HP Chromebook x360
with an
**Intel® Celeron®
processor**

**Encode an HD
video and save
over 5 minutes**
in the PowerDirector
Android™ app

**Merge audio
tracks and save
10 seconds**
in the SoundTrap
web app

**Print a diagram
and save
over a second**
in the Lucidchart
Chrome app

Enable students to do more in less time with an Intel processor-powered Chromebook

A Chromebook powered by an Intel Celeron N3450 processor completed several media-focused activities faster than a Chromebook powered by a MediaTek processor

Every day, students use apps to navigate the digital spaces that classrooms have become. If devices running media-based apps take too long to complete an action, students can lose their way, become distracted, and feel frustrated. Putting Chromebooks powered by Intel Celeron N3450 processors in the hands of your students could help them stay engaged and focused.

At Principled Technologies, we pitted a new Intel Celeron N3450 processor-powered HP Chromebook against a MediaTek M8173C processor-powered Lenovo Chromebook. The Chromebook powered by Intel took less time to complete several media-focused classroom activities. When students wait less on apps, they face fewer opportunities for distraction and have more time to finish assignments.

The following pages describe a fictional scenario in which middle school students use the Intel Celeron N3450 processor-powered HP Chromebook x360 11 G1 EE and the MediaTek M8173C processor-powered Lenovo N23 Yoga Chromebook. Though the story may be hypothetical, it's based on facts we found here at PT. For more detailed testing information, see the appendices beginning on page 7.

Two cousins sharing stories

During holiday downtime, cousins Aaliyah and Jasmin talk about school. Aaliyah thinks it's easy to finish the work for her eighth-grade classes with her Intel Celeron N3450 processor-powered HP Chromebook. Sixth-grader Jasmin sometimes gets frustrated because she feels like she's waiting on her MediaTek processor-powered Chromebook when she's doing assignments.
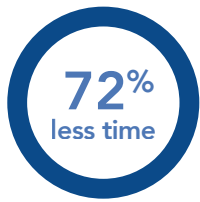
Aaliyah

Jasmin

Chromebook with Intel
Celeron processor
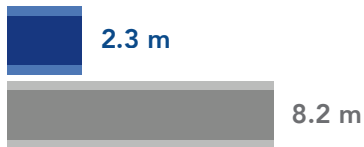
Android™ apps for Chromebooks
Google is rolling out support for Android apps on many Chromebook devices. Being able to install apps from the Google Play™ store opens your Chromebook to new possibilities and functionality you can't get with older or unsupported models.

To learn more about Android apps and the Chromebooks that support them, visit https://sites.google.com/a/chromium.org/dev/chromium-os/chrome-os-systems-supporting-android-apps.

72% less time

Produce/encode HD video
in PowerDirector (Android app)

Time (min)
lower is better

2.3 m

8.2 m

21% less time

Merge tracks
in SoundTrap (web app)

Time (sec)
lower is better

37.1 s

47.1 s

Language arts class: Render videos in less time

For her English class, Aaliyah took part in a group assignment to create a video based on a Langston Hughes poem.

After filming with her group, Aaliyah transferred the footage to her Chromebook. She rendered high-definition (HD) and standard-definition (SD) versions of the video. Rendering the HD version saved Aaliyah nearly six minutes compared to her cousin's MediaTek processor-based Chromebook. The Intel Celeron processor-based Chromebook also saved over a minute when rendering the SD version of the video compared to what Jasmin would experience.

Aaliyah had to put together music for the video, too. She merged a separately recorded vocal track with a downloaded song so she could apply an audio filter. Compared to using Jasmin's Chromebook, Aaliyah saved 10 seconds with her Intel Celeron processor-powered Chromebook.

58% less time
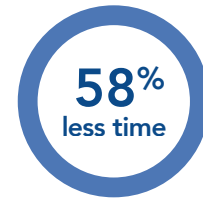
Produce/encode SD video
in PowerDirector (Android app)
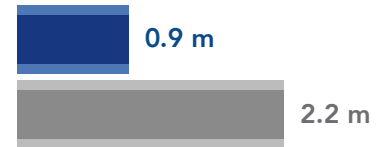
Time (min)
lower is better

0.9 m

2.2 m

Chromebook with Intel Celeron N3450 processor
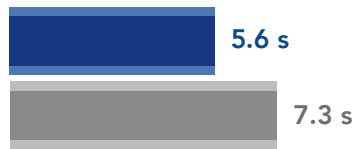
Chromebook with Mediatek M8173C processor

Science class: Print diagrams faster

Sixth grade brought Jasmin's first introduction to chemistry, and she couldn't quite understand how sodium and chlorine atoms fit together to make sodium chloride. She decided it might help to construct the compound out of a molecular modeling kit, so during study hall, she printed a diagram of the compound for reference from Lucidchart. If Jasmin had Aaliyah's Intel Celeron processor-powered Chromebook, she would have saved over a second and half on this task.

23% less time

Print a diagram
in Lucidchart (Chrome app)

Time (sec)
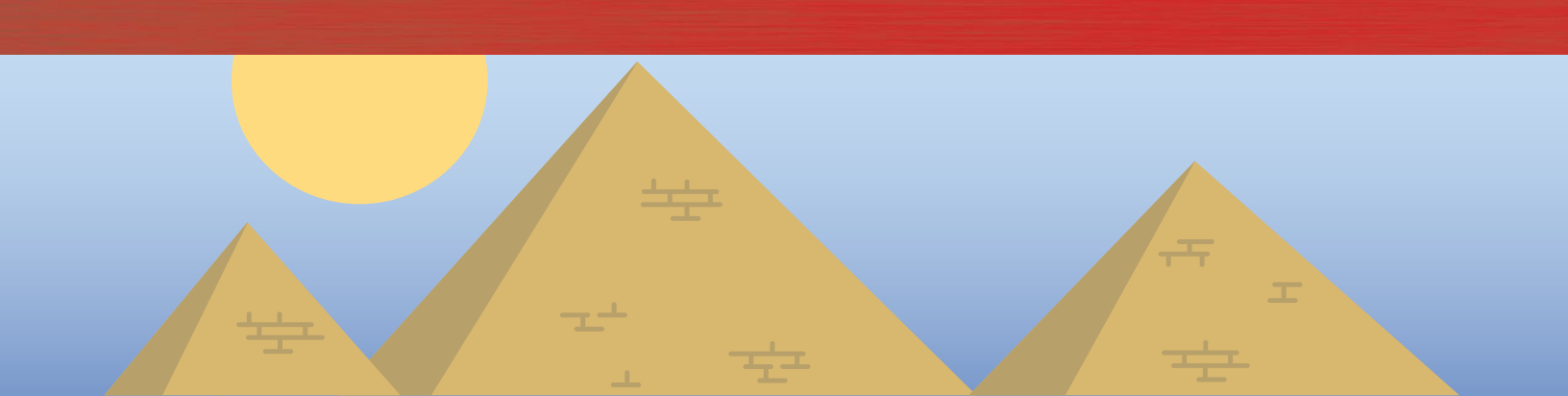*lower is better*

5.6 s

7.3 s

■ Chromebook with Intel Celeron N3450 processor

■ Chromebook with Mediatek M8173C processor

Design lesson plans from an array of apps

Using Chromebooks in the classroom can promote creativity in students as well as teachers. Both Chromebooks ran Android, web-based, and Chrome apps. When teachers can build lesson plans featuring apps across multiple platforms, they can have more opportunities to be creative.
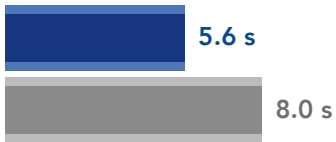
History class: Create media to post and generate data more quickly

30%
less time
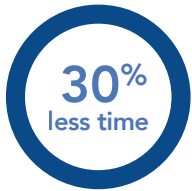
Save image to gallery
in Adobe® Photoshop® Lightroom® (Android app)

Time (sec)
lower is better

5.6 s

8.0 s

While learning about early civilizations, Aaliyah's history teacher challenged her class to live without social media for one week. Half the class groaned and grumbled, while the other half chattered with excitement.

To let her friends know about her social media absence, Aaliyah altered an image of the Great Pyramid of Giza in the Adobe Photoshop app of her Chromebook while in class and saved it to her gallery to later post to Facebook. Aaliyah's Chromebook let her save the image over two seconds faster than Jasmin's would have.

Aaliyah then recorded a brief video message for her YouTube channel and rendered it in the WeVideo app. Aaliyah's Chromebook saved her five minutes when rendering the video compared to the MediaTek processor-based Chromebook.

63%
less time
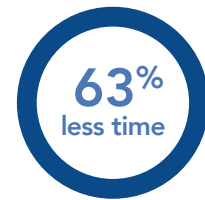
Render video for free
in WeVideo Video Editor (Android app)

Time (min)
lower is better

3.1 m

8.6 m

17%
less time
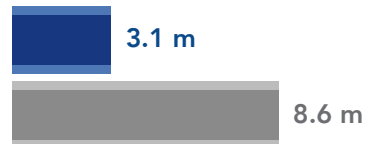
Generate Facebook report
in Wolfram Alpha (web app)

Time (sec)
lower is better

7.8 s

9.4 s

Aaliyah really enjoyed her social media break. The teacher asked for proof that Aaliyah and the other students didn't use social media, so Aaliyah generated a report of Facebook data from Wolfram Alpha. It took Aaliyah's Intel Celeron processor-powered Chromebook over one and half fewer seconds to generate the report compared to Jasmin's Chromebook.

■ Chromebook with Intel Celeron N3450 processor

■ Chromebook with Mediatek M8173C processor

Conclusion

Today's students face challenging assignments and lessons that require computers, and speedy Chromebooks can help keep them focused and engaged. We found that an Intel Celeron N3450 processor-powered Chromebook completed a number of media-based activities faster than a MediaTek processor-based Chromebook. The Intel Celeron processor-based Chromebook allows students to render videos, generate reports on Facebook data, and print diagrams with less waiting. You could help your classrooms stay productive and engaging by choosing Intel Celeron processor-powered Chromebooks.

On November 16, 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 November 17, 2017.

Appendix A: System configuration information

System	HP Chromebook x360 G1 EE	Lenovo Yoga N23
Processor	Intel Celeron N3450	MediaTek MTK 8173C
Processor freq (GHz)	1.1–2.2	1.2
Processor cores	4	2
Memory (GB)	8	4
Storage (GB)	32	32
Battery type	Li-Ion	Li-Ion
Battery capacity (Wh)	47.36	42
Display (size, resolution)	11.6", 1,366 x 768	11.6", 1,366 x 768
Wireless	802.11 AC	802.11 AC
Bluetooth	4.0	4.0
USB ports	2 x USB-C, 2x USB 3.1	1 x USB-C, 1x USB 3.1
System weight (lbs.)	3.17	2.71
OS (version)	62.0.3202.82	62.0.3202.82
Build/firmware	Snappy.9042.136.0	Hana.8438.100.0

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

PowerDirector Video Editor App: 4K, Slow Mo & More

Encoding HD Video

1. From the Google Play Store, install PowerDirector, and pin the app to the shelf.
2. From the shelf, launch the app, and select Allow to enable access to device media storage.
3. Click the New Project icon, and enter a name for the test project.
4. Click the Download folder, and click the test footage to insert the footage onto the timeline.
5. Select the layers icon, and select the text icon to insert a title into the beginning of the clip. Name the title "Test HD Video."
6. Click the Export icon.
7. Click More Output Options.
8. With HD video resolution selected, start the timer, and click Next.
9. When the video share screen appears, stop the timer.

Encoding SD video

1. From the shelf, click the PowerDirector Video Editor icon to launch the app.
2. Load the saved test project.
3. Click the Export icon.
4. Click More Output Options.
5. With SD video resolution selected, start the timer, and click Next.
6. When the video share screen appears, stop the timer.

SoundTrap

Merging tracks in the Dubstep Demo

1. From the Chrome browser, navigate to soundtrap.com.
2. Sign in with a test account.
3. From the landing page, click Enter Studio.
4. From the template selection screen, click Dubstep DEMO.
5. From the horizontal dropdown menu, click Settings, and click Merge Tracks….
6. Check each instrument track to be merged.
7. With all tracks selected, start the timer and click Merge.
8. When merging completes, stop the timer.

LucidChart

Printing a diagram

1. To launch the Chrome app, click the LucidChart icon.
2. To log in with the test account, click the Google logo.
3. From the Templates panel, click More Templates.
4. Change Categories to All, and scroll down to the Tech Jargon template. Click the thumbnail preview to open the template.
5. Click File, and hover over Print.
6. Simultaneously start the timer, and click Print.
7. When the print preview fully loads, stop the timer.

Adobe Photoshop Lightroom

Saving image to gallery (highest quality)

1. From the Google Play Store, install Adobe Photoshop Mix, and pin the app to the shelf.
2. From the shelf, launch the app, and click Get Started.
3. Click Add Photos.
4. Click Allow to enable access to device media storage.
5. Select the test image, and click Add.
6. Close the app, and relaunch from the shelf.
7. From the images list, click the test image thumbnail.
8. Click the dropdown menu icon.
9. Click Save to Gallery.
10. Click Highest Available Quality.
11. Start the timer, and click OK.
12. When the save completes, stop the timer.

WeVideo Video Editor

Rendering video for free

1. Install WeVideo from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. Click the blue + icon.
4. Click Gallery.
5. Click Allow to enable access to device media storage.
6. From the folder browser, select the test footage, and click the green checkmark icon.
7. Click the paper airplane icon.
8. Start the timer, and click Save with watermark.
9. When the save completes, stop the timer.

Wolfram Alpha

Generating Facebook Report

1. From the Chrome browser, navigate to wolframalpha.com.
2. Sign in with the test account.
3. Click the search bar, and search for "facebook report."
4. When the search results load, click Analyze My Facebook Data.
5. A prompt will appear to authorize connecting to a Facebook account. Click to continue with the test Facebook account.
6. Start the timer, and click Generate my Report.
7. Before the next test timing run, log into the test Facebook account.
8. From the test Facebook account, click the help icon>Privacy Shortcuts, and click See More Settings.
9. From the Privacy Settings and Tools page, click Apps.
10. Click the X icon next to Wolfram Connection, and click Remove. Stop the timer.

This project was commissioned by Intel Corp.

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