



HP Pavilion x360 14t-dy000 powered by an Intel Core i5-1135G7 processor and an Intel Core i3-1125G4 processor



HP ProBook x360 11 G7 EE powered by an Intel Pentium Silver N6000 processor



Get a handle on higher-education projects with a laptop powered by an Intel Core processor

Intel Core i5-1135G7 and Core i3-1125G4 processor-powered laptops saved time on a variety of tasks

Executive Summary

At Principled Technologies, we compared the responsiveness of three Windows 10 laptops while completing tasks in a variety of common apps that college/university-level students might use for their assignments or extracurricular activities:

- Intel Pentium Silver N6000 processor-powered laptop
- Intel Core i3-1125G4 processor-powered laptop
- Intel Core i5-1135G7 processor-powered laptop

We tested these laptops using apps such as Microsoft OneDrive, Adobe Photoshop, and Google Drive. In each case, the laptops powered by Intel Core processors saved time while completing tasks. Furthermore, the Intel Core processor-powered devices achieved higher scores on benchmarking apps WebXPRT 3 and Speedometer 2.0, meaning that one would expect these devices to be more responsive during web browsing and web app activities.



Up to 77% less time

importing photos in Adobe Lightroom*^Δ



Up to 60% less time

creating a chart in Microsoft Excel*^Δ



Up to 58% less time

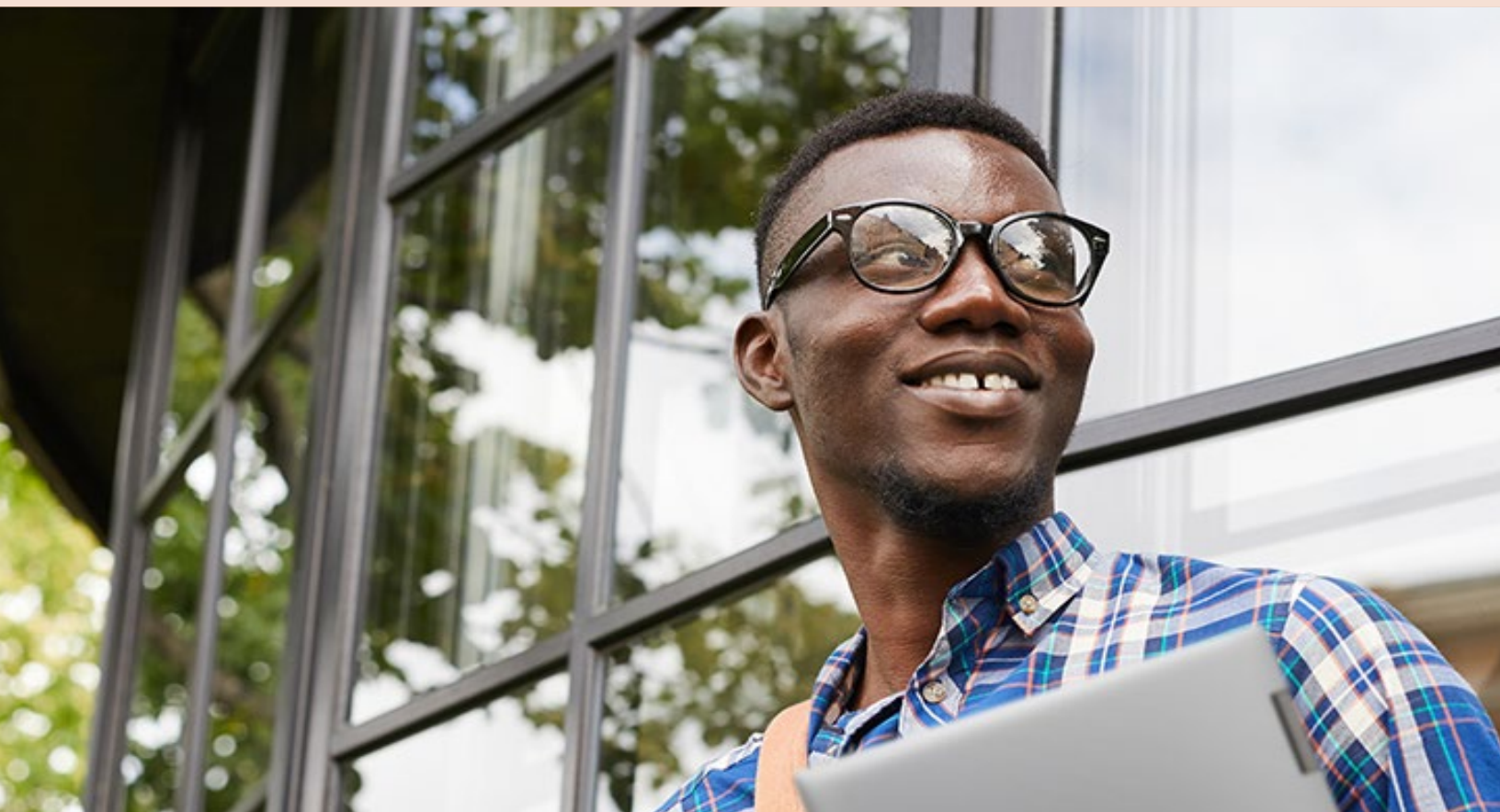
launching a Zoom meeting*^Δ

*Comparing an HP Pavilion x360 14t-dy000 with an Intel Core i5-1135G7 processor, HP Pavilion x360 14t-dy000 with an Intel Core i3-1125G4 processor, and a HP ProBook x360 11 G7 EE with an Intel Pentium Silver N6000

^ΔSee [the science behind this report](#) for detailed system configurations and benchmark results.

How we tested

To test each Windows 10 laptop, we hand-timed common tasks in a variety of apps that college and university students might use to complete educational assignments. We sorted these tasks into three scenarios to better portray how students might use these apps in the real world: a scenario that used a variety of Microsoft 365 apps, a scenario involving a Microsoft PowerPoint presentation, and a photo-editing scenario involving Adobe Photoshop and Adobe Photoshop Lightroom. For each scenario, each laptop was connected to a three-way video call via Zoom to reflect a remote learning experience.



It's a new school year, and Ellen has settled into college life without skipping a beat. She's involved herself in a wide variety of campus clubs and activities to stay occupied and stimulated during school. (Too many clubs, her grandpa tells her on a Zoom call.) Her fast, responsive Intel Core i5 processor-powered laptop is certainly enough to keep up with all of Ellen's reading assignments, her lab spreadsheets, and even her family—but can it keep up with **her**?



Save time working with a variety of Microsoft 365 apps

In this scenario, the Intel Core i5-1135G7 processor-powered device saved up to 40 seconds, while the Intel Core i3-1125G4 processor-powered device saved 35.5 seconds compared to the Intel Pentium Silver N6000 processor-powered device. Notably, when creating a clustered-column chart in Microsoft Excel, the Intel i3-1135G7 processor-powered device saved 53 percent of the time required to complete the task compared to the device with the Intel Pentium Silver N6000 processor.

Save up to 40 seconds working with presentations and charts during a Zoom call with Zoom, Microsoft OneDrive, Microsoft Excel, and Microsoft PowerPoint

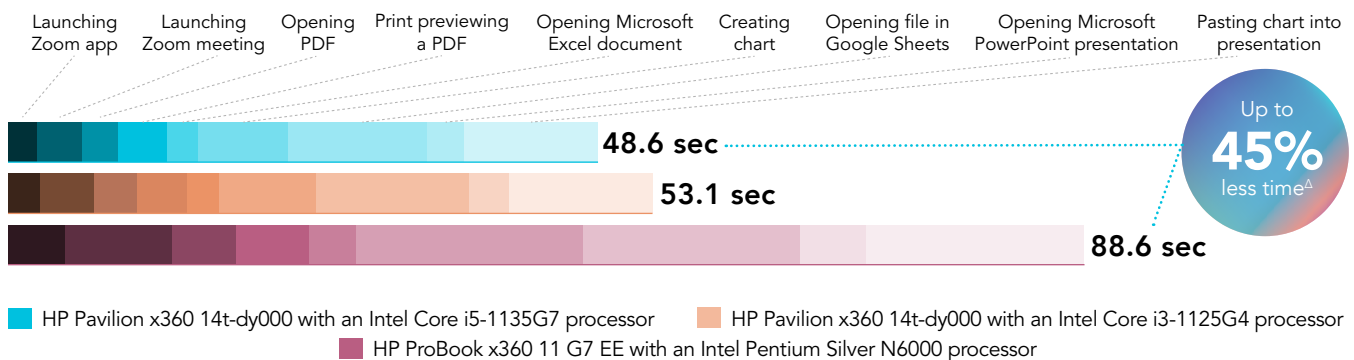


Figure 1: Time (in seconds) to complete tasks in various productivity apps. Less time is better. Source: Principled Technologies.

Zoom

Zoom is a teleconferencing and video chat app that enables users to connect, share ideas, and participate in remote events, seminars, and more. Individuals and companies around the world use Zoom as an integral part of their day-to-day operations.¹

Microsoft 365

Microsoft 365 is a cloud-based productivity suite that enables users to work in Microsoft Office apps on up to five devices concurrently. Apps include Word, Excel, PowerPoint, OneNote, Outlook, and Skype.²

^ΔSee [the science behind this report](#) for detailed system configurations and benchmark results.

Keith takes just *one* more final look at his PowerPoint presentation before he'll put it away and get dinner. Honest. Keith's not usually one to stress over assignments this much, but... Wait, is that the wrong image on slide 12?

Keith opens his research folder on OneDrive. His Intel Core i3 processor-powered laptop lets him insert the right image quickly. He sighs. OK. Just *one more* final look.



Save time working on PowerPoint presentations

For this scenario testing presentation-related tasks during a Zoom call, the Intel Core i5 processor-powered laptop saved up to 16.1 seconds total compared to the other laptops, while the Intel Core i3 processor-powered laptop saved 13.9 seconds versus the laptop with the Intel Pentium Silver N6000 processor.

Save up to 16.1 seconds working with presentations during a Zoom call with Microsoft PowerPoint and Microsoft OneDrive

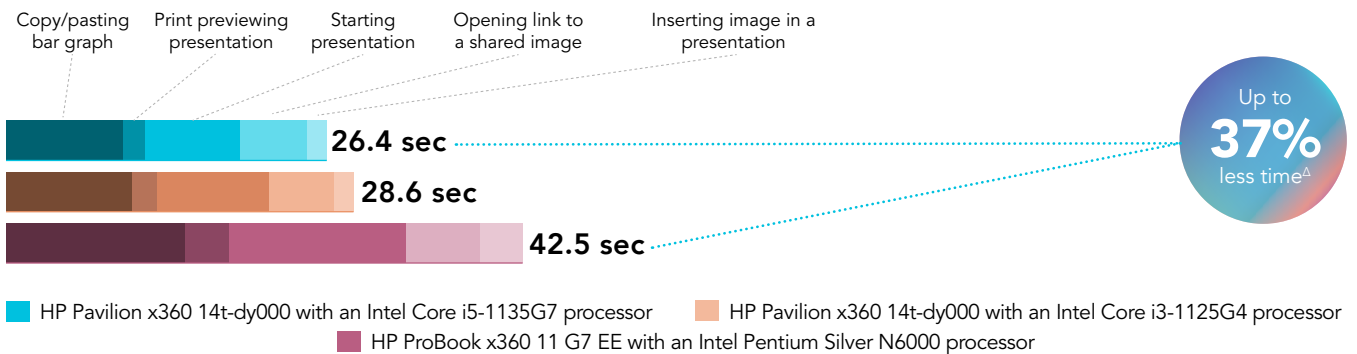


Figure 2: Time (in seconds) to complete presentation tasks with Microsoft PowerPoint and Microsoft OneDrive. Less time is better. Source: Principled Technologies.

Microsoft OneDrive

OneDrive is online storage that enables users to access and edit files across devices, back up precious data to the cloud, and share and collaborate on documents in real time via Microsoft Online apps (such as PowerPoint Online).³

^ΔSee [the science behind this report](#) for detailed system configurations and benchmark results.

In the library, Anita stares at the screen of her laptop, eagle eyed, as she quickly tabs through the dozens of photos she snapped at a campus event that afternoon. After half a minute or so, she smiles. There it is: the perfect shot. (And five more where that came from, if her editor doesn't like it!) Working as a photojournalist for her campus paper has been fulfilling in ways she never expected, and her Intel Core i3 processor-powered laptop helps ensure she's at the top of her game with photo edits.



Save time editing photos in Adobe Creative Cloud apps

In our scenario testing a few photo-editing tasks in Adobe apps during a three-way Zoom call, the Intel Core i5-1135G7 processor-powered laptop saved up to 14.3 minutes overall. The Intel Core i3-1125G4 processor-powered laptop saved 13.4 minutes compared to the Intel Pentium Silver N6000 processor-powered laptop in the overall scenario. The Core i3 processor-powered laptop saved 73 percent of the time required to import photos into Adobe Lightroom and saved 62 percent of the time required to merge photos in Adobe Photoshop compared to the Intel Pentium Silver processor-powered laptop.

Save up to over 14 minutes working with photos during a Zoom call with Adobe Lightroom and Adobe Photoshop

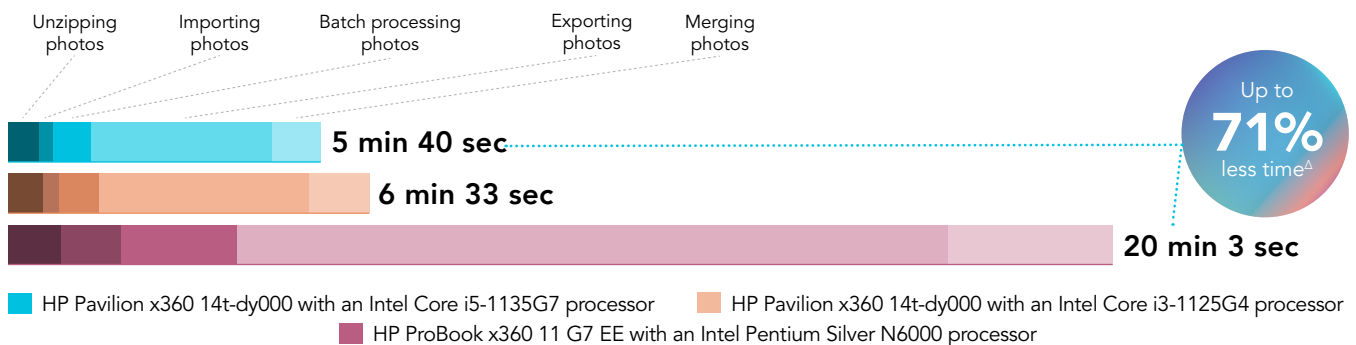


Figure 3: Time (in seconds) to complete photo-editing tasks in Adobe Photoshop and Adobe Photoshop Lightroom. Less time is better. Source: Principled Technologies.

Adobe Photoshop Lightroom

Lightroom is a cloud based photo editing app that enables users to edit, organize, and manage photos across your devices, and to share their next big photography project with collaborators.⁵

^ASee [the science behind this report](#) for detailed system configurations and benchmark results.



Stronger performance on web-based benchmark tests

To assess the web performance of each laptop, we ran two benchmark tests:

- WebXPRT 3, a browser benchmark that uses HTML5 and JavaScript-based scenarios to compare the ability of different devices to handle tasks in online apps and webpages⁶
- Speedometer 2.0, a browser benchmark that tests web app responsiveness by measuring the time required for simulated users to complete certain tasks⁷

The results of each test continued the trend we saw with our timed-task scenarios: the Intel Core i5 processor-powered laptop achieved the highest scores (up to 37.9 percent higher than the other laptops).

WebXPRT 3 score

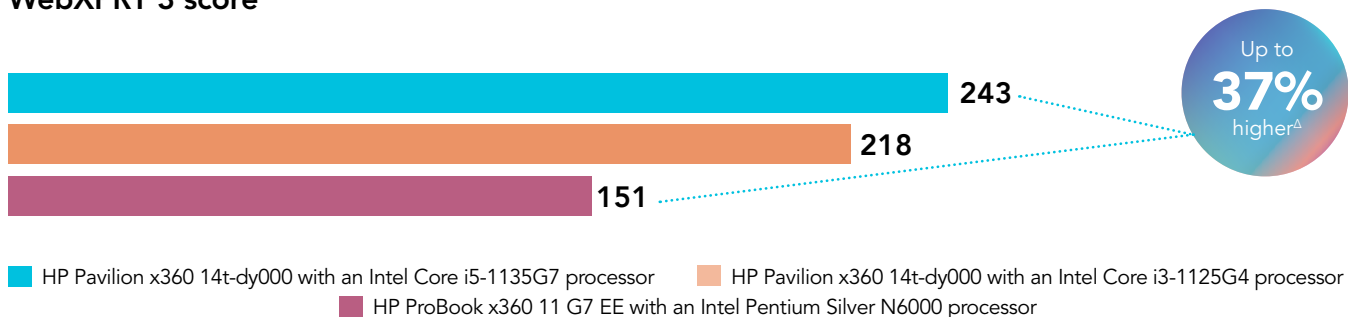


Figure 4: Comparison of WebXPRT 3 benchmark scores. Higher scores are better. Source: Principled Technologies.

Speedometer 2.0 score

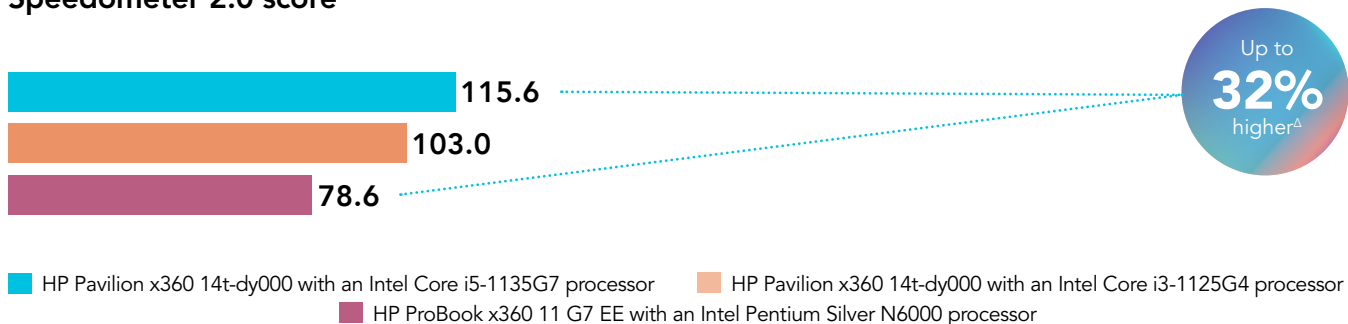


Figure 5: Comparison of Speedometer 2.0 benchmark scores. Higher scores are better. Source: Principled Technologies.

^ASee [the science behind this report](#) for detailed system configurations and benchmark results.



Conclusion

The eclectic nature of the higher-education experience means students are responsible for a wide variety of tasks throughout their college years. To help them achieve their potential, students need devices that can support their work, facilitate remote lectures, and enable them to stay in communication with friends and loved ones. In our tests comparing three Windows 10 laptops, we found that laptops powered by Intel Core i3-1125G4 and Intel Core i5-1135G7 processors saved time on tasks in common apps such as Microsoft PowerPoint, Adobe Photoshop, Zoom, and others compared to a laptop with an Intel Pentium Silver N6000 processor. Additionally, the Intel Core processor-powered laptops achieved higher scores on web-based benchmarks WebXPRT 3 and Speedometer 2.0, suggesting stronger performance with web-apps and websites in general.

- 1 "Video Conferencing, Cloud Phone, Webinars, Chat, Virtual Events | Zoom," accessed July 20, 2021, <https://zoom.us>.
- 2 "Microsoft 365 for home use," accessed July 20, 2021, <https://www.microsoft.com/en-us/microsoft-365/explore-microsoft-365-for-home>.
- 3 "OneDrive Personal Cloud Storage," accessed July 20, 2021, <https://www.microsoft.com/en-us/microsoft-365/onedrive/online-cloud-storage>.
- 4 Javier Soltero, "Google Meet premium video meetings—free for everyone," accessed July 20, 2021, <https://www.blog.google/products/meet/bringing-google-meet-to-more-people/>.
- 5 "Photo editing and organizing software | Adobe Photoshop," accessed July 20, 2021, <https://www.adobe.com/products/photoshop-lightroom.html>.
- 6 "PT - WebXPRT," accessed July 20, 2021, <https://www.principledtechnologies.com/benchmarkxpirt/webxpirt/>.
- 7 "About Speedometer 2.0," accessed July 20, 2021, <https://browserbench.org/Speedometer2.0/>.

We concluded our hands-on testing on July 12, 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 July 5, 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 1: Results of our timed-task testing.

Task	HP ProBook x360 11 G7 EE with Intel® Pentium® Silver N6000 processor	HP Pavilion x360 14t-dy000 with Intel Core™ i3-1125G4 processor	HP Pavilion x360 14t-dy000 with Intel Core i5-1135G7 processor	Core i3 vs Pentium	Core i5 vs Pentium	Core i5 vs Core i3
Scenario #1						
Median sum of all tasks in Scenario #1	88.6	53.1	48.6	39.5%	45.1%	8.5%
Zoom Cloud Meetings						
Launching the application	4.7	2.7	2.4	42.6%	48.9%	11.1%
Launching a meeting	8.8	4.4	3.7	45.5%	58.0%	15.9%
Microsoft OneDrive						
Opening a PDF	5.3	3.5	3.0	18.9%	43.4%	14.3%
Print-previewing a PDF	6.0	4.2	4.0	16.7%	33.3%	4.8%
Microsoft Excel						
Opening an Excel spreadsheet	3.9	2.6	2.6	25.6%	33.3%	0.0%
Creating a chart	18.7	8.0	7.4	53.5%	60.4%	7.5%
Opening an Excel spreadsheet in Google Sheets	17.8	12.6	11.4	28.1%	36.0%	9.5%
Microsoft PowerPoint						
Opening a presentation	5.5	3.3	3.1	36.4%	43.6%	6.1%
Pasting an Excel chart into a presentation	17.9	11.8	11.0	33.5%	38.5%	6.8%

Task	HP ProBook x360 11 G7 EE with Intel® Pentium® Silver N6000 processor	HP Pavilion x360 14t-dy000 with Intel Core™ i3-1125G4 processor	HP Pavilion x360 14t-dy000 with Intel Core i5-1135G7 processor	Core i3 vs Pentium	Core i5 vs Pentium	Core i5 vs Core i3
Scenario #2						
Median sum of all tasks in Scenario #2	42.5	28.6	26.4	30.6%	37.9%	7.7%
Microsoft PowerPoint						
Copying a chart from Excel and pasting it into a presentation	14.7	10.4	9.6	27.2%	34.7%	7.7%
Print-previewing a presentation	3.7	2.0	1.8	27.0%	51.4%	10.0%
Beginning a presentation	14.5	9.3	7.9	34.5%	45.5%	15.1%
Microsoft OneDrive						
Opening a link to a shared image	6.1	5.3	5.5	0.0%	9.8%	-3.8%
Microsoft PowerPoint						
Inserting an image into a presentation	3.5	1.6	1.6	28.6%	54.3%	0.0%
Scenario #3						
Median sum of all tasks in Scenario #3	1203.2	393.6	340.7	67.2%	71.7%	13.4%
Windows Desktop						
Unzipping 100 .DNG photos	58.3	38.3	34.3	34.3%	41.2%	10.4%
Adobe® Lightroom®						
Importing 100 .DNG photos	65.4	17.1	14.9	73.4%	77.2%	12.9%
Batch-processing 100 .DNG photos	125.8	44.3	41.4	64.4%	67.1%	6.5%
Exporting 100 .DNG photos as .JPGs	774.0	228.1	197.1	70.4%	74.5%	13.6%
Adobe Photoshop®						
Performing a content-aware photo merge of six images	179.7	65.8	53.0	62.9%	70.5%	19.5%
Benchmarks - Score, higher is better						
WebXPRT 3 - Microsoft Edge Web Browser	151.00	218.00	243.00	30.7%	37.9%	10.3%
Speedometer 2.0 - Microsoft Edge Web Browser	78.61	103.00	115.60	23.7%	32.0%	10.9%

System configuration information

Table 2: Detailed information on the system we tested.

System	HP ProBook x360 11 G7 EE	HP Pavilion x360 14t-dy000	HP Pavilion x360 14t-dy000
Processor	Intel Pentium Silver N6000	Intel Core i3-1125G4	Intel Core i5-1135G7
Max processor frequency (GHz)	3.30	3.70	4.20
Processor cores	4	4	4
Memory (GB)	8	8	8
Storage model and size (GB)	256GB KIOXIA KBG40ZNV256G	256GB SK Hynix® BC711	256GB SK Hynix BC711
Bluetooth	5	5	5
USB	1x USB 3.1 Type-C, 2x USB 3.1 Gen 1	1x USB 3.1 Type-C, 2x USB 3.1 Gen 1	1x USB 3.1 Type-C, 2x USB 3.1 Gen 1
Battery type	Lithium-ion	Lithium-ion	Lithium-ion
Battery capacity (Wh)	48	43	43
Display	11.6" 1366x768	14" 1920x1080	14" 1920x1080
OS (version)	Windows 10 Pro 20H2	Windows 10 Pro 20H2	Windows 10 Pro 20H2
System weight (lbs.)	3.16	3.33	3.33

How we tested

For each scenario, we downloaded and installed the requisite apps to each Windows device under test. For applications that required accounts or authentication, we created test profiles and logged in the users on each device. For each scenario, we connected the devices to a three-way Zoom video meeting and left the meeting running for the duration of the testing. We tested each task for a given scenario sequentially. After one run of a given scenario, we reset the laptop and performed two additional test runs for a total of three.

Scenario #1

Testing with Zoom Cloud Meetings

Launching the application

1. From the Windows desktop, press the Windows key. In the search bar, type `zoom`.
2. Simultaneously start the timer and click Open.
3. When the Zoom Cloud Meetings application opens, stop the timer.

Launching a meeting

1. From the Zoom application menu, simultaneously start the timer and click New Meeting.
2. When the Join Audio menu appears, stop the timer.

Testing with Microsoft OneDrive

Opening a PDF

1. To open the File Explorer, press Windows key + E.
2. Navigate to the OneDrive folder.
3. Locate the test document. To open the context menu, right-click the document.
4. Simultaneously start the timer and click Open.
5. When the document has fully loaded in the Edge browser PDF viewer, stop the timer.

Print-previewing a PDF

1. From the Edge browser PDF viewer, to open the print menu, simultaneously start the timer and press Ctrl + P.
2. When the print preview has fully loaded, stop the timer.

Testing with Microsoft Excel

Opening an Excel spreadsheet from OneDrive

1. From the OneDrive file explorer, locate the test document. To open the context menu, right-click the document.
2. Simultaneously start the timer and click Open.
3. When the document has fully loaded in Microsoft Excel, stop the timer.

Creating a chart

1. Select four columns of data from the test document. From the ribbon menu, click Insert.
2. In the ribbon menu, in the Recommended Charts section, click the drop-down icon for Combo chart.
3. Simultaneously start the timer and click to select the Clustered Column - Line chart.
4. When the chart has fully loaded in the document, stop the timer.

Opening an Excel spreadsheet in Google Sheets

1. From Excel, save the updated test document with the newly created chart.
2. Open the Edge browser, and navigate to <https://drive.google.com>.
3. Upload the Excel document to the test account's Drive folder.
4. From Google Drive, right-click the document, and hover over the option for Open with.
5. Simultaneously start the timer and select Google Sheets.
6. When Google Sheets fully loads the test document, stop the timer.

Testing with Microsoft PowerPoint

Opening a presentation

1. From the OneDrive file explorer, locate the test presentation. To open the context menu, right-click the document.
2. Simultaneously start the timer and click Open.
3. When the PowerPoint presentation has fully loaded in Microsoft PowerPoint, stop the timer.

Pasting an Excel chart into a presentation

1. To refocus Microsoft Excel, press Alt + Tab.
2. Click to select the chart element from the test document.
3. To copy the chart, press Ctrl + C.
4. To refocus Microsoft PowerPoint, press Alt + Tab.
5. Select the first slide from the PowerPoint presentation.
6. Simultaneously start the timer and press Ctrl + V to paste the chart into the presentation.
7. When the chart fully loads, stop the timer.

Scenario #2

Testing with Microsoft PowerPoint

Copying a chart from Excel and pasting it into a presentation

1. From File Explorer, open the OneDrive folder.
2. Open the test documents in Microsoft Excel and PowerPoint.
3. Click to select the chart element from the test document in Microsoft Excel.
4. To copy the Excel chart, press Ctrl + C.
5. To refocus Microsoft PowerPoint, press Alt + Tab.
6. Click to select the first slide from the PowerPoint presentation.
7. Simultaneously start the timer and press Ctrl + V to paste the chart into the presentation.
8. When the chart fully loads, stop the timer.

Print-previewing a presentation

1. With the PowerPoint presentation open, to begin the test and enter the print menu, simultaneously start the timer and press Ctrl + P.
2. When the print preview has fully loaded, stop the timer.

Beginning a presentation

1. If you have not already done so from the previous test, exit the print menu.
2. From the ribbon menu, click Slide Show.
3. Simultaneously start the timer and click From Beginning to begin the PowerPoint presentation.
4. When the first presentation slide has fully loaded, stop the timer.

Testing with Microsoft OneDrive

Opening a link to a shared image

1. From the OneDrive file explorer, right-click the test image, and click Share.
2. From the share menu, click Copy link.
3. Open the Edge browser, and paste the link into the URL bar.
4. To begin the test and navigate to the shared image URL, simultaneously start the timer and press Enter.
5. When the image has fully loaded in the Edge browser, stop the timer.

Testing with Microsoft PowerPoint

Inserting an image into a presentation

1. From the Edge browser, right-click the shared image, and select Copy Image.
2. To refocus Microsoft PowerPoint, press Alt + Tab.
3. Click to select the first slide from the presentation navigation menu.
4. To begin the test and paste the image into the presentation, simultaneously start the timer and press Ctrl + V.
5. When the image has fully loaded, stop the timer.

Scenario #3

Testing with Windows Desktop

Unzipping 100 .DNG photos

1. Using File Explorer, navigate to the test archive.
2. Right-click the test archive, and click Open.
3. Create a new folder to house the uncompressed contents of the archive.
4. To select all photos from the archive, press Ctrl + A.
5. Click and drag the contents of the archive to the folder you just created.
6. Simultaneously start the timer and release the mouse button on the newly created folder.
7. When the extraction completes, stop the timer.

Testing with Adobe Lightroom

Importing 100 .DNG photos

1. From the Adobe Creative Cloud® application, open Adobe Lightroom.
2. From the navigation menu, click Add Photos.
3. Navigate to the test folder, and click Review for Import.
4. Simultaneously start the timer and click Add 100 Photos.
5. When the progress bar completes, stop the timer.

Batch-processing 100 .DNG photos

1. Click to select the first photo in the newly uploaded album.
2. To expand the Edit menu, click the Edit icon.
3. To apply the automatic image adjustment, click Auto.
4. Click the drop-down menu, and select Choose Edit Settings to Copy.
5. From the Copy Settings menu, under the Select category, ensure each box is checked, and click Copy.
6. To navigate back to the photo album, click the library icon. To select all photos in the album, press Ctrl + A.
7. To paste the settings to all images, press Ctrl + V.
8. From the alert menu, to begin the test and the batch processing, simultaneously start the timer and click OK.
9. When the progress bar completes, stop the timer.

Exporting 100 .DNG photos as .JPGs

1. From the Lightroom photo library, to select all photos, press Ctrl + A.
2. Click File, and select Export...
3. Click the File Type drop-down menu, and change the selection to .JPG. Leave the default .JPG export settings.
4. Simultaneously start the timer and click Export 100 Photos.
5. When the progress bar completes, stop the timer.

Testing with Adobe Photoshop

Performing a content-aware photo merge of six images

1. From the Creative Cloud application, launch Adobe Photoshop.
2. Select File→Automate→Photomerge...
3. From the Photomerge menu, click Browse...
4. Select the six test images, and click OK.
5. Leave the default Layout, and check to enable the following options under Source Files:
 - Vignette Removal
 - Geometric Distortion Correction
 - Content Aware Fill Transparent Areas
6. Simultaneously start the timer and click OK.
7. When the photo-merged panorama has fully loaded, stop the timer.

WebXPRT 3

Running WebXPRT 3

1. Power on the device, and log in.
1. Allow the device to idle for 10 minutes to clear any background startup activity. 3. Open the default web browser, and navigate to <https://www.principledtechnologies.com/benchmarkxpvt/webxpvt/>.
2. Click Run WebXPRT 3.
3. Click Continue.
4. Click Start.
5. When the test completes, record the score.

Speedometer 2.0 - BrowserBench

Running Speedometer 2.0

1. Power on the device, and log in.
2. Allow the device to idle for 10 minutes to clear any background startup activity. 3. Open the default web browser, and navigate to <https://browserbench.org/Speedometer2.0/>.
3. Click Start Test.
4. When the test completes, record the score.

Intel contributes to the development of benchmarks by participating in, sponsoring, and/or contributing technical support to various benchmarking groups, including the BenchmarkXPRT Development Community administered by Principled Technologies.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors.

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