Render an 8K video to HEVC H.265 in nearly half the time

in Adobe Premiere Pro
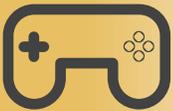
Play more of the Steam games you want

with better gaming compatibility (100%) vs. 40% compatibility for MacBook Air

Experience display features not available on the Apple MacBook Air 13"

with touch-screen and pen support

Comparing the Microsoft Surface Laptop 3 13.5" and Apple MacBook Air 13" with M1 chip

The Surface Laptop 3 (13.5") outpaced an Apple MacBook Air (13") with Apple M1 chip on AI-based photo enhancement and video rendering tasks, while offering touchscreen and pen support

In the fourth quarter of 2020, Gartner reported the highest global PC market growth in a decade.[1] With consumers largely at home using their laptops for everything from work to school to gaming and staying connected with friends and family, it's hardly surprising that systems offering strong performance and robust feature sets are in demand.

At Principled Technologies, we compared the Microsoft Surface Laptop 3 13.5" with 10th Gen Intel® Core™ processor to the Apple® MacBook Air® 13" with Apple M1 chip in a number of areas that matter to laptop users. We found that the Surface Laptop 3 13.5" provided:

- **Faster photo enhancement and video rendering.** The Surface Laptop 3 13.5" shaved five minutes off photo enlargement using the Topaz Labs Gigapixel AI app and rendered a video (exporting a RED camera 8K 1.5GB file to HEVC (H.265)) faster in Adobe® Premiere Pro®, which could mean that you spend less time waiting on that type of work.

- **More compatibility for gaming.** Our research shows (see Table 1 for details) that the Microsoft Surface Laptop 3 13.5" with 10th Gen Intel Core processor is compatible with the 50 most popular games on Steam, while the Apple MacBook Air 13" with Apple M1 chip would work with less than half—just 40 percent—of those games.

In addition to these advantages, the Microsoft Surface Laptop 3 13.5" provides a display experience that offers helpful features, including touchscreen with pen support and the Windows Hello camera for passwordless login. While we did not test these additional features, you can read more about them on page 2.

Staying at home—but not staying put—with the Microsoft Surface Laptop 3 13.5"

Spending more time at home has its pluses and minuses, but one thing is certain: people are relying on their devices even more to stay connected, which makes laptop portability and performance key.

To gauge performance of the systems in some key areas, we compared the Microsoft Surface Laptop 3 13.5" with Intel Core i7-1065G7 processor and the Apple MacBook Air 13" with Apple M1 chip in the following areas:

- AI-powered photo enhancement and video rendering performance
- Gaming compatibility
- Camera image quality

We configured both test systems as similarly as possible; each system had 16 GB of RAM, a 256GB SSD, similar screen resolutions (2256x1504 for the Surface Laptop 3 13.5" and 2560x1600 for the MacBook Air 13"), and slightly different battery capacities (a lower 45.8 Whr for the Surface Laptop 3 13.5" and a higher 49.9 Whr for the MacBook Air 13"). For further system configuration details and information about how we tested, see the appendix to this report, which begins on page 9.

About the Microsoft Surface Laptop 3 13.5"

The Surface Laptop 3 comes in two sizes, 13.5" and 15"; we used only the smaller form factor in our testing for the fairest comparison to the MacBook Air. The Surface Laptop 3 13.5"runs on a 10th Gen Intel Core i7 processor and offers a touch-screen PixelSense™ display, Instant On and password-free sign in with face recognition via Windows Hello, and up to 1.5TB SSDs.

To learn more about the Surface Laptop 3 13.5", visit
https://www.microsoft.com/en-us/p/surface-laptop-3/8vfggh1r94tm?activetab=overview.

- **PixelSense Touchscreen display**
  More ways to use your apps than with MacBook Air
- **Support for Surface Pen**
  Use the Surface Pen to sign document and make markups quickly
- **Support multiple external monitors**
  Native support for multiple monitors vs. a single monitor on MacBook Air 13"
- **More choices in size and look**
  Choose from two screen sizes and multiple color options

Do faster work in demanding apps on the Microsoft Surface Laptop 3 13.5"

While everyone's work is a little different, looking at demanding tasks can give you a sense of how your laptop might handle tough challenges. Figure 1 shows the time it took to enlarge an image by 6x using Topaz Labs Gigapixel AI, an application that uses machine learning to enlarge and enhance images. The Microsoft Surface Laptop 3 13.5" completed the task in a fraction of the time of the Apple device, shaving over 5 minutes off the image enhancement time of the Apple MacBook Air 13". Professional photo editors or consumers who frequently enhance images using this tool could save significant time on these tasks with the Microsoft Surface Laptop 3 13.5".

Time to enlarge an image by 6x *Lower is better | (mm:ss)*

8:45.8

3:02.5

Microsoft Surface Laptop 3 13.5"
with Intel Core i7-1065G7

Apple MacBook Air 13"
with Apple M1
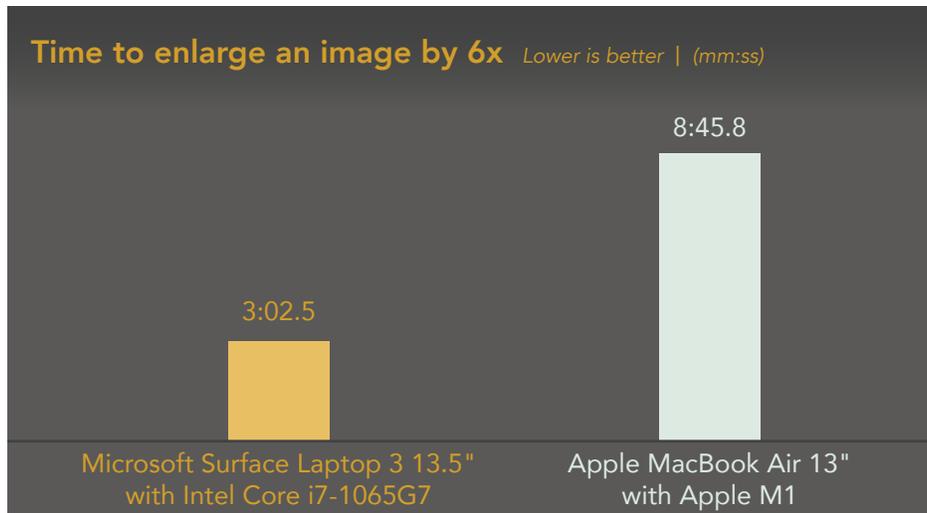
Figure 1: Time, in minutes: seconds, to upscale/enlarge a 4284x2844 resolution image by 6x to 25704x17064 resolution in Topaz Labs Gigapixel AI. Lower is better. Source: Principled Technologies.

Another Topaz Labs application that uses machine learning to edit images, DeNoise AI, removes noise and recovers detail to deliver better image quality when enhancing and editing photos. Using this application to remove noise from a sample image, the Microsoft Surface Laptop 3 13.5" decreased noise reduction time by 80.1 percent compared to the Apple MacBook Air 13" (see Figure 2), making it much quicker for photo editors or consumers to recover details in their images.

Time to remove noise from an image *Lower is better | (mm:ss)*

0:08.0

0:40.3

Microsoft Surface Laptop 3 13.5"
with Intel Core i7-1065G7

Apple MacBook Air 13"
with Apple M1
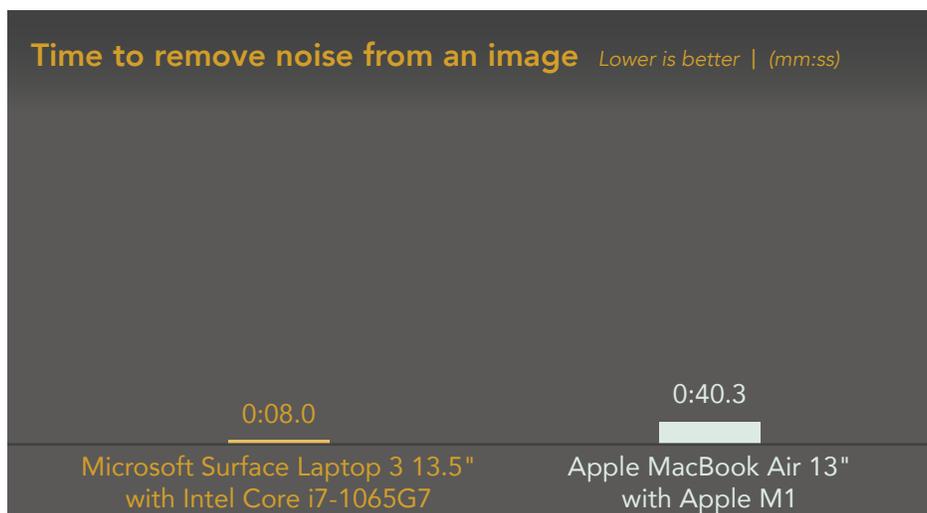
Figure 2: Time, in seconds, to reduce noise from an image using Topaz Labs DeNoise AI. Lower is better. Source: Principled Technologies.

Microsoft Surface Laptop 3 13.5" completed a video rendering task in Adobe Premiere Pro in nearly half the time

Rendering high-quality video in Adobe® Premiere Pro® is a demanding task for creators, who can meet project deadlines faster if they aren't stuck waiting on their systems. To see how the systems fared on very demanding tasks, we tested rendering time with an 8K file. In our tests, the Microsoft Surface Laptop 3 13.5" cut rendering time by 45 percent (exporting a RED camera 8K 1.5GB file to HEVC (H.265) in Adobe Premiere Pro) over the Apple MacBook Air 13" with M1 chip (see Figure 3).

Time to export a RED camera file to HEVC *Lower is better | (mm:ss)*

1:28.2 — Microsoft Surface Laptop 3 13.5" with Intel Core i7-1065G7

2:41.8 — Apple MacBook Air 13" with Apple M1
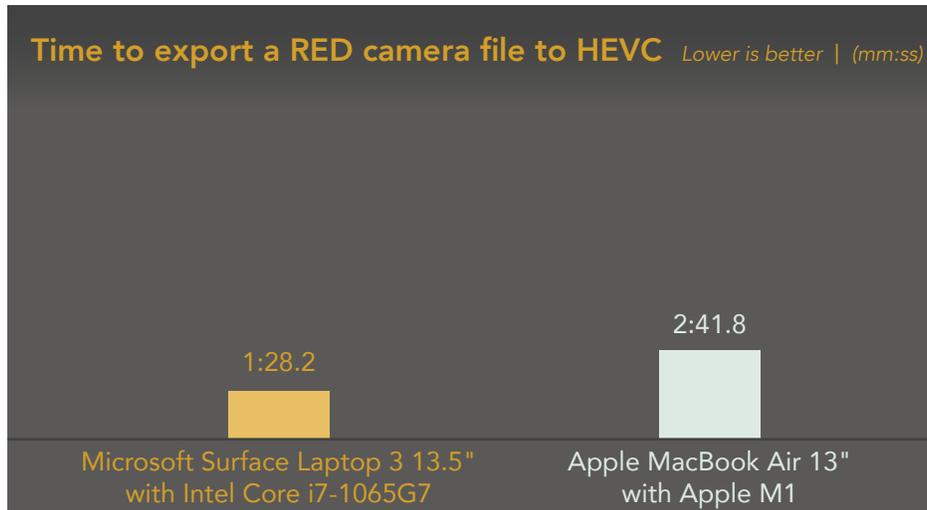
Figure 3: Time, in minutes: seconds, to export a RED camera 8K 1.5GB file to HEVC (H.265) in Adobe Premiere Pro. Lower is better. Source: Principled Technologies.
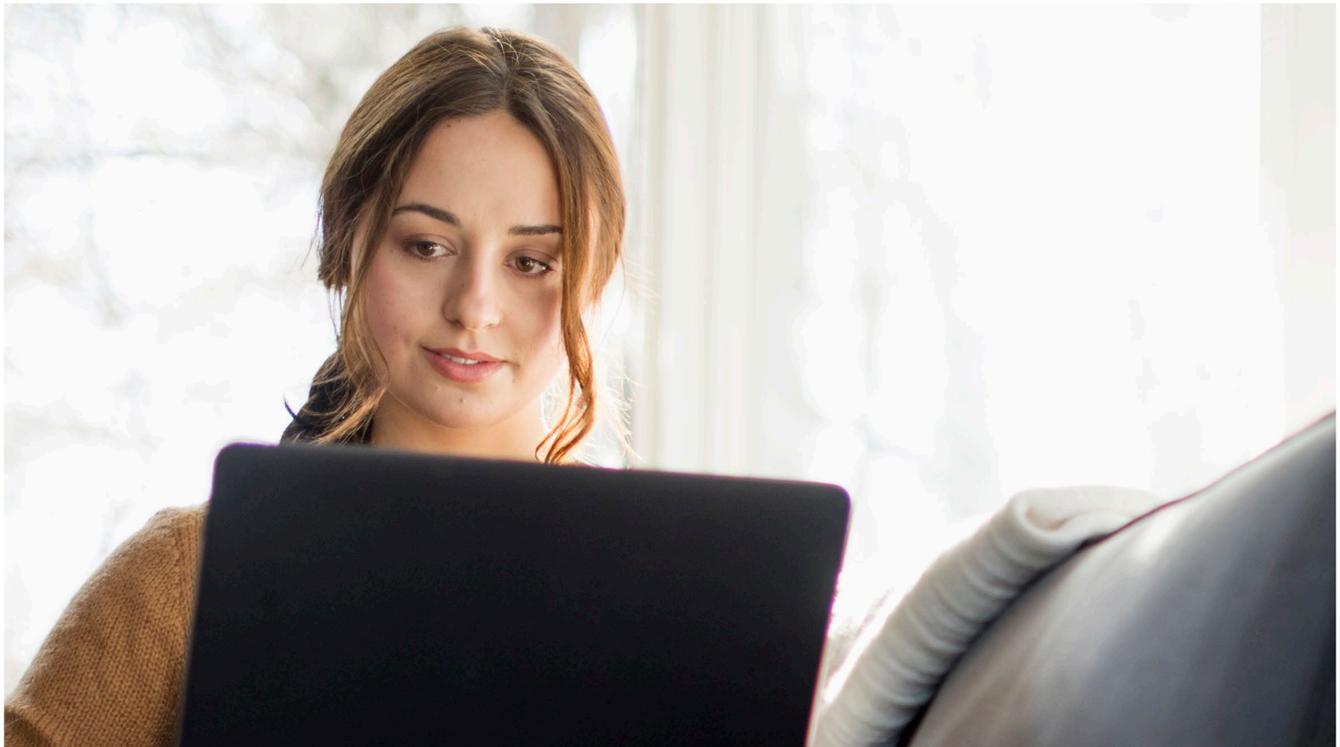
Play more than two times the Steam games you want— including Sea of Thieves— on the Microsoft Surface Laptop 3 13.5"

If you or a family member want to use your laptop for gaming, choose the system that offers the broadest compatibility with today's popular games, or you may find yourself out of luck. The Microsoft Surface Laptop 3 13.5" offers compatibility with all of the top 50 games on Steam, while the Apple MacBook Pro 13" with Apple M1 processor would be unable to run 62 percent of the most popular games on the list, including Grand Theft Auto and Sea of Thieves. Please note that we did not install and test these games on each system; rather we acessed the Top 50 list available at https://steamcharts. com/top and clicked each game to a purchase page that noted compatibility with Windows and/or macOS. For every macOS-compatible game, we then went to https://applesilicongames. com/games to verify if the game works on systems with Apple M1 processors. Table 1 shows the top 50 games on Steam and their compatibility with each system.

Table 1: Compatibility with the top 50 games on Steam, taken from https:// steamcharts.com/top on April 20, 2021. Source: Principled Technologies.

Steam Charts Top 50 Games 04/20/2021	Windows 10 compatible	macOS compatible	Apple Silicon M1 compatible
Counter-Strike: Global Offensive	✓	✓	✓
Dota 2	✓	✓	✓
PLAYERUNKNOWN'S BATTLEGROUNDS	✓	✗	✗
Apex Legends	✓	✗	✗
Team Fortress 2	✓	✓	✓
Grand Theft Auto V	✓	✗	✗
Path of Exile	✓	✓	✗
Tom Clancy's Rainbow Six Siege	✓	✗	✗
Warframe	✓	✗	✗
Rust	✓	✓	✓
Football Manager 2021	✓	✓	✓
Wallpaper Engine	✓	✗	✗
The Binding of Isaac: Rebirth	✓	✓	✓
ARK: Survival Evolved	✓	✓	✗
Valheim	✓	✗	✗
Rocket League	✓	✗	✗
PAYDAY 2	✓	✗	✗
The Forest	✓	✗	✗
Dead by Daylight	✓	✗	✗
Destiny 2	✓	✗	✗
Stellaris	✓	✓	✓
Monster Hunter: World	✓	✗	✗
Sid Meier's Civilization VI	✓	✓	✓
Unturned	✓	✓	✓
War Thunder	✓	✓	✗
Euro Truck Simulator 2	✓	✓	✓
Black Desert Online	✓	✗	✗
Hearts of Iron IV	✓	✓	✓
OUTRIDERS	✓	✗	✗
Terraria	✓	✓	✓
Garry's Mod	✓	✓	✗
Tale of Immortal	✓	✗	✗
World of Tanks Blitz	✓	✓	✓
Stardew Valley	✓	✓	✓
The Elder Scrolls Online	✓	✓	✓
The Witcher 3: Wild Hunt	✓	✗	✗
Total War: WARHAMMER II	✓	✓	✓
Space Wars	✓	✗	✗
Cities: Skylines	✓	✓	✓
Farming Simulator 19	✓	✓	✓
7 Days to Die	✓	✓	✓
Sea of Thieves	✓	✗	✗
Sid Meier's Civilization V	✓	✓	✓
Satisfactory	✓	✗	✗
DayZ	✓	✗	✗
Battlefield V	✓	✗	✗
NBA 2K21	✓	✗	✗
Brawlhalla	✓	✓	✗
Forza Horizon 4	✓	✗	✗
Mount & Blade II: Bannerlord	✓	✗	✗

Comparing camera quality in low light

In a time when people frequently connect via Microsoft Teams and other videoconferencing apps, camera quality is crucial to presenting an accurate face to the world. Figure 4 compares the camera quality of the Microsoft Surface Laptop 3 13.5", which offers a 720p HD f2.0 camera (front-facing), to that of the Apple MacBook Air 13" with M1 chip, which offers a 720p FaceTime HD camera, in dim lighting conditions. Though image preference is subjective, we feel that the low light image reflects better color accuracy on the Surface Laptop 3.


Figure 4: Image quality in dim lighting conditions. Source: Principled Technologies.
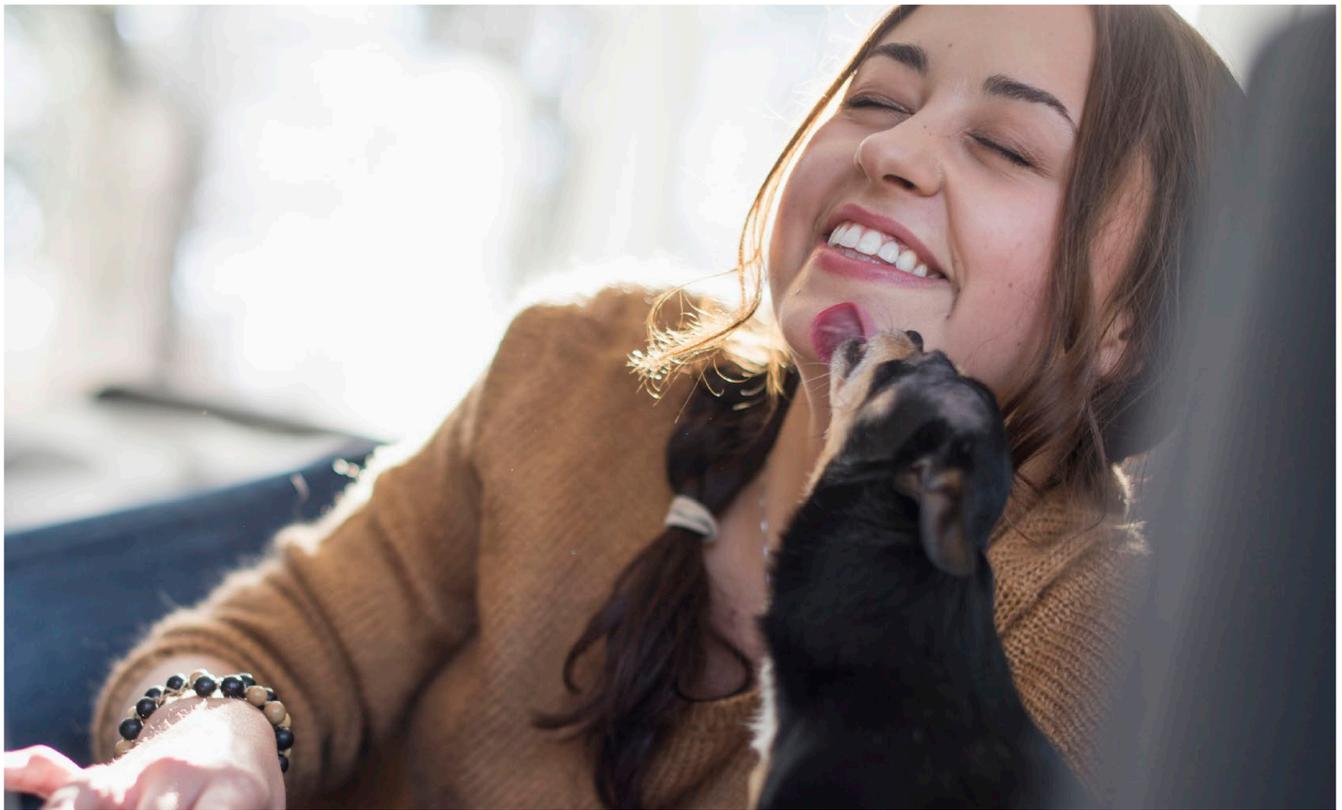
Conclusion

Choosing a laptop with strong performance on demanding apps can make a difference in your productivity throughout the workday, and compatibility with more games can make for a better experience when you're off the clock. We found that the Microsoft Surface Laptop 3 13.5" improved performance on a video rendering task and an AI-based photo enhancement task compared to the Apple MacBook Air 13" with M1 chip. The Microsoft Surface Laptop 3 13.5" also offers features that could enhance user experience such as face sign-in via Windows Hello, touch-screen display, multiple color and size options to provide a custom fit, and removeable SSDs for serviceability.

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1   Gartner, Inc., "Gartner Says Worldwide PC Shipments Grew 10.7% in Fourth Quarter 2020 and 4.8% for the Year," accessed March 11, 2021, https://www.gartner.com/en/newsroom/press-releases/2021-01-11-gartner-says-worldwide-pc-shipments-grew-10-point-7-percent-in-the-fourth-quarter-of-2020-and-4-point-8-percent-for-the-year.

We concluded our hands-on testing on February 22, 2021. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on January 11, 2021 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

To learn more about how we have calculated the wins in this report, go to http://facts.pt/calculating-and-highlighting-wins. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 2: Results of our testing.

	Microsoft Surface Laptop 3 13.5"	Apple® MacBook Air® 13"
Time to export a RED camera 8K 1.5GB File to HEVC (H.265) (Lower is better)		
Average - sec	88.2	161.8
Minimum Average - sec	87.4	158.7
Maximum Average - sec	89.0	163.8

Table 2 presents the pricing data for the configurations we tested, but Microsoft and Apple both offer many configuration options for their respective systems. As of April 1, 2021, the retail price of the Microsoft Surface Laptop 3 ranges from $999.00 - $2,399.99, with discounted prices available from $769.99 - $1,879.99, according to the Microsoft website. As of April 1, 2021, the Apple MacBook Air 13" with M1 chip ranges in price from $999.00 - $2,049.00, according the the Apple website.

Table 3: Pricing, in USD, as of March 29, 2021 from Microsoft and Apple websites.

	Microsoft Surface Laptop 3 13.5"	Apple MacBook Air 13"
Price	$1,599.99	$1,199.00

System configuration information

Table 4: Detailed information on the system we tested.

System configuration information	Microsoft Surface Laptop 3 13.5"	Apple MacBook Air 13"
Processor		
Vendor	Intel®	Apple
Name	Core™ i7-1065G7	M1
Core frequency (GHz)	1.3 – 3.9	3.2
Number of cores	4	8
Memory		
Amount (GB)	16	16
Type	LPDDR4X	Unified
Graphics		
Vendor	Intel	Apple
Model number	Intel Iris Plus Graphics	M1 8 core GPU
Storage		
Amount (GB)	256	256
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Wi-Fi 6 802.11ax	802.11ax Wi-Fi 6
Bluetooth	5.0	5.0
USB	1 x USB-C port 1 x USB-A port 1 x Surface Connect port	2 x Thunderbolt / USB 4 ports
Battery		
Type	Integrated Lithium-polymer	Integrated Lithium-polymer
Rated capacity (mAh)	45.8 Whr	49.9 Whr
Display		
Size (in.)	13.5"	13.3"
Resolution	2,256 x 1,504	2,560 x 1,600
Operating system		
Vendor	Microsoft	Apple
Name	Windows 10 Home	macOS® Big Sur
Build number or version	19042.804	11.2.1
BIOS		
BIOS name and version	Microsoft 9.102.140	N/A

System configuration information	Microsoft Surface Laptop 3 13.5"	Apple MacBook Air 13"
Dimensions		
Height	0.57"	0.16"– 0.63"
Width	12.1"	11.97"
Depth	8.80"	8.36"
Weight (lbs.)	2.84	2.8

How we tested

Hand-timing tests

Gigapixel AI

We recorded how long it took to upscale/enlarge a 4,284x2,844 image to a 25,704x17,064 (6x) image. To complete this test, you need the Topaz Labs Gigapixel AI v5.4.4 application and a stopwatch.

Setting up the test (both Windows and macOS systems)

1. Register, download, and install the Topaz Labs Gigapixel AI free trial from https://topazlabs.com/gigapixel-ai/.
2. Launch Gigapixel AI, and enter the username and password to start the free trial.
3. Close Gigapixel AI.

Running the test (both Windows and macOS systems)

1. Launch Gigapixel AI.
2. Click Browse and select the test image.
3. Under the Scale tab select 6x.
4. Click Save Image. Verify that the image format is JPG and that the quality is set to the maximum of 10.
5. Simultaneously start the stopwatch and click Save.
6. Stop the stopwatch when the checkmark appears with the message All images processed.
7. Record the result.
8. Wait 5 minutes before performing the next run.
9. Repeat steps 1 through 8 four more times.

DeNoise AI

We recorded how long it took to remove noise from an image, using the Topaz Labs DeNoise AI v2.4.2 application.

Setting up the test (both Windows and macOS systems)

1. Register, download, and install the Topaz Labs Gigapixel AI free trial from https://topazlabs.com/denoise-ai-2/.
2. Launch DeNoise AI and enter the username and password to start the free trial.
3. Close DeNoise AI.

Running the test (both Windows and macOS systems)

1. Launch DeNoise AI.
2. Click Browse, and select the test image.
3. Under the DeNoise AI tab, select the following settings:

    • Remove Noise= 40

    • Enhance Sharpness= 22

    • Recover Original Detail= 20

    • Color Noise Reduction= 0

4. Click Save Image. Verify that the image format is JPG, and that the quality is set to the maximum of 10.
5. To start the DeNoise process, click Save.
6. Once the DeNoise process has been completed, record the time that appears in the box located at the bottom of the screen.
7. Wait 5 minutes before performing the next run.
8. Repeat steps 1 through 7 four more times.

Creating an Adobe Premiere Pro video

We recorded how long it took to export an 8K RED video file to HEVC (H.265), using Adobe Premiere Pro v14.9.

Running the test on Windows systems

1. Launch Adobe Premiere Pro.
2. Select Open Project, select the test Premiere project file, and click Open.
3. To bring up the Export Media dialog, press Ctrl+M.
4. From the Format drop-down menu, choose HEVC (H.265).
5. Simultaneously start the timer and click Export.
6. When the export has finished, stop the timer, and record the time.
7. Close Premiere and wait 5 minutes before performing the next run.
8. Repeat steps 1 through 7 four more times.

Running the test on macOS systems

1. Launch Adobe Premiere Pro.
2. Select Open Project, select the test Premiere project file, and click Open.
3. To bring up the Export Media dialog, press CMD+M.
4. From the Format drop-down menu, choose HEVC (H.265).
5. Simultaneously start the timer and click Export.
6. When the export has finished, stop the timer, and record the time.
7. Close Premiere and wait 5 minutes before performing the next run.
8. Repeat steps 1 through 7 four more times.

Capturing images using built-in camera apps

1. Set each system brightness as close to 200 nits without going below that level.
2. Using a Digital light meter (Dr.meter LX1330B), measure the room brightness.
3. For Windows 10 systems, open the Camera App. For macOS systems, open the Photo Booth App.
4. When positioned correctly, take a picture.

This project was commissioned by Microsoft.

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