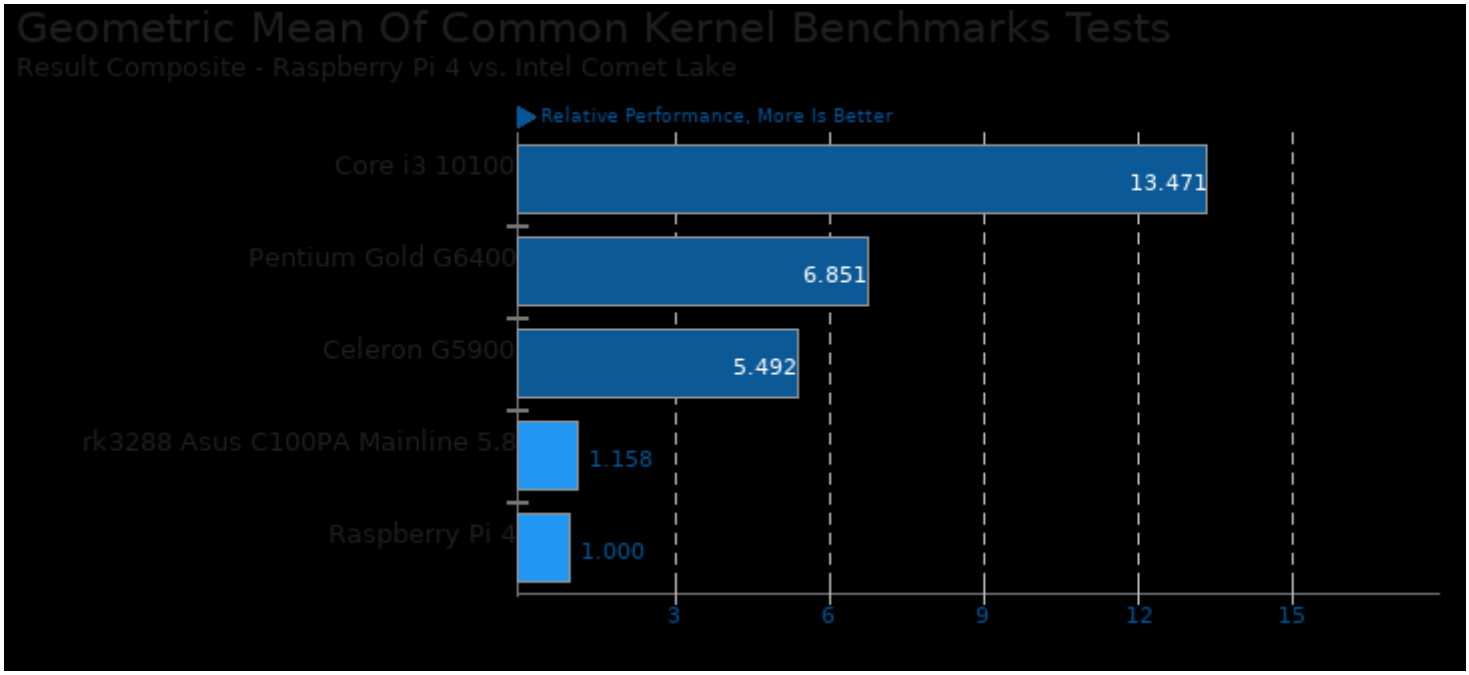
Geometric mean based upon tests: pts/encode-mp3 and pts/encode-flac



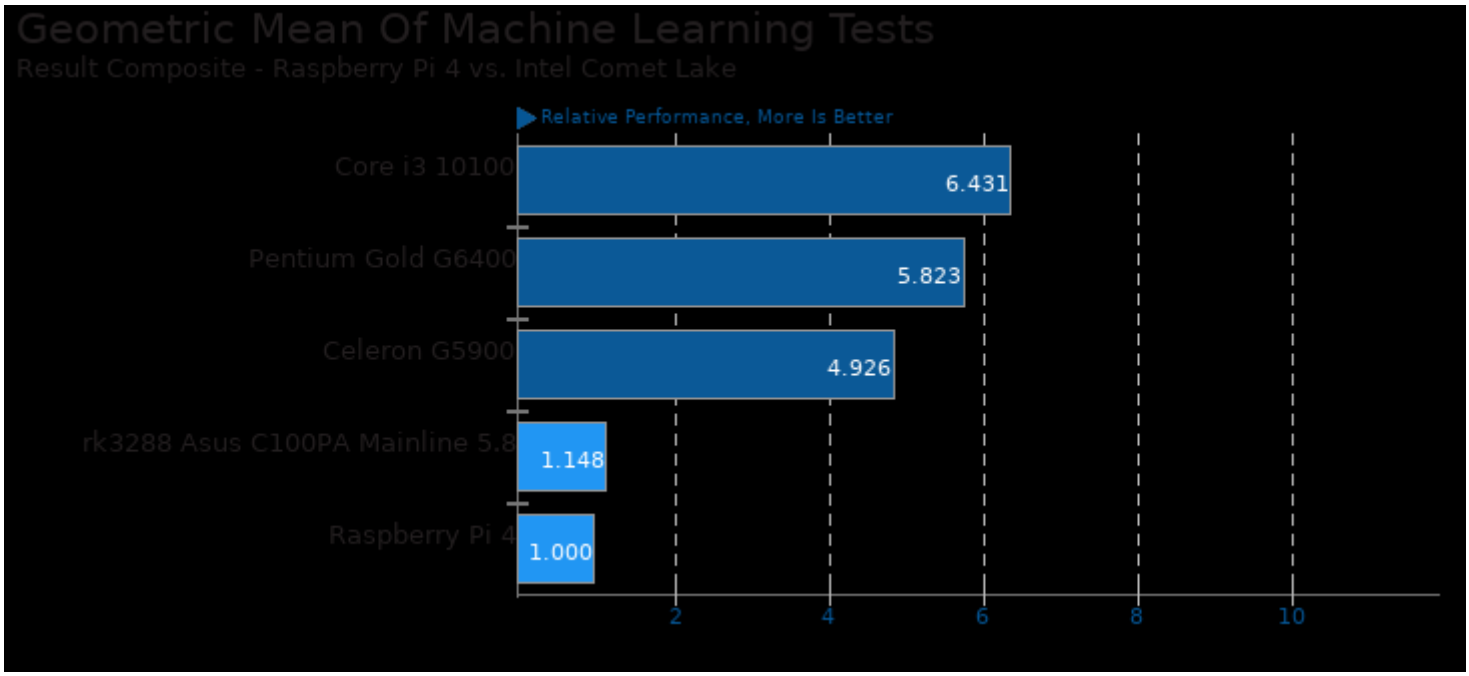
Geometric mean based upon tests: system/octave-benchmark, pts/lammps, pts/hmmer, pts/mafft, pts/numpy and pts/scikit-learn



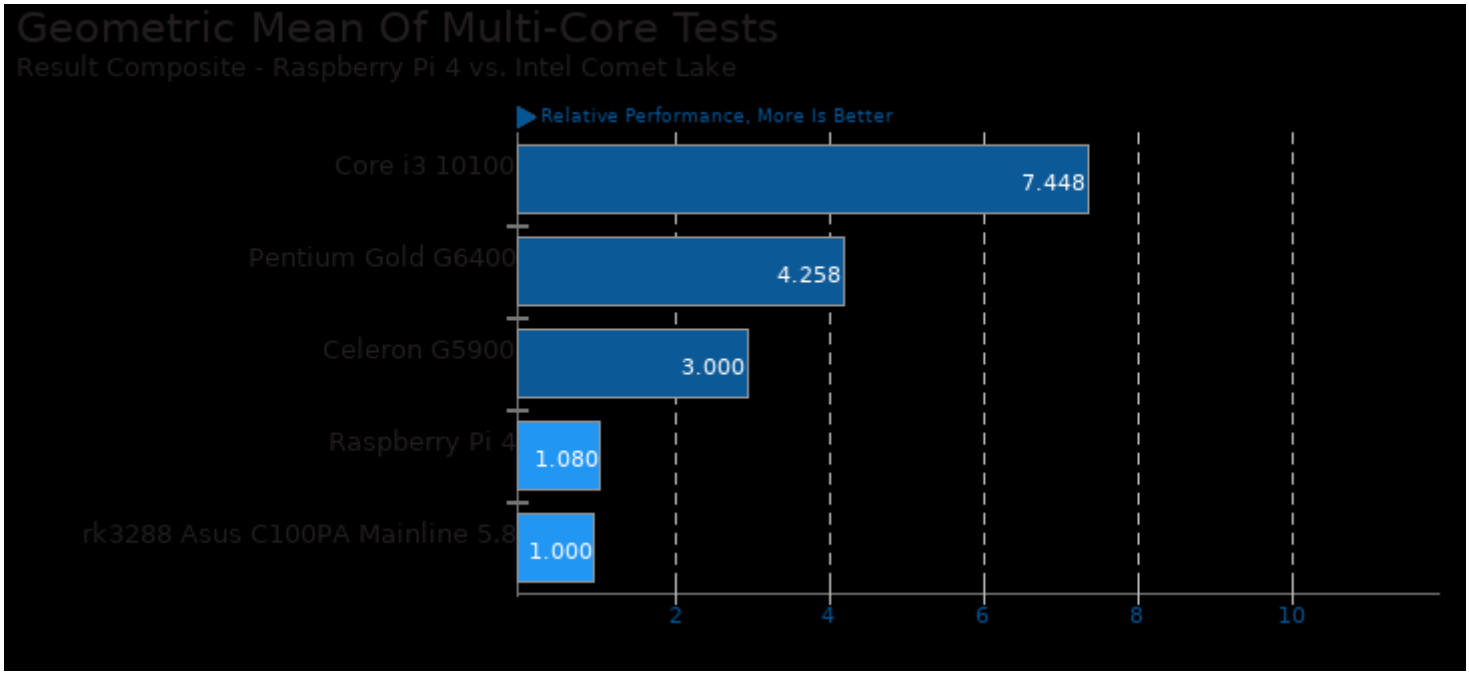
Geometric mean based upon tests: pts/graphics-magick, system/inkscape, system/rawtherapee, pts/tjbench, system/gimp, system/hugin, system/rsvg and system/gegl



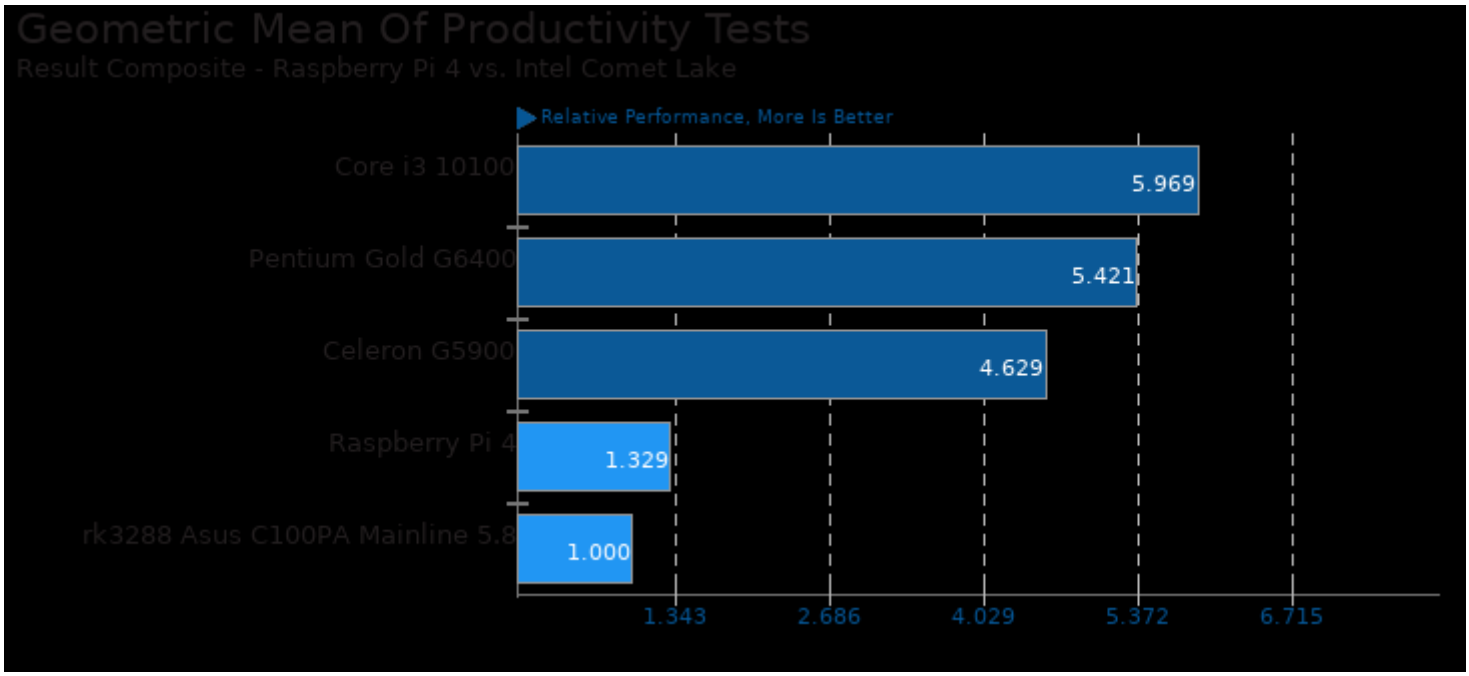
Geometric mean based upon tests: pts/sqlite-speedtest and pts/openssl



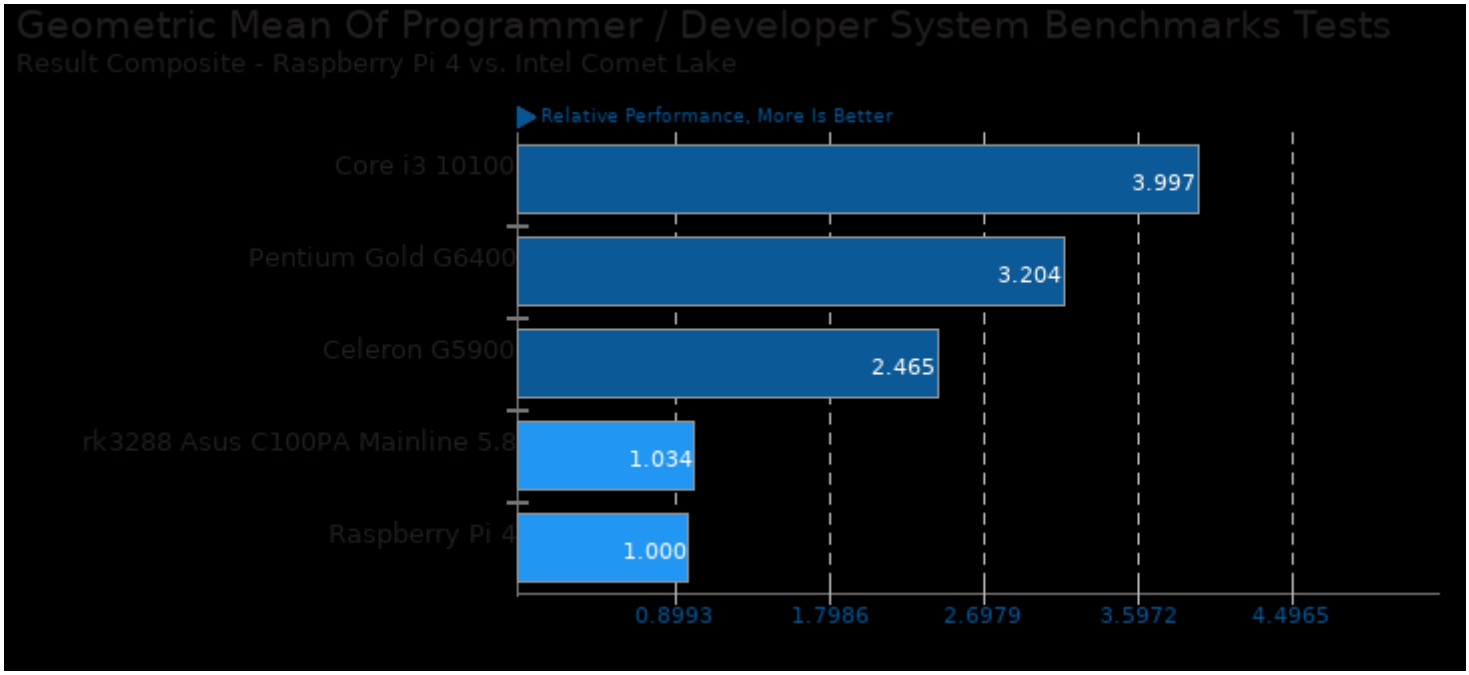
Geometric mean based upon tests: pts/numpy and pts/scikit-learn



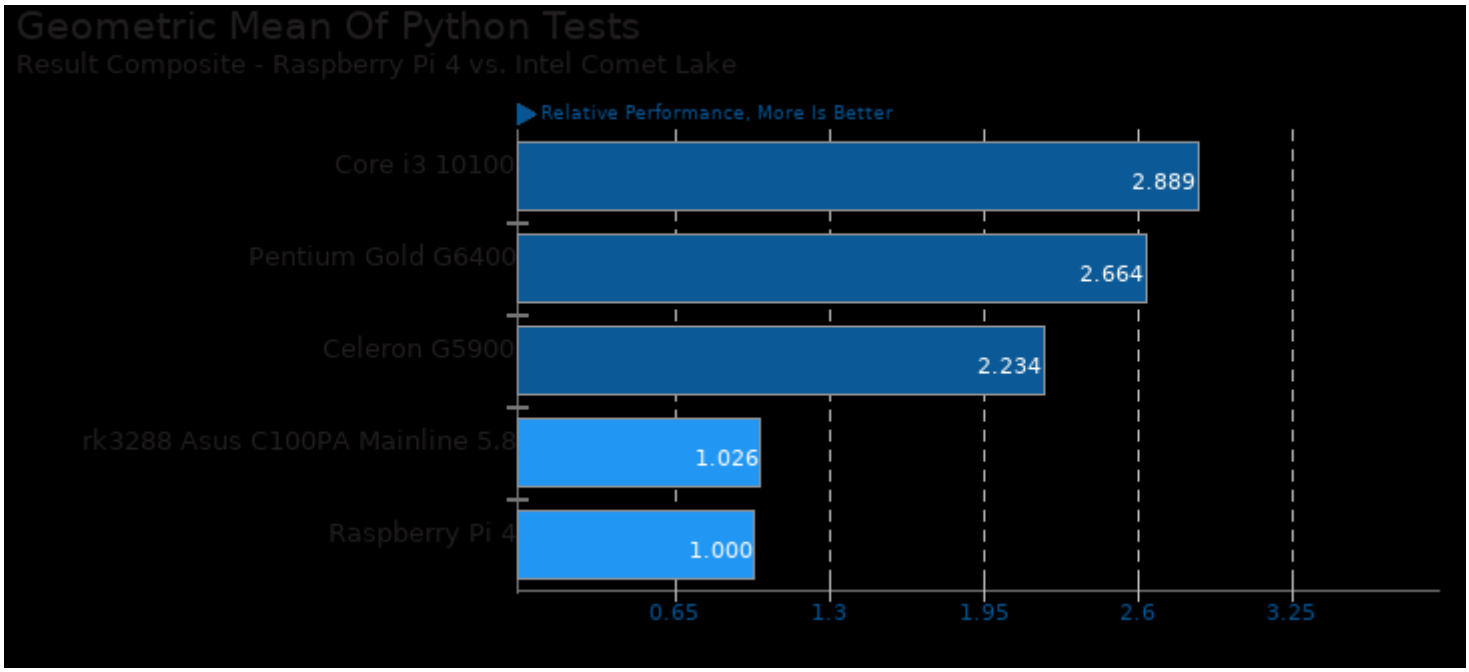
Geometric mean based upon tests: pts/c-ray, pts/coremark, pts/aircrack-ng, pts/smallpt, pts/graphics-magick, pts/lammps, pts/compress-7zip, pts/build-apache, pts/build-php, pts/build-gdb, pts/build-mplayer, pts/aobench and pts/ttsiod-renderer



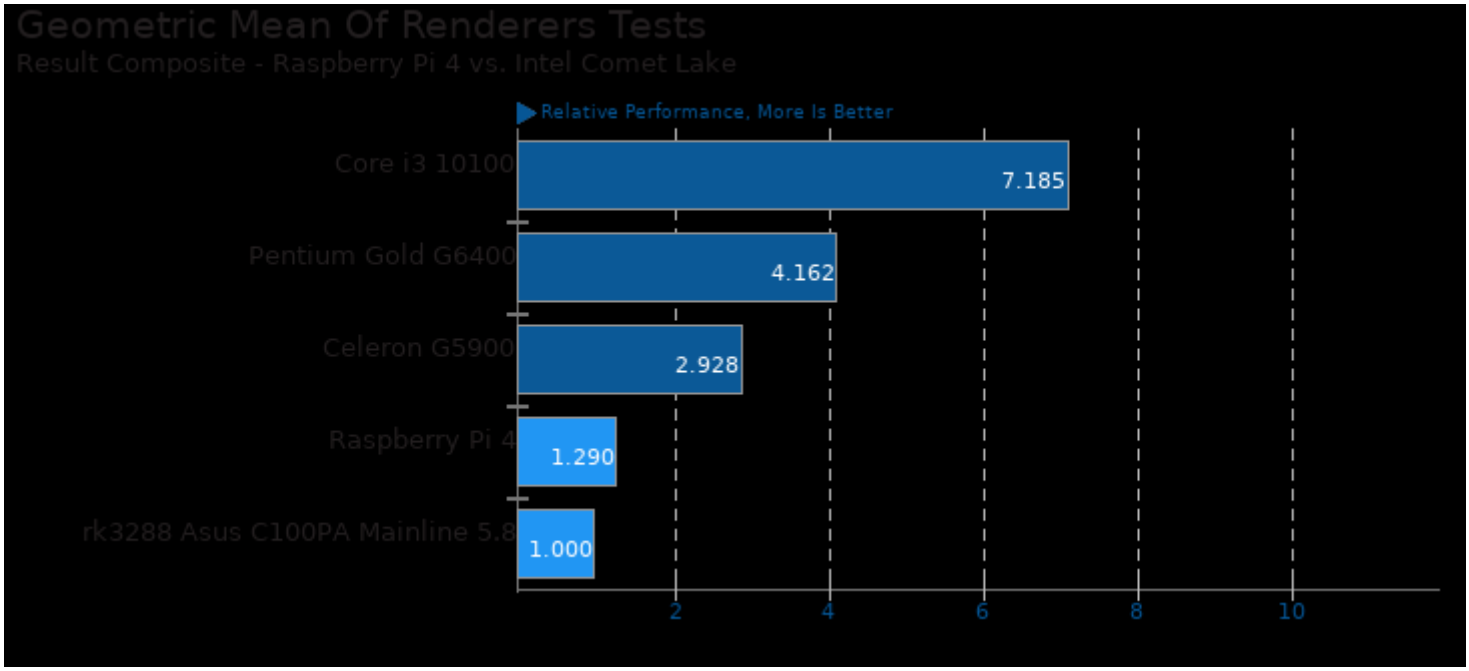
Geometric mean based upon tests: system/libreoffice, system/octave-benchmark, system/inkscape, system/gimp, system/gegl and system/rsvg



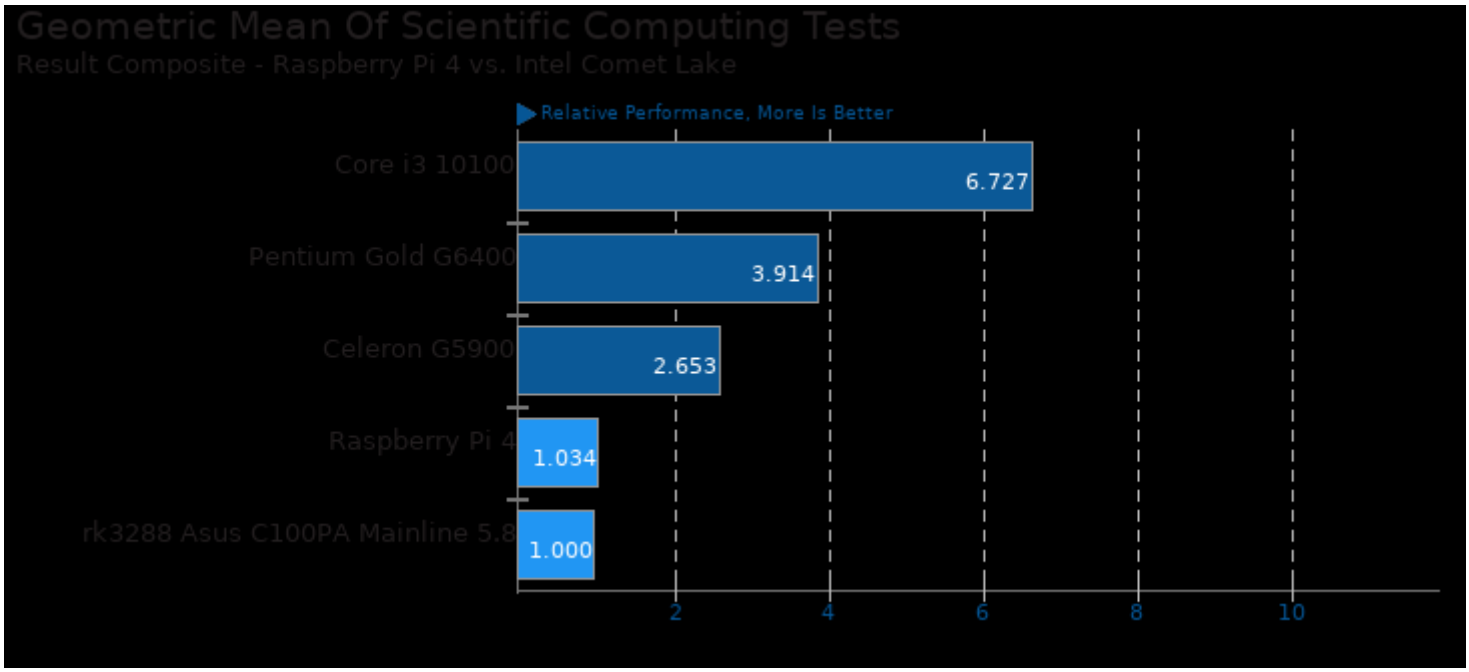
Geometric mean based upon tests: pts/sqlite-speedtest, pts/pyperformance, pts/pybench, pts/build-apache, pts/build-php, pts/build-gdb and pts/build-mplayer



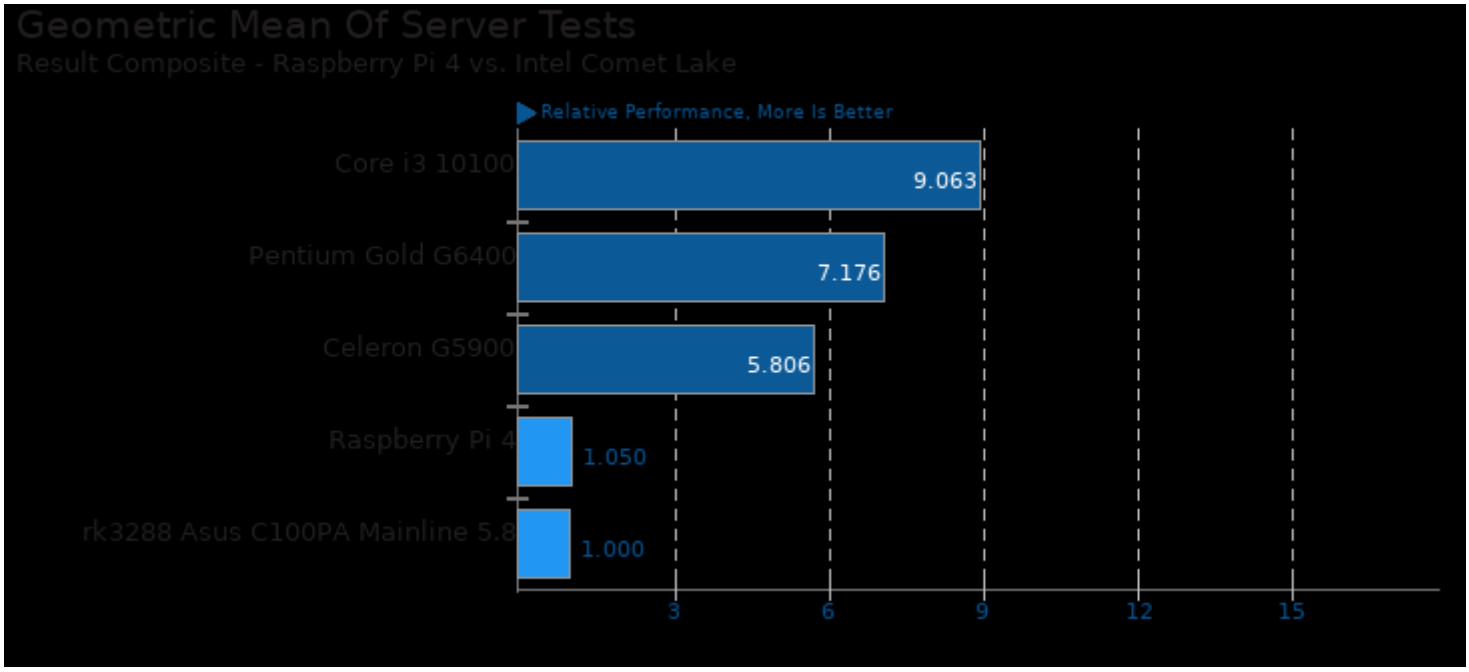
Geometric mean based upon tests: pts/pybench, pts/numpy, pts/scikit-learn and pts/pyperformance



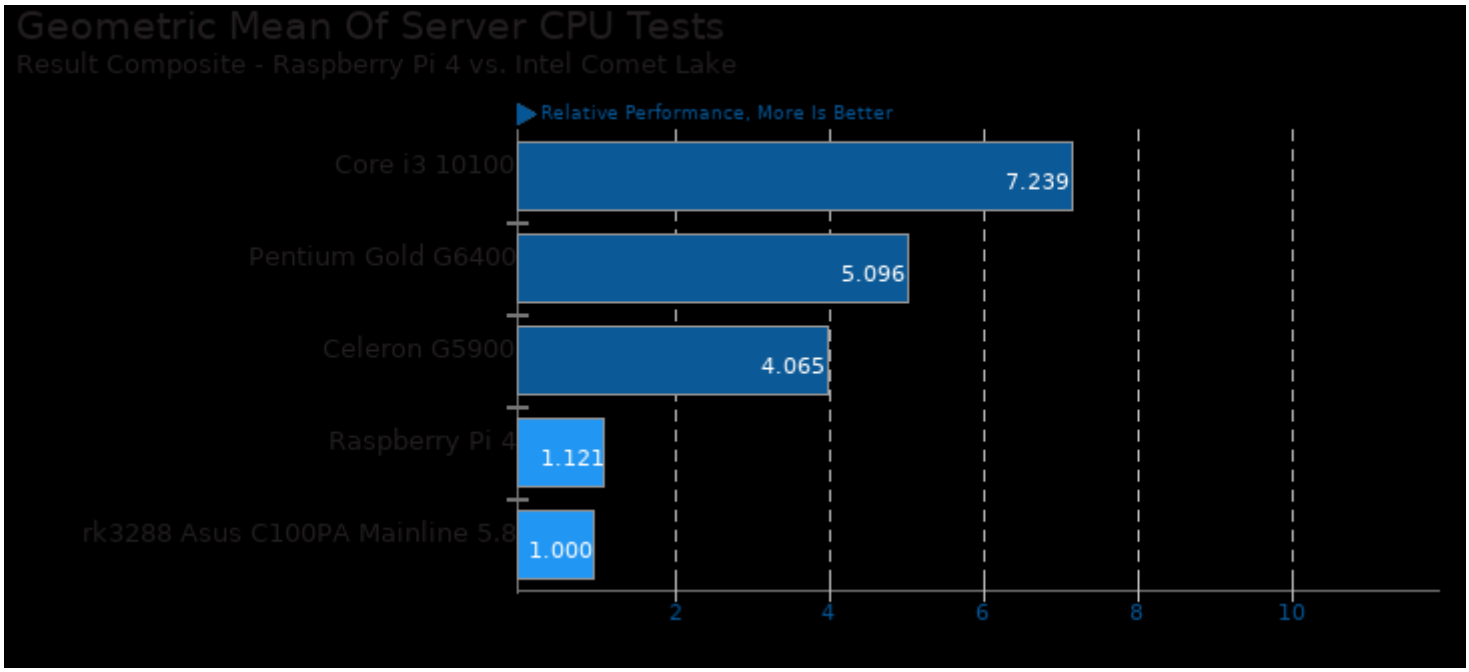
Geometric mean based upon tests: pts/c-ray, pts/aobench, pts/smallpt and pts/ttsiod-renderer



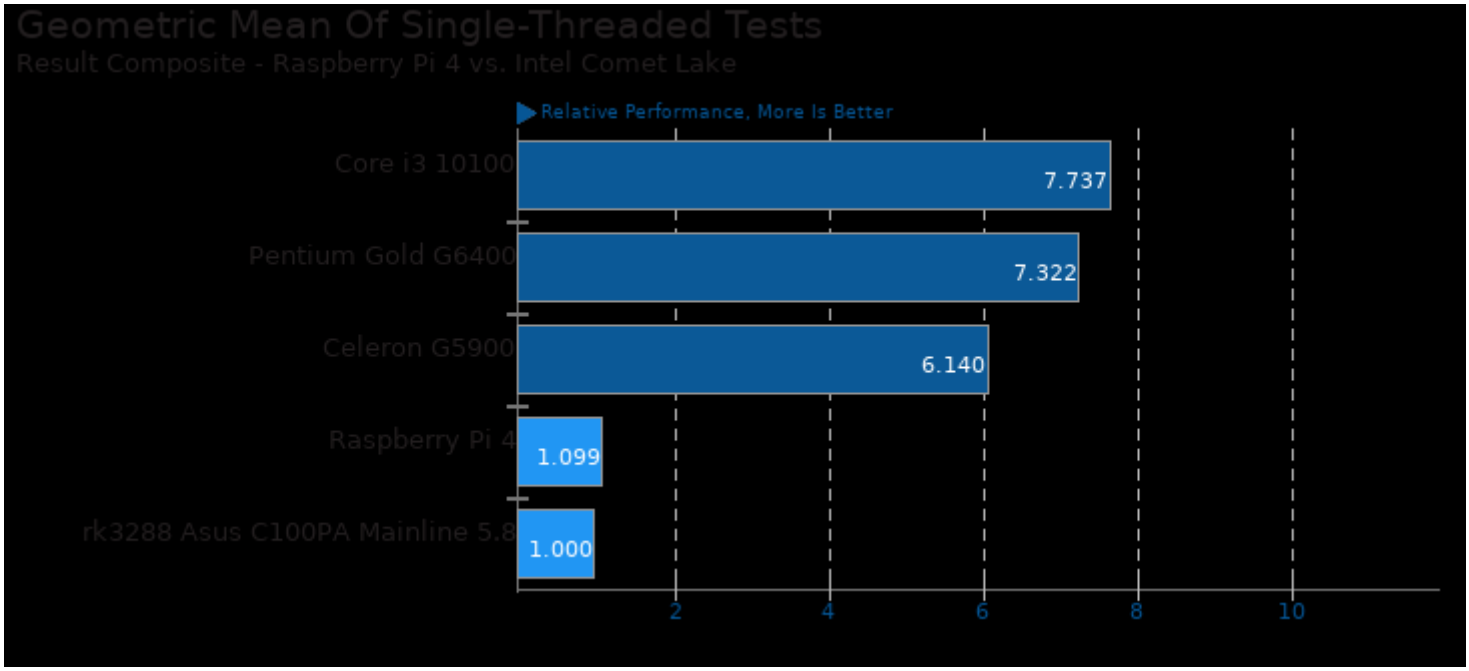
Geometric mean based upon tests: system/octave-benchmark, pts/lammps, pts/hmmer and pts/mafft



Geometric mean based upon tests: pts/phpbench, pts/openssl, pts/perl-benchmark and pts/sqlite-speedtest



Geometric mean based upon tests: pts/dacapobench, pts/compress-7zip, pts/build-php, pts/c-ray, pts/openssl, pts/tjbench, system/gimp, pts/pybench, pts/numpy, pts/phpbench, pts/scikit-learn and system/tesseract-ocr



Geometric mean based upon tests: pts/polybench-c, pts/numpy, pts/encode-flac, pts/encode-mp3, pts/perl-benchmark, pts/tjbench, system/inkscape, pts/pybench, pts/phpbench and system/tesseract-ocr

This file was automatically generated via the Phoronix Test Suite benchmarking software on Friday, 29 March 2024 10:53.