

Prepare print preview in 48% less time
in Google Sheets™



Open large Excel spreadsheet in 37% less time
in Google Drive



Open a 50MB PDF in 39% less time
in Adobe® Acrobat® Reader

Stay engaged in your academic work with a Chromebook powered by the Intel Core m3 processor

Tasks in everyday apps took less time to complete than with a Chromebook powered by the Intel Celeron N3150 processor

It's always been a challenge to keep students' attentions in the lecture hall—and with the amount of devices competing for a pupil's eyes and ears, it's getting even harder. When the technologies students use are fast and responsive, there are fewer opportunities for their minds to wander. And if you're using a Chromebook as an educator, you need a device that can keep up with the speed and volume of your students' work.

At Principled Technologies, we compared how long it took to complete common tasks in popular Android™ apps using two Chromebooks: the Samsung Chromebook Pro powered by the Intel Core m3 processor, and the Acer Chromebook R 11 powered by the Intel Celeron® N3150 processor. The Chromebook powered by the Intel Core m3 processor was faster, which could translate to less waiting for students and educators alike.

Improve the student/teacher experience

Educators and students both work in various documents and files all day long. Any speed bump in the process of making, editing, or sharing documents will compound as they repeat common tasks countless times in a week. To see how device speed could affect students and teachers, we tested app performance in several categories: opening previously created files, previewing documents, and exporting or saving documents.



Edit your work faster

Having to wait for a file to load before editing a document can disrupt a student's flow, or cause a delay when an educator is putting together class materials.

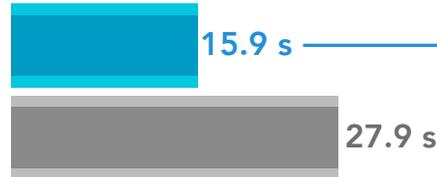
But with a Chromebook powered by an Intel Core m3 processor, you could experience fewer delays and get to your work sooner. For example, opening a large spreadsheet in Google Sheets took us 10 fewer seconds with the Intel Core m3 processor-powered device compared to the Chromebook powered by the Intel Celeron N3150.

You spend the majority of your time in the *middle* of your work—and whether that means analyzing lab data or literary works, using a Chromebook powered by an Intel Core m3 processor could ensure you can resume these critical tasks faster.



Open large spreadsheet in Google Sheets

Time (sec) – lower is better



43%
less time

Open file in Google Docs™

Time (sec) – lower is better



31%
less time

Open Excel spreadsheet in Google Drive™

Time (sec) – lower is better



37%
less time

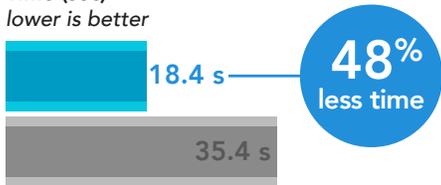
 Intel Core m3 processor (Samsung Chromebook Pro)  Intel Celeron N3150 processor (Acer Chromebook R 11)

Review documents in less time

When you just need to review a document without getting into the editing process, it can be maddening to get stuck waiting as your device prepares the file. But with an Intel Core m3 processor-powered Chromebook, you could start your review faster than with a Chromebook powered by an Intel Celeron N3150 processor. For example, we previewed an Excel spreadsheet in Google Drive 17 seconds faster with the Intel Core m3 processor-powered device.

Preview Excel document in Google Drive

Time (sec)
lower is better



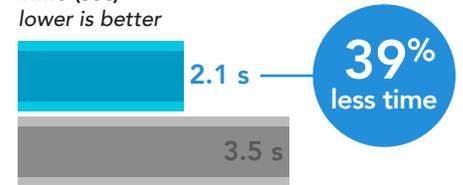
Open PDF in Google Docs

Time (sec)
lower is better



Open large 50MB PDF in Adobe Acrobat Reader

Time (sec)
lower is better

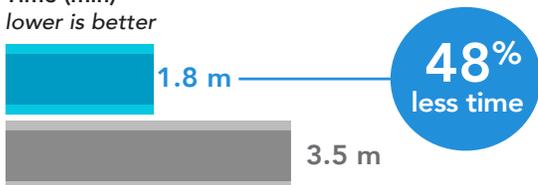


 Intel Core m3 processor (Samsung Chromebook Pro)  Intel Celeron N3150 processor (Acer Chromebook R 11)

Whether you're an educator with dozens of student documents to comb through, or a student with a ton of lecture notes to catch up on, a Chromebook powered by the Intel Core m3 processor could save you time during your work.

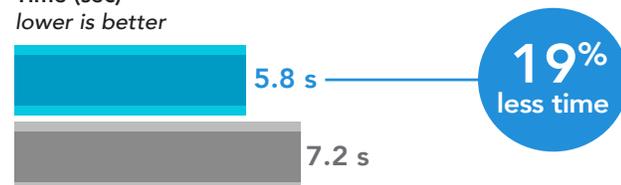
Preview large document in Google Sheets

Time (min)
lower is better



Preview ebook PDF in Google Drive

Time (sec)
lower is better



 Intel Core m3 processor (Samsung Chromebook Pro)  Intel Celeron N3150 processor (Acer Chromebook R 11)

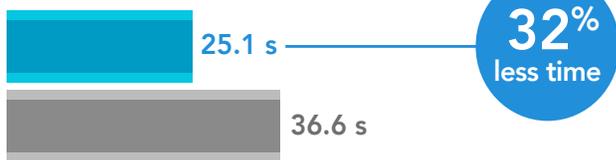
Create print previews faster

Before students print their files, it's important to have an overview of exactly how the document will look on the page. Given how busy computer labs can be throughout the year, being able to quickly scan a print preview can help students get their documents fast before rushing off to class.

With the Intel Core m3 processor-powered Chromebook, we prepared a print preview of a large Google Sheets spreadsheet over a minute and 50 seconds sooner—a difference this large could mean the difference between printing a document in time for class and getting caught behind a whole queue of other students with the same idea.

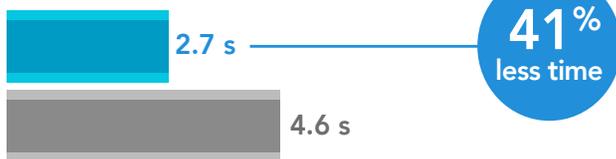
Save large Excel document in Google Sheets

Time (sec) – lower is better



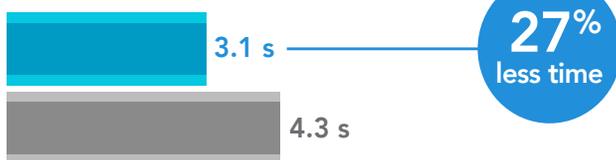
Open document to print in Microsoft OneDrive

Time (sec) – lower is better



Save and edit picture in Google Photos™

Time (sec) – lower is better



 Intel Core m3 processor (Samsung Chromebook Pro)  Intel Celeron N3150 processor (Acer Chromebook R 11)

Export documents faster

Saving or exporting a document is the last step in many workflows before a student is able to switch to another task or finish up for the day. And for educators, the sooner they can save their documents, the sooner students can get their hands on class materials.

Using Google Sheets with the Intel Core m3 processor-powered Chromebook, we saved a large Microsoft Excel spreadsheet more than ten seconds faster than we could with the Chromebook powered by an Intel Celeron N3150 processor.





Conclusion

Educators and their students work diligently in their documents every day—so their Chromebooks should facilitate the work they do instead of getting in the way. Our tests demonstrated that a Chromebook powered by the Intel Core m3 processor was faster at these tasks than a Chromebook powered by the Intel Celeron N3150 processor, which could allow students to devote more time to projects, stay on task, and stay engaged longer. Educators could reap these time-saving benefits too, as they review student work and make class content for effective education.

On June 12, 2017, we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears. For older systems, we chose configurations representative of typical purchases of those systems. We concluded hands-on testing on June 13, 2017.

Appendix A: System configuration information

System	Samsung Chromebook Pro	Acer Chromebook R 11
Processor	Intel Core m3-6Y30	Intel Celeron N3150
Processor freq (GHz)	0.9-2.2	1.6-2.08
Processor cores	2	4
Memory (GB)	4	4
Storage (GB)	32	32
Battery type	Li-Ion	Li-Ion
Battery capacity (Wh)	51	36
Display	12.3" 2,400 x 1,600	11.6" 1,366 x 768
Wireless	802.11 AC	802.11 AC
Bluetooth	4.0	4.0
USB ports	2x USB-C	1x USB 3.0, 1x USB 2
System weight (lbs.)	2.38	2.71
OS (version)	60.0.3112.20 dev (64-bit)	61.0.3129.0 dev (64-bit)
Build/firmware	Caroline.7820.286.0	Cyan.7287.57.100

Appendix B: How we tested

Creating the background workload

To simulate typical Chromebook use, we ran a combination of news, email, chat, document viewing, music, and social media websites in the background. For websites that required accounts, we created test profiles and logged in the users on each device.

1. From the shelf, open Chromebook settings.
2. Navigate to the On Startup section of the settings, and select Open a specific page or set of pages.
3. Select Open a specific page or set of pages, insert the following URLs, and click OK.
 - forbes.com
 - markets.ft.com/data
 - arstechnica.com
 - mail.google.com
 - slack.com
 - drive.google.com
 - docs.google.com
 - youtube.com/feed/music
 - sheets.google.com
 - twitter.com
 - facebook.com
4. Restart the Chromebook. Before testing, navigate through each tab to ensure that both devices have fully loaded all the same content.

Testing each application

Google Sheets

Saving a large Google Sheet as Excel document

1. Install Google Sheets from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click Skip to skip the tutorial.
3. Close the app and reopen it by clicking on the Sheets icon on the shelf.
4. From the recent files screen, click the test Sheet to open it.
5. Click the menu icon from the top navigation bar.
6. Click Share & export, and click Save As...
7. With Excel (.xlsx) selected, start the timer and click OK.
8. When the saving dialog closes, stop the timer.

Preparing a print preview (large document)

1. From the shelf, click the Google Sheets icon to launch the app.
2. From the recent files screen, click the test Sheet to open it.
3. Click the menu icon from the top navigation bar.
4. Click Share & export, start the timer, and click Print.
5. When the print preview fully loads, stop the timer.

Opening a large-sized spreadsheet (Excel)

1. From the shelf, click the Google Sheets icon to launch the app.
2. From the recent files screen, start the timer and click the test Excel sheet to open it.
3. When the Excel sheet fully loads, stop the timer.

Google Photos

Saving an edited image as a copy

1. Install Google Photos from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click Albums.
3. Click to open the Download folder.
4. Click to open the test image.
5. Click the pencil icon to open the editing menu.
6. Click Auto to apply automatic image correction.
7. Click the dropdown menu icon.
8. Start the timer, and click Save copy.
9. When the image finishes saving, stop the timer.

Adobe Acrobat Reader

Opening a downloaded PDF

1. Install Adobe Acrobat Reader from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click the Local tab.
3. Click Allow to enable access to local device storage.
4. Start the timer, and click the test PDF file.
5. When the PDF fully loads, stop the timer.

Google Drive

Opening a Google Docs document

1. Install Google Drive from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. From the files list, start the timer and click the test Google Doc.
4. When the document fully loads, stop the timer.

Opening an Excel Sheet in Google Sheets

1. Launch the app from the shelf.
2. From the files list, click the dropdown menu icon next to the test Excel sheet.
3. Start the timer, and click Open With.
4. When the sheet fully loads, stop the timer.

Opening an Excel Sheet preview

1. Launch the app from the shelf.
2. From the files list, start the timer, and click the test Excel sheet thumbnail.
3. When the sheet fully loads, stop the timer.

Opening a Word Doc in Google Docs

1. Launch the app from the shelf.
2. From the files list, click the dropdown menu icon next to the test Word document.
3. Start the timer, and click Open With.
4. When the document fully loads, stop the timer.

Loading a print preview for eBook PDF

1. Launch the app from the shelf.
2. From the files list, click the thumbnail for the test PDF.
3. When the PDF loads, click the dropdown menu icon.
4. Start the timer, and click Print.
5. When the print preview fully loads, stop the timer.

Microsoft OneDrive

Printing a PDF

1. Install Microsoft OneDrive from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. From the Files list, click the test PDF document.
4. When the PDF loads, click the dropdown menu icon.
5. Click Print.
6. From the Print dialog screen, start the timer, and click Print.
7. When the print preview fully loads, stop the timer.

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