

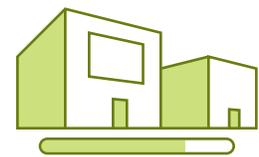


Shorten the time from conception to execution with the HP ZBook Studio 16 G10

Comparing the HP ZBook Studio G10 with an Intel Core i9-13900H processor to the HP ZBook Studio G9 with an Intel Core i9-12900H processor

For technical professionals and content creators on the move, the right mobile workstation is one that can enable inspiration, helping them turn their ideas into reality as quickly as possible. That's easier said than done when the ideas involve complex graphics, renders, simulations, and videos. These teams need fast, powerful workstations to handle both compute-intensive graphics work and everyday office tasks. Newer technologies can often provide a performance boost.

To quantify just how much a newer workstation could help, we compared the new HP ZBook Studio 16 G10 with a 13th Generation Intel® Core™ i9-13900H processor to its predecessor, the HP ZBook Studio 16 G9 with a 12th Generation Intel Core i9-12900H processor. We conducted our testing with seven different performance benchmarks, some tailored specifically to graphics-intensive work, as well as hand-timing two scenarios to see how much faster the new ZBook Studio handled content creation tasks. The new HP ZBook Studio G10 delivered standout performance in a number of areas, offering an intriguing option to creators seeking their next system.



Build complex graphics faster

with higher Basemark GPU, 3DMark®, and Geekbench GPU benchmark scores; higher GFXBench frame rates; and more samples per minute in Blender



Put AI to work for you in less time

with higher scores on Procyon® AI Inference Benchmark for Windows



Finish photo and video projects more quickly

with shorter Adobe® Lightroom® Classic import times and faster Gigapixel AI upscaling

How we tested

To determine the benefits of upgrading to the newest HP ZBook Studio 16-inch Mobile Workstation PC with a 13th Generation Intel Core i9 H-series processor, we compared the system performance of a G10 with that of a G9:

HP ZBook Studio 16 G10 Mobile Workstation

- Intel Core i9-13900H processor
- NVIDIA® RTX™ 4080 graphics card
- 32 GB of memory
- 1 TB of PCIe® NVMe™ storage

HP ZBook Studio 16 G9 Mobile Workstation

- Intel Core i9-12900H processor
- NVIDIA RTX 3080 Ti graphics card
- 32 GB of memory
- 1 TB of PCIe NVMe storage

*The graphics card differences are due to what is standard for each configuration.

To measure system performance improvements from a variety of angles, we tested with an array of benchmark tests:

- **Basemark GPU and GFXBench benchmarks**
measure sustained, long-term graphics performance
- **Blender and 3DMark benchmarks**
measure 3D rendering performance and speed
- **Geekbench benchmarks**
measure single- and multi-core CPU and GPU performance
- **Procyon Office Productivity Benchmark**
measures system performance using Microsoft 360 apps.
- **Procyon AI Inference Benchmark**
measures AI accelerator performance

Next, we ran two custom scenarios, which reflect common workflows for content creation, and timed how long it took each mobile workstation to complete them:

- **Importing and exporting 50 photos**
using Adobe Lightroom Classic
- **Upscaling image resolution 4x**
using Topaz Labs Gigapixel AI

About the HP ZBook Studio 16 G10

HP says that the 16-inch ZBook Studio 16 G10 Mobile Workstation is “packed with pro-performance in a sleek PC that fits in your bag,” and features 13th Generation Intel Core vPro processors, NVIDIA graphics, AI-powered noise suppression, and HP Vaporforce Thermals to keep things cool.¹ To learn more, go to <https://www.hp.com/us-en/workstations/zbook-studio.html>.



The benchmark scores and hand-timed content creation results we report reflect the specific configurations we tested. Any difference in the configurations you test, as well as screen brightness, network traffic, or software additions, can affect these results. For a deeper dive into our testing parameters and procedures, see the [science behind the report](#).



Comparing performance using benchmarks

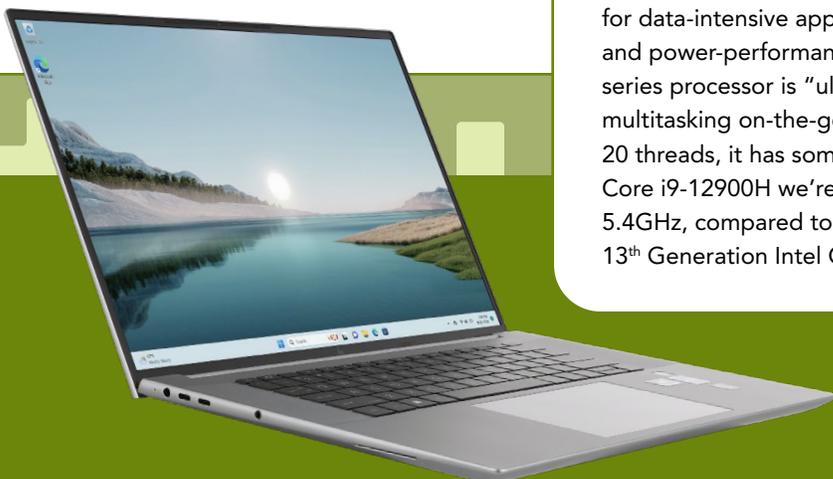
Creative work involves brainstorming, ideating, and left-brain problem-solving—but when push comes to shove, it also requires buckling down and doing the work. A newer mobile workstation can enable both productivity and creativity by reducing the time it takes to create graphics, videos, visual effects, and CAD objects, not to mention handle the normal business work that every office worker has from time to time. Keeping these goals in mind, we tested the HP ZBook Studio 16 G10 Mobile Workstation against its predecessor using a variety of benchmarks.

Why CPU and GPU benchmarks matter

CPU performance affects tasks such as checking your email, editing a picture, and playing music—whether you're doing each individually or all of it simultaneously. Professional workflows also increasingly involve GPU-driven elements, including AI, ray-traced rendering, computer-aided engineering (CAE), simulations, larger models and datasets, and high-resolution content.

About the Intel Core i9-13900H processor

According to Intel, 13th Generation Intel Core processors feature “technologies for data-intensive applications, ultra-fast connectivity, accelerated AI workloads, and power-performance optimization.”² This 13th Generation Intel Core i9 H series processor is “ultraportable,” designed to power gaming, creating, and multitasking on-the-go.³ With six performance-cores, eight efficient-cores, and 20 threads, it has some specifications identical to the 12th Generation Intel Core i9-12900H we’re comparing it to. But with a higher core frequency—4.1 – 5.4GHz, compared to the previous-generation processor’s 3.8 – 5.0 GHz—the 13th Generation Intel Core i9-13900H processor can deliver faster clock speeds.⁴



Speed up your renders

Complex renders have the power to create immersive environments in games, thrilling visuals in videos, and helpfully detailed models for architecture and engineering projects. But getting these benefits requires some serious computing power. Showing all the detail in the render is also a compute-intensive, graphics-intensive task. We used multiple benchmarks to show the benefits of the HP ZBook Studio 16 G10 on these tasks that are vital to content creators.

Basemark GPU

Score | Higher is better

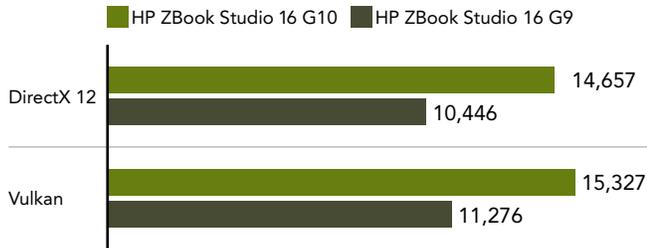


Figure 1: Basemark GPU DirectX 12 and Vulkan benchmark scores. Higher is better. Source: Principled Technologies.

Blender 3.6

Samples per minute | Higher is better

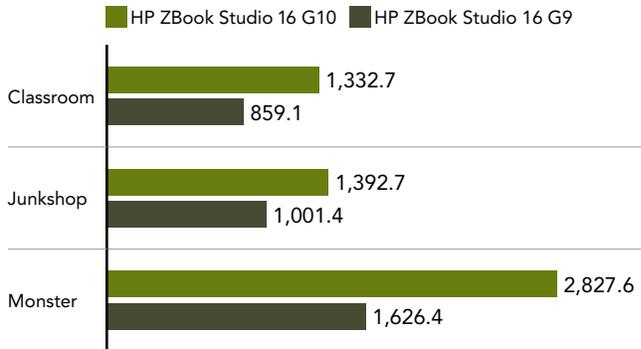


Figure 2: Blender benchmark samples per minute results. Higher is better. Source: Principled Technologies.

GFXBench

Total frames rendered | Higher is better

HP ZBook Studio 16 G10 HP ZBook Studio 16 G9

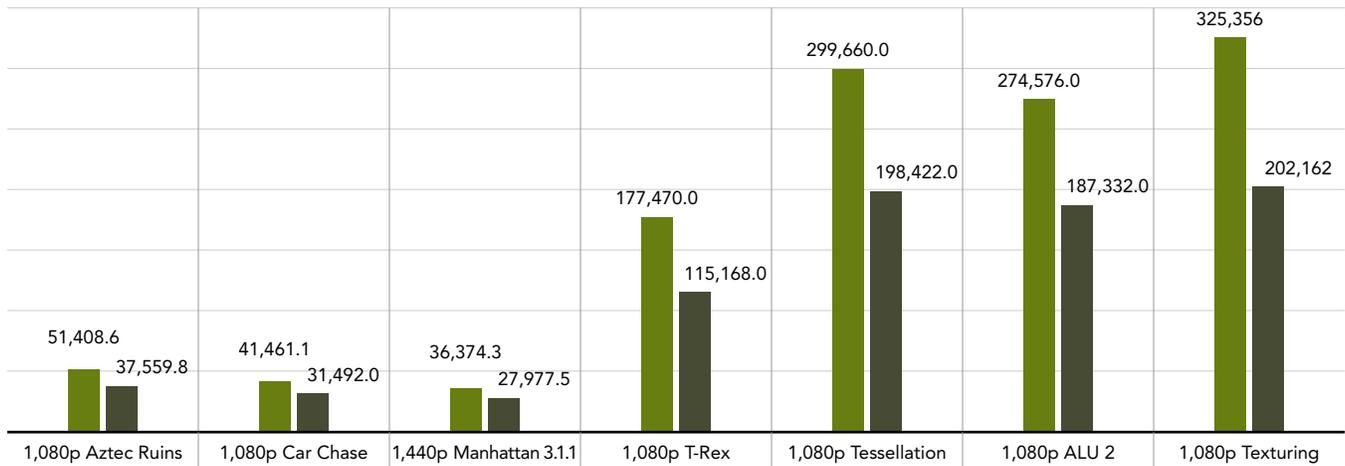


Figure 3: GFXBench benchmark workload total frames rendered. Higher is better. Source: Principled Technologies.

About these benchmarks

We ran the Basemark GPU and GFXBench benchmarks, which use high-level, game-like scenes to measure a device's graphics performance.^{5,6} We also ran the Blender 3.6 Open Data benchmarks, which measure how quickly a system can render different visually complex scenes.⁷ The different scores we highlight for these benchmarks represent different scenes; taken as a whole, you can see that the HP ZBook Studio 16 G10 Mobile Workstation consistently delivered higher performance.



Complete demanding workloads faster

With a device that better handles GPU-intensive workloads—for example, image processing, digital image capture, computer vision, and machine learning⁸—employees can get their work done faster. And while gaming isn't a part of every workstation user's everyday activities, with processors and graphics cards that can handle tough gaming workloads, your workstations could process complex information and deliver important results quicker to engineers, scientists, and more. Across the benchmarks we ran in this area, we saw the HP ZBook Studio 16 G10 Mobile Workstation offer notably higher scores than its predecessor, indicating that this new system could offer the boost in efficiency you're looking for.

Geekbench 6 Pro: GPU Compute OpenCL

Score | Higher is better

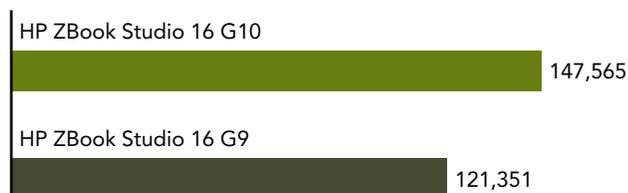


Figure 4: Geekbench 6 Pro Compute OpenCL scores. Higher is better. Source: Principled Technologies.

3DMark Time Spy

Overall score | Higher is better

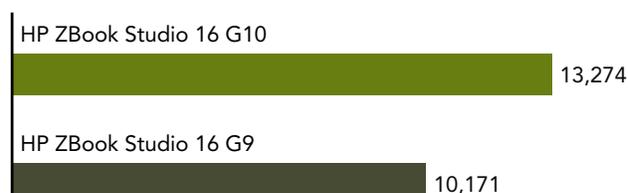


Figure 5: 3DMark Time Spy benchmark scores. Higher is better. Source: Principled Technologies.

About these benchmarks

To test the systems' performance under demanding workloads, we ran Geekbench benchmarks, which measure CPU and GPU performance using workloads that represent everyday tasks found in popular real-world apps and realistic datasets.⁹ For another angle on CPU and graphics performance, this time with the DirectX 12 graphics API, we also tested with the 3DMark Time Spy benchmark.¹⁰



Utilize AI to draw conclusions from datasets faster

AI is everywhere, and while there are plenty of concerns about how it might affect creative professionals, it also has enormous potential to help speed and enhance artistic workflows. AI can also help data scientists and decision-makers draw valuable insights from large datasets and help solve complex business problems. Higher performance on an AI inference workload, such as what we saw with the HP ZBook Studio 16 G10 Mobile Workstation, can help creatives and engineers alike.

Procyon AI Inference Benchmark for Windows

■ HP ZBook Studio 16 G10 ■ HP ZBook Studio 16 G9

Score | Higher is better

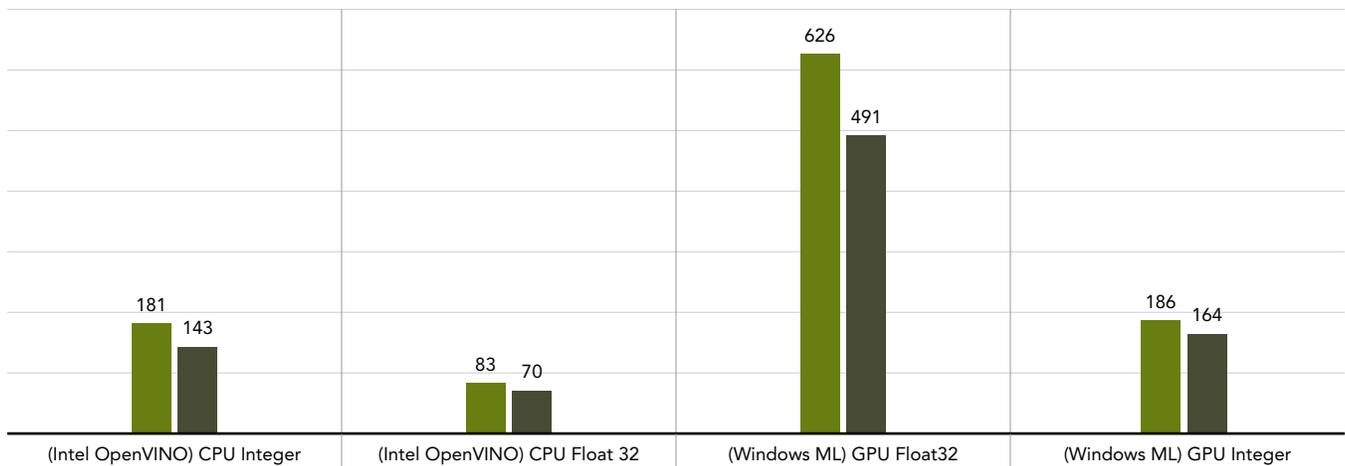


Figure 6: Procyon AI Inference Benchmark for Windows (Intel OpenVINO™) CPU Integer results. Higher is better. Source: Principled Technologies.

About this benchmark

To measure AI inference performance, we ran Procyon AI Inference Benchmark for Windows, which uses “a range of popular, state-of-the-art neural networks” to run common AI tasks.¹¹ We tested with both Intel OpenVINO and Windows ML, two different AI toolkits available for use on Windows systems.

Stay productive across projects

Not only should your workstation support the project-specific, intensive tasks you do, but it should also empower everyday work with speedy performance in productivity and creative apps. By minimizing delays in everything from working with spreadsheets to editing photos, saving time in the apps you use every day can quickly add up to more focused work throughout the week, month, and year.

Procyon Office Productivity

Overall score | Higher is better

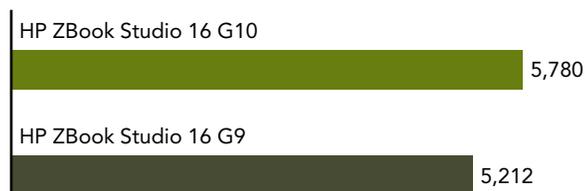


Figure 7: Procyon Office Productivity benchmark scores. Higher is better. Source: Principled Technologies.

PugetBench for Photoshop

Score | Higher is better

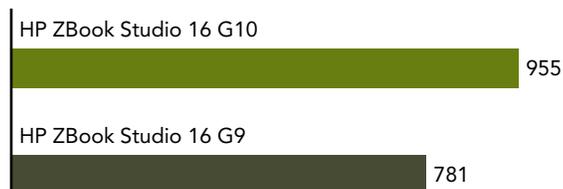
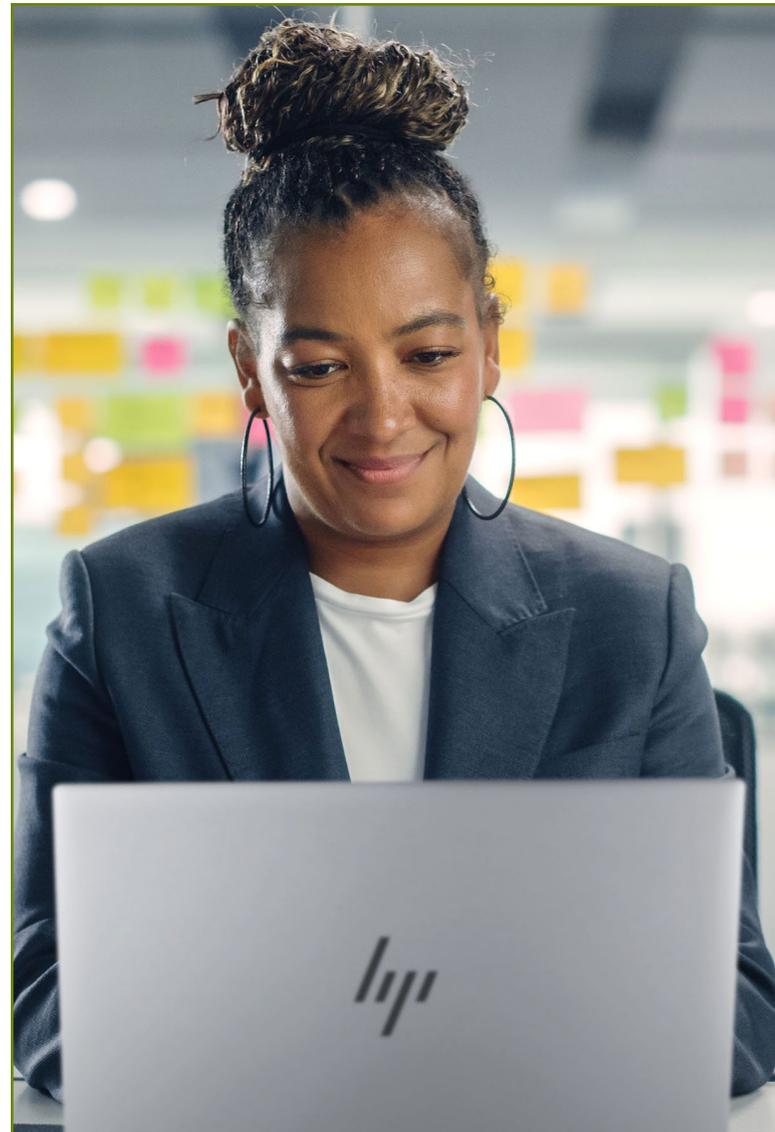


Figure 8: PugetBench for Photoshop benchmark scores. Higher is better. Source: Principled Technologies.



About this benchmark

For these everyday productivity tests, we tested the systems with Procyon Office Productivity benchmark, which bases its score on how quickly and smoothly systems execute common tasks in Microsoft Word, Excel, PowerPoint, and Outlook.¹² We also ran PugetBench for Photoshop for a look at performance with a creativity app. This benchmark runs a series of real-world tasks in Photoshop, including tests designed specifically to stress GPUs.¹³

Hand-timed photo task comparisons

Whether your project is in pre-production, production, or post-production, a mobile workstation that can power your team through each stage of the process can save time—which may translate to more time for reviewing, pivoting to other projects, or perfecting the details. In our hand-timed tests, we focused on two key parts of a creative workflow to see how teams could benefit from choosing the HP ZBook Studio 16 G10 Mobile Workstation.

Save time processing images

With the power of deep learning technology, AI image upscalers can improve photo quality by enhancing details and resolution. The Topaz Labs Gigapixel AI application is one such image upscaler that enlarges and enhances images with machine learning.¹⁴ In this hand-timed test, we upscaled a 4284x2844 resolution image to a 17136x11376 resolution image using the Gigapixel AI app—that’s an enhancement of four times. The newer HP ZBook Studio 16 G10 Mobile Workstation saved 8 seconds compared to its predecessor, a noticeable difference when you’re trying to move at the speed of your ideas.

Upscale image resolution 4x using Gigapixel AI

Time (seconds) | Lower is better

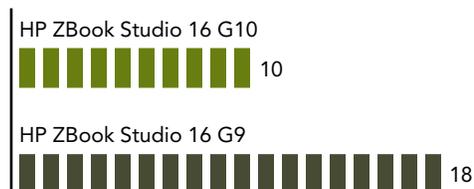


Figure 9: Time to upscale image resolution 4x using Gigapixel AI. Lower is better. Source: Principled Technologies.

Save time importing images

When photography and graphics teams can speed up the image import process, they have more time to spend putting those photos to work in their marketing collateral. And when weeding through hundreds or thousands of photos, any time they save can quickly compound. We looked at how long it took both systems to import photos into Adobe Lightroom Classic, which enables teams to edit, organize, store, and share images with a local file- or folder-based workflow.¹⁵ Again, here, the newer system saved time.

Import 50 photos using Adobe Lightroom Classic

Time (seconds) | Lower is better

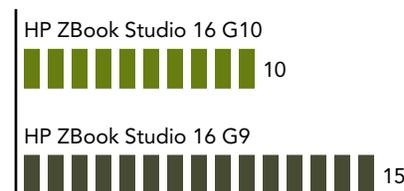


Figure 10: Time to import 50 photos using Adobe Lightroom Classic. Lower is better. Source: Principled Technologies.



Conclusion

Transforming an idea into reality is never easy, especially when it involves complex graphics or 3D renders, but a capable workstation can make all the difference. We used a variety of benchmarks, as well as two hand-timed tasks, to show the benefits of the new HP ZBook Studio 16 G10 Workstation with its 13th Generation Intel Core i9-13900H processor compared to its predecessor, the HP ZBook Studio 16 G9. We found that the newer ZBook Studio G10 achieved higher scores on benchmarks measuring graphics and AI inference performance, among others, and sped the time to upscale an image and import photos. With a workstation like this, your technical professionals and creative teams could speed the time from brainstorming to finished product.

1. HP, "HP ZBook Studio," accessed September 26, 2023, <https://www.hp.com/us-en/workstations/zbook-studio.html>.
2. Intel, "13th Gen Intel® Core™ Mobile Processors Achieve Breakthrough performance," accessed September 26, 2023, <https://www.intel.com/content/www/us/en/products/docs/processors/core/13th-gen-core-mobile-brief.html>.
3. Intel, "13th Gen Intel® Core™ Mobile Processors Achieve Breakthrough performance."
4. Intel, "Intel® Core™ i7-1265U Processor," accessed August 28, 2023, <https://www.intel.com/content/www/us/en/products/sku/226258/intel-core-i71265u-processor-12m-cache-up-to-4-80-ghz/specifications.html>.
5. Basemark, "Basemark GPU," accessed August 9, 2023, <https://www.basemark.com/benchmarks/basemark-gpu/>.
6. GFXBench, "The Benchmark," accessed August 9, 2023, <https://gfxbench.com/benchmark.jsp>.
7. Blender, "Time to Interact," accessed August 9, 2023, <https://www.blender.org/download/releases/3-6/>.
8. Geekbench, "Geekbench 6 GPU Compute Workloads," accessed September 18, 2023, <https://www.geekbench.com/doc/geekbench6-gpu-compute-workloads.pdf>.
9. Geekbench, "Introducing Geekbench 6," accessed August 9, 2023, <https://www.geekbench.com>
10. UL Solutions, "3DMark," accessed September 27, 2023, <https://benchmarks.ul.com/3dmark>.
11. UL Procyon® AI Inference Benchmark for Windows," accessed August 9, 2023, <https://benchmarks.ul.com/procyon/ai-inference-benchmark-for-windows>.
12. UL Solutions, "Procyon® Office Productivity Benchmark," accessed September 27, 2023, <https://benchmarks.ul.com/procyon/office-productivity-benchmark>.
13. Puget Systems, "PugetBench for Photoshop," accessed September 27, 2023, <https://www.pugetsystems.com/labs/articles/pugetbench-for-photoshop-1132/>.
14. Topaz Labs, "Gigapixel AI," accessed September 6, 2023, <https://www.topazlabs.com/gigapixel-ai>.
15. Adobe, "Adobe Photoshop Lightroom Classic," accessed September 18, 2023, <https://www.adobe.com/products/photoshop-lightroom-classic.html>.

Read the science behind this report at <https://facts.pt/6qF6lzh>



Facts matter.®

Principled Technologies is a registered trademark of Principled Technologies, Inc. All other product names are the trademarks of their respective owners. For additional information, review the science behind this report.

This project was commissioned by HP.