Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

We compared battery life and system responsiveness on two entry-level 15-inch Microsoft Windows-based business laptops: the Dell Latitude™ 3510 powered by a dual-core Intel® Core™ i3-10110U processor and the HP ProBook 455 G7 Notebook PC powered by a quad-core AMD Ryzen™ 3 4300U processor.

For battery life and performance metrics, we ran the MobileMark® 2018 and SYSmark® 2018 benchmarks, which use actual applications in real-world workloads that reflect business worker usage patterns.

Enjoy over 8 hours unplugged

based on MobileMark 2018 battery life results

Get more done with 18% faster system responsiveness

based on MobileMark 2018 overall performance scores

Dell Latitude 3510 Business Laptop

This 15-inch business laptop comes with Dell Optimizer, a dual-core 10th Gen Intel Core i3 processor, and an anti-glare non-touch display.[1]

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020

What we tested

We left each entry-level business laptop in the default "better performance" power mode and equipped both with 4 GB of memory, 256 GB of PCIe® SSD storage, and the largest capacity batteries available for each model:

- **Dell Latitude 3510 Business Laptop** powered by a dual-core 10th Gen Intel Core i3-10110U processor with integrated Intel UHD Graphics for 10th Generation Intel Core i3-10110U and a 3-cell 53-Whr ExpressCharge™ capable battery

- **HP ProBook 455 G7 Notebook PC** powered by a quad-core AMD Ryzen 3 4300U processor with integrated AMD Radeon™ UMA Graphics and a 3-cell 45-Whr battery with rapid-charge technology

The MobileMark 2018 performance-qualified battery life and SYSmark 2018 application-based benchmarks put the devices under test through real-world workloads running the same applications business users use every day.[2,3]

The overall battery life and performance qualification scores we report reflect the specific Dell Latitude 3510 Business Laptop and HP ProBook 455 G7 Notebook PC 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 appendices.

Better system responsiveness

Both laptops delivered a full workday's worth of battery life. However, the HP ProBook 455 G7 Notebook PC, powered by a quad-core AMD Ryzen 3 4300U processor and a 45-Whr battery, was more battery efficient, which we discuss in detail in the appendices. And the Dell Latitude 3510 Business Laptop, powered by a dual-core Intel Core i3-10110U processor and a 3 cell 53-Whr battery, delivered 18 percent faster system responsiveness.

Figure 1: MobileMark 2018 overall battery life results. Time (hh:mm). More time is better.

Stay unplugged 13 minutes longer
Based on MobileMark 2018 overall battery life

Time (hh:mm)

Dell Latitude 3510	8:20
HP ProBook 455 G7	8:07

■ Dell Latitude 3510 Business Laptop powered by an Intel Core i3-10110U processor *(53-Whr battery)*

■ HP ProBook 455 G7 Notebook PC powered by an AMD Ryzen 3 4300U processor *(45-Whr battery)*

Source: Principled Technologies.
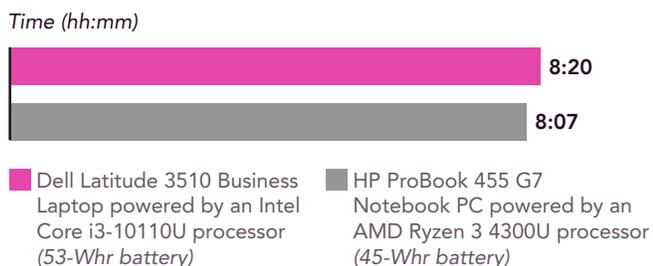
Figure 2: MobileMark 2018 overall performance qualification score. Higher is better. Source: Principled Technologies

18% faster system responsiveness
Based on MobileMark 2018 overall performance qualification

Score

Dell Latitude 3510	753
HP ProBook 455 G7	637

■ Dell Latitude 3510 Business Laptop powered by an Intel Core i3-10110U processor *(53-Whr battery)*

■ HP ProBook 455 G7 Notebook PC powered by an AMD Ryzen 3 4300U processor *(45-Whr battery)*
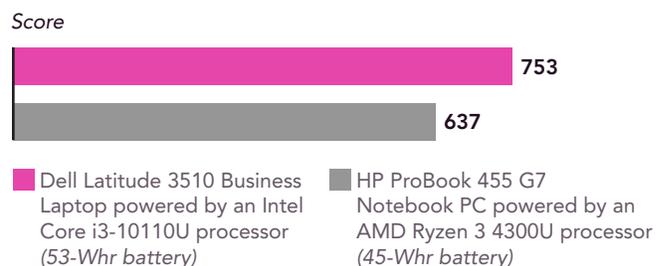
Is performance more important to you than battery life?

When we moved the power mode slider on both laptops from default to best performance and ran MobileMark 2018 again, performance on the Dell Latitude 3510 Business Laptop jumped 10 percent and battery life dropped by over one hour. There was no noticeable change in battery life or performance on the HP ProBook 455 G7 Notebook PC. To see these results, go to the appendices.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 2

Measuring performance while working unplugged

Whether you or your crew is working from home or on the front lines with the public, capable entry-level business laptops that don't need to be tethered to an outlet for optimal performance provide the freedom to get things done in a timely manner from wherever it's most convenient.

For another perspective on unplugged performance, we prepared the systems identically using the SYSmark configuration tool (see page 10 in the appendices for more information). Then, we performed the SYSmark 2018 benchmark testing twice—once to measure system performance when they were plugged in and the second time to measure system performance when they were unplugged. For the plugged-in results, we allowed SYSmark to run the devices through its workloads three times and took the median score of those three runs. For the unplugged results, we ran the benchmark on each fully charged system one run at a time and reported the median score.

In the plugged-in test, the HP ProBook 455 G7 Notebook PC, powered by a quad-core AMD Ryzen 3 4300U processor and a 45-Whr battery, performed 6 percent better than the Dell Latitude 3510 powered by an Intel Core i3-10110U dual-core processor and a 53-Whr battery.

In the unplugged test, however, the performance numbers for the HP ProBook 455 G7 Notebook PC powered by a quad-core AMD Ryzen 3 4300U processor and a 45-Whr battery, dropped 23 percent compared to the 5 percent drop on the Dell Latitude 3510 powered by a dual-core Intel Core i3-10110U processor and a 53-Whr battery. This drop resulted in a 16 percent win for the Dell Latitude 3510, powered by a dual-core Intel Core i3-10110U processor and a 53-Whr battery, when running on battery.

16% faster system responsiveness

Based on SYSmark 2018 overall rating while on battery

Score

899	Dell Latitude 3510 Business Laptop powered by an Intel Core i3-10110U processor (53-Whr battery)
770	HP ProBook 455 G7 Notebook PC powered by an AMD Ryzen 3 4300U processor (45-Whr battery)
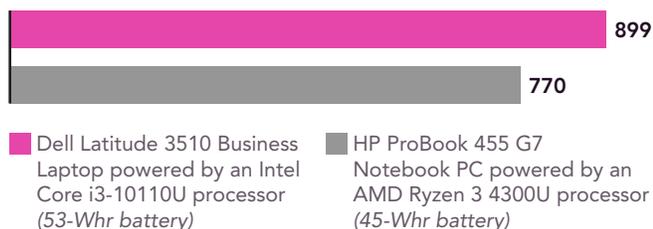
Figure 4: SYSmark 2018 overall performance rating while running on battery. Higher is better. Source: Principled Technologies.

For a deeper dive into the individual results as well as our testing parameters and procedures, see the appendices.

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1   Dell, "New Latitude 3510 Business Laptop," accessed August 19, 2020, https://www.dell.com/en-us/work/shop/dell-laptops-and-notebooks/new-latitude-3510-business-laptop/spd/latitude-15-3510-laptop.

2   BAPCo, "An Overview of MobileMark 2018," accessed August 24, 2020, https://bapco.com/wp-content/uploads/2019/10/MobileMark_2018_White_Paper_v1.1.pdf.

3   BAPCo, "An Overview of SYSmark 2018," accessed August 24, 2020, https://bapco.com/wp-content/uploads/2019/06/BAPCo_SYSmark_2018_White_Paper_1.1.pdf.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 3

Appendices

We concluded our hands-on testing on August 30, 2020. 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 August 5, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

Table 1: Results of our benchmark testing. These scores are the median of three runs.

	Dell Latitude 3510 Business Laptop powered by a dual-core Intel Core i3-10110U processor	HP ProBook 455 G7 Notebook PC powered by a quad-core AMD Ryzen 4300U processor
MobileMark 2018 (Better performance [default] setting)		
Overall battery life (hh:mm)	8:20	8:07
Overall performance qualification	753	637
Battery efficiency (min/Whr ratio)	9.4	10.8
MobileMark 2018 (Best performance setting)		
Overall battery life (hh:mm)	7:18	8:06
Overall performance qualification	815	637
SYSMark 2018		
Overall rating while plugged in	950	1,009
Overall rating while on battery	899	770

The 10 percent larger Whr capacity of the battery in the Dell Latitude 3510 might suggest that the business laptop should last unplugged approximately 10 percent longer than the HP ProBook 455 G7, if all other factors (e.g., system configuration, screen brightness, network traffic, software) were equal; however, in our tests the Dell Latitude 3510 lasted unplugged for only 13 minutes (or three percent) longer.

System configuration information

Table 2: Detailed information on the systems we tested.

System configuration information	Dell Latitude 3510 Business Laptop powered by a dual-core Intel Core i3-10110U processor	HP ProBook 455 G7 Notebook PC powered by a quad-core AMD Ryzen 3 4300U processor
Processor		
Vendor	Intel	AMD
Name	Core i3	Ryzen 3
Model number	10110U	4300U
Base - max frequency (GHz)	2.1- 4.1	2.7-3.7
Number of cores	2	4
Memory		
Amount (GB)	4	4
Type	DDR4	DDR4
Speed (MHz)	2,667	3,200

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 4

System configuration information	Dell Latitude 3510 Business Laptop powered by a dual-core Intel Core i3-10110U processor	HP ProBook 455 G7 Notebook PC powered by a quad-core AMD Ryzen 3 4300U processor
Graphics		
Vendor	Intel	AMD
Model number	UHD Graphics for 10th Generation Intel Core i3-10110U	Radeon Graphics
Storage		
Vendor	SK Hynix	Samsung
Model number	BC511	MZVLQ256HAJD-000H1
Amount (GB)	256	256
Type	M.2 PCIe NVMe	M.2 PCIe NVMe
Connectivity/expansion		
Wired internet	Realtek PCIe Gbe	Realtek PCIe Gbe
Wireless internet	Qualcomm QCA61x4A	Realtek RTL8822CE
Bluetooth	5.1	5.0
USB	1x USB 2.0 1x USB 3.2 with PowerShare 1x USB 3.2 1x USB 3.2 Gen 1 Type-C	2x USB 3.1 1x USB Type-C
Video	HDMI 1.4	HDMI 1.4
Battery		
Type	Lithium-Ion	Lithium-Ion
Rated capacity (Whr)	53	45
Display		
Size (in.)	15.6	15.6
Type	HD Anti-Glare	FHD LED SVA Anti-Glare
Resolution	1,366 x 768	1,366 x 768
Touchscreen	No	No
Operating system		
Vendor	Microsoft	Microsoft
Name	Windows 10 Pro	Windows 10 Pro
Build number or version	10.0.18363	10.0.18363
BIOS		
BIOS name and version	Dell Inc. 1.2.2	HP S79 Ver. 01.02.01
Dimensions		
Height (in)	0.71-0.78	0.75
Width (in)	14.23	14.37
Depth (in)	9.76	10.11
Weight (lbs.)	4.2	4.41

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 5

How we tested

Setting up the system

Capturing driver information from the OEM factory image

1. Connect an external HDD to the system.
2. On the external drive, create a directory named Drivers.
3. Hold the Shift key, and restart the system.
4. Choose Troubleshoot→Advanced options→Command prompt.
5. Type `DISM /image:C: /export-driver /destination:D:\drivers` (Note: In this scenario, the external drive is labeled D; however, this name may be different depending on the configuration of the system.)

Installing Windows 10 Pro

1. Connect an external HDD to the system.
2. In the BIOS, disable SecureBoot.
3. Install a clean version of Windows 10 Pro onto the test system.
4. To complete installation, follow the on-screen instructions, using the default selections when appropriate.
5. To install any missing drivers, open Device Manager, and use the OEM factory drivers captured onto the external HDD.
6. To install the latest chipset and graphics drivers available, go to either https://www.intel.com/content/www/us/en/support.html or https://www.amd.com/en/support.
7. Run Windows Update, and install all updates available.
8. Launch the Windows Store app, and install all Store app updates.
9. Verify the date and time are correct, and synchronize the system clock with the time server.
10. Disable Automatic Windows Update.
11. Right-click Start.
12. Select Computer Management.
13. Select Services and Applications.
14. Select Services.
15. Scroll down, and double-click Windows Update.
16. Click Stop.
17. From the Startup type drop-down menu, select Disabled.

Capturing an image

1. Connect an external HDD to the system.
2. Right-click the desktop, and select Personalize→Home→Update & security→Backup→More options→See advanced settings→System Image Backup→Create a system image.
3. Verify that the external HDD is selected as the save drive, and click Next.
4. Verify that all drives are selected to back up, and click Next.
5. Click Start backup.
6. At Do you want to create a system repair disc, select No, and close the dialogs.

Restoring an image

1. Connect an external HDD to the system.
2. Press and hold the Shift key while restarting the system.
3. Select Troubleshoot.
4. Select Advanced options.
5. Select System image recovery.
6. Select the User account.
7. Enter the system password, and click Continue.
8. Verify that the external HDD is selected, and click Next.
9. Once the recovery has completed, click Finish.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 6

Measuring performance-qualified battery life

MobileMark 2018

Avoiding antivirus software conflicts

MobileMark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the notebook PCs before we installed the benchmark.

Avoiding pre-installed software conflicts

MobileMark 2018 installs the following applications, which its test scripts employ:

Productivity
- Adobe® Acrobat® Pro DC
- AutoIT 3.3.14.2
- Google® Chrome™
- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016
- Windows Zip

Creativity
- Adobe Photoshop® CC
- Adobe Lightroom® Classic CC
- CyberLink PowerDirector® 2015

Web Browsing
- Google Chrome
- Microsoft Movies & TV

If any of these applications already exist on the system under test, they could cause problems with the benchmark due to software conflicts. To avoid any such issues, we uninstalled all conflicting pre-installed software applications—including different versions of any of the programs MobileMark 2018 uses—before we installed the benchmark.

Adjusting display brightness and power settings

The brightness of a notebook's display affects its battery life. Therefore, BAPCo requires that, before you test with MobileMark 2018, you ensure the brightness of the notebook's monitor is greater than or equal to 200 nits in the center of a completely white screen while the notebook is unplugged and running on battery power. The measurement follows the standards from the Video Electronics Standards Association (www.vesa.org).

We complied with this standard for all our tests by setting each notebook PC's brightness as close to 200 nits as we could without going below that level. We used the following procedure before we started each test. Note: This procedure assumes we began with the notebook plugged into the power supply.

1. To create a completely blank, white screen, open Microsoft Paint by clicking Start→All Programs→Accessories→Paint.
2. Press Ctrl+W to open the Resize and Skew dialog.
3. Under Horizontal and Vertical, enter 200, and click OK.
4. Click the View tab.
5. To view a white screen, click Full screen.
6. To allow the screen to warm, wait 45 minutes.
7. Unplug the notebook from the power supply, and measure the display's brightness using a luminance meter in the center of the screen. (We used a Gossen Mavolux5032C luxmeter.)
8. If the reading is below or significantly greater than 200 nits, adjust the screen brightness to as close to 200 nits as you can without going under, and retest:
   a. Click Start.
   b. In the Windows Start search box, type `display settings`
   c. Adjust the slider to change the Display brightness to the correct percentage that produces no less than 200 nits.
9. Allow the notebook to run on battery power for 10 minutes, re-measure the display, and adjust the brightness up or down as necessary.
10. Verify that the notebook saved the brightness setting by plugging in the system, unplugging it, and taking another reading.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 7

Using the MobileMark built-in configuration tool

This tool supports three levels of configuration:

1. Only makes changes that are REQUIRED for the benchmark to run.
2. Additionally, makes changes that are RECOMMENDED for repeatable results.
3. Additionally, makes OPTIONAL changes that help ensure best results.

The Configuration tool makes the following configuration changes at each of the three levels:

Level 1 - Required

- Disables User Account Control (UAC)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update
- Enables Windows Search

Level 2 - Recommended

- Create BAPCo power scheme
- Set Power Plan Type to Balanced
- Set CPU Adaptive Mode
- Disables Battery Saver Dimming
- Verifies Battery Saver Threshold
- Disables Disk Defrag
- Disables Windows Error Reporting
- Disables Windows Lock Screen
- Disables Windows Pop-ups
- Disables Screen Saver and Monitor Timeout
- Disables Windows Sidebar/Gadgets
- Disables Desktop Slideshow
- Disables Windows Defender
- Disables Windows Firewall
- Set Font Smoothing

Level 3 - Optional

- Disables Hard Disk Timeout
- Disables System Restore
- Ignores Laptop Lid Close

We chose the official BAPCo 'Run Benchmark' default as outlined in the BAPCo MobileMark2018 User Guide http://bapco.com/wp-content/uploads/2019/03/BAPCo_MobileMark2018_user_guide_v1.3.pdf which runs the benchmark using the Required and Recommended options.

Setting up the performance-qualified battery life test

1. Verify that the wireless adapter is enabled and connected to a wireless router that is not connected to the Internet.
2. Verify that the screen brightness is set to no less than 200 nits.
3. Install MobileMark 2018 with the default options.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged
vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 8

Running the performance-qualified battery life test

1. Power mode:
   - For OOB (default) testing, click the battery icon in the taskbar, and verify power mode is set to Better performance.
   - For Best performance testing, click the battery icon in the taskbar, and slide the power mode slider all the way to the right.
2. Launch MobileMark 2018.
3. Click the Settings Gear icon.
4. Verify that Conditioning Run is enabled.
5. Enable Process Idle Tasks.
6. Enter a name for the benchmark run.
7. To return to the main menu, click Back.
8. Click Run Benchmark.
9. When prompted, unplug the AC power adapter. The test will begin immediately.
10. The benchmark is complete when the notebook PC has fully depleted its battery and is no longer operational when running on battery power.
11. Repeat steps 1 through 10 twice more, and record the median battery life and performance qualification results.
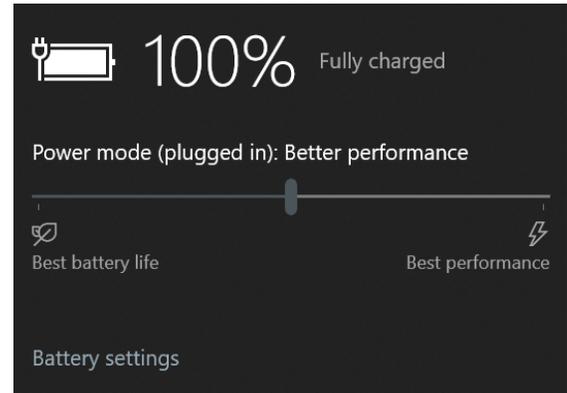
Figure 3: What we saw when we clicked the Battery icon on the Windows 10 taskbar.
Source: Principled Technologies.

Measuring performance

SYSmark 2018

Avoiding antivirus software conflicts

SYSmark 2018 is not compatible with any virus-scanning software, so we uninstalled any such software present on the notebook PCs before we installed the benchmark.

Avoiding pre-installed software conflicts

SYSmark 2018 installs the following applications, which its test scripts employ:

Productivity
- Adobe Acrobat Pro DC
- AutoIT 3.3.14.2
- BowPad64-2.3.3 installer
- Google Chrome
- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016
- Windows Zip

Creativity
- Adobe Photoshop CC 2017
- Adobe Lightroom Classic CC
- CyberLink PowerDirector 2015

Responsiveness
- Adobe Acrobat Pro DC
- Adobe Lightroom Classic CC
- Adobe Photoshop CC 2017
- CyberLink PowerDirector 2015
- Google Chrome

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged
vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 9

- Microsoft Excel 2016
- Microsoft OneNote 2016
- Microsoft Outlook 2016
- Microsoft PowerPoint 2016
- Microsoft Word 2016

If any of these applications already exist on the system under test, they could cause problems with the benchmark due to software conflicts. To avoid any such issues, we uninstalled all conflicting pre-installed software applications—including different versions of any of the programs SYSmark 2018 uses—before we installed the benchmark.

Using the SYSmark built-in configuration tool

This tool supports three levels of configuration:

1.   Only makes changes that are REQUIRED for the benchmark to run.
2.   Additionally, makes changes that are RECOMMENDED for repeatable results.
3.   Additionally, makes OPTIONAL changes that help ensure best results.

The Configuration tool makes the following configuration changes at each of the three levels:

Level 1 - Required

- Disables User Account Control (UAC)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update

Level 2 - Recommended

- Disables User Account Control (UAC)
- Set DPI Scaling to 100%
- Disables Low Battery Actions
- Disables Network Proxies
- Disables System Sleep and Hibernate
- Disables Windows Update
- Create BAPCo power scheme
- Set Power Plan Type to High Performance
- Set CPU High Performance
- Disables Disk Defrag
- Disables Windows Error Reporting
- Disables Windows Lock Screen
- Disables Windows Pop-ups
- Disables Screen Saver and Monitor Timeout
- Disables Windows Sidebar/Gadgets
- Disables Desktop Slideshow
- Disables Windows Defender
- Disables Windows Firewall
- Set Font Smoothing

Level 3 - Optional

- Disables Hard Disk Timeout
- Disables System Restore
- Ignores Laptop Lid Close

We chose the official BAPCo 'Run Benchmark' default as outlined in the BAPCo SYSmark2018 User Guide http://bapco.com/wp-content/uploads/2018/10/BAPCo_SYSmark2018_user_guide.pdf which runs the benchmark using the Required and Recommended options.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged
vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 10

Setting up the test

1. Install SYSmark 2018 with the default options.

Running the test while the device is plugged in

1. Launch SYSmark 2018.
2. Click on the Settings Gear icon.
3. For iterations, enter 3.
4. Verify that Conditioning Run is enabled.
5. Enable Process Idle Tasks.
6. Enter a name for the benchmark run.
7. To return to the main menu, click Back.
8. Click Run Benchmark.
9. When the benchmark finishes, record the SYSmark 2018 benchmark results.

Running the test while the device is unplugged

1. Plug-in the laptop charger, and fully charge the system.
2. Launch SYSmark 2018.
3. Click on the Settings Gear icon.
4. For iterations, enter 1.
5. Verify that Conditioning Run is disabled.
6. Enable Process Idle Tasks.
7. Enter a name for the benchmark run.
8. To return to the main menu, click Back.
9. Unplug the system charger.
10. Click Run Benchmark.
11. When the benchmark finishes, record the SYSmark 2018 benchmark results.
12. Repeat steps 1-11 two more times, and record the median results.

This project was commissioned by Dell Technologies.

Dell Latitude 3510 Business Laptop with a dual-core Intel Core i3-10110U processor did more unplugged vs. HP ProBook 455 G7 Notebook PC with a quad-core AMD Ryzen 3 4300U processor

September 2020 | 11