The science behind the report:

Get faster Chromebooks™ for your students' coding, collaboration, and multimedia work

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Get faster Chromebooks for your students' coding, collaboration, and multimedia work.

We concluded our hands-on testing on May 29, 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 May 20, 2020 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

Table 1: Time to complete tasks in various apps. We present time in seconds below.

Task	HP Chromebook x360 11A G3 EE with an **Intel Celeron N4020 processor**	HP Chromebook 11A G6 EE with an **AMD A4-9120C processor**	Lenovo 100e Chromebook with a **MediaTek 8173C processor**	Percentage win HP Chromebook x360 11A G3 EE vs. HP Chromebook 11A G6 EE	Percentage win HP Chromebook x360 11A G3 EE vs. Lenovo 100e Chromebook
Explain Everything					
Open local presentation	2.7	3.8	3.4	28%	20%
Export presentation video	4.1	6.8	5.1	39%	19%
Google Meet					
Launching the app	1.8	2.4	2.7	25%	33%
Launching a new meeting	3.0	3.7	3.6	18%	16%
Multitasking with Google Meet					
Previewing a large PDF from Google Drive	7.8	9.6	8.5	18%	8%
Opening a large CSV in Google Sheets	18.6	29.9	62.0	37%	70%
Trinket					
Opening the From Block to Code "Lesson"	6.6	7.1	7.5	7%	12%
Opening the Switch Case Challenge	4.0	5.4	5.7	25%	29%

Task	HP Chromebook x360 11A G3 EE with an **Intel Celeron N4020 processor**	HP Chromebook 11A G6 EE with an **AMD A4-9120C processor**	Lenovo 100e Chromebook with a **MediaTek 8173C processor**	**Percentage win HP Chromebook x360 11A G3 EE vs. HP Chromebook 11A G6 EE**	**Percentage win HP Chromebook x360 11A G3 EE vs. Lenovo 100e Chromebook**
Repl.it					
Opening the Java editor	5.2	7.8	8.2	**33%**	**36%**
WeVideo					
Render one-minute video	48.5	74.4	181.4	**34%**	**73%**
Tinkercad					
Loading the design gallery	3.7	4.4	5.3	**15%**	**30%**
Opening the Retail Row model	27.6	38.1	33.7	**27%**	**18%**
Soundtrap					
Merging tracks	22.5	43.0	34.5	**47%**	**34%**

Table 2: Battery life testing. We present time in minutes below.

CrXPRT 2 **Elapsed time (minutes)**	HP Chromebook x360 11A G3 EE with an **Intel Celeron N4020 processor**	HP Chromebook 11A G6 EE with an **AMD A4-9120C processor**	Lenovo 100e Chromebook with a **MediaTek 8173C processor**	**Percentage win HP Chromebook x360 11A G3 EE vs. HP Chromebook 11A G6 EE**	**Percentage win HP Chromebook x360 11A G3 EE vs. Lenovo 100e Chromebook**
Run 1	750	660	690		
Run 2	780	680	740		
Run 3	740	660	710		
Median	**760**	**670**	**710**	**11%**	**6%**

System configuration information

Table 3: Detailed information on the systems we tested.

System	HP Chromebook x360 11A G3 EE	HP Chromebook 11A G6 EE	Lenovo 100e Chromebook
Processor	Intel Celeron N4020	AMD A4-9120C	MediaTek 8173C
Processor frequency (GHz)	1.1	1.6	2.1
Processor cores	2	2	4
Memory (GB)	4	4	4
Storage (GB)	32	16	32
Bluetooth	5	4.2	4.1
USB	2x USB 3.1 Type-C, 2x USB 3.1 Gen 1	2x USB 2.0, 2x USB Type C	1x USB 3.0, 1x USB Type C
Battery type	Lithium-Ion	Lithium-Ion	Lithium-Ion
Battery capacity (Wh)	47	47	42
Display	11.6" 1366x768	11.6" 1366x768	11.6" 1366x768
OS (version)	81.0.4044.94	81.0.4044.94	81.0.4044.94
System weight (lbs.)	3.19	2.80	2.68

How we tested

Creating the background workload

To simulate typical Chromebook use, we ran a combination of news, email, chat, music, document viewing, 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.
3. Select Open a specific page or set of pages.
4. Insert the following URLs, and click OK.

   - Forbes.com
   - Markets.ft.com/data
   - Arstechnica.com
   - mail.google.com
   - slack.com (logged into Slack chat, #general channel)
   - drive.google.com
   - docs.google.com (viewing document)
   - youtube.com/feed/music
   - drive.google.com (viewing document)
   - sheets.google.com (viewing spreadsheet)
   - twitter.com
   - facebook.com

5. Restart the Chromebook. Before testing, navigate through each tab to ensure that both devices have fully loaded the same content.

Testing the applications

Explain Everything

Open local presentation

1. From the Google Play store, install Explain Everything. Pin the app to the shelf.
2. Launch the Explain Everything app from the shelf.
3. Simultaneously start the timer and click the test project.
4. When the test project fully loads, stop the timer.

Exporting a presentation as a project

1. From the shelf, launch the Explain Everything app.
2. Click the test project.
3. Click Share, and click Export.
4. On the Export project screen, select Project.
5. For the source, click Local storage.
6. Simultaneously start the timer and click Export.
7. When the Export successful message appears, stop the timer.

Trinket

Opening the "From Block to Code" lesson

1. From the Chrome browser, navigate to trinket.io.
2. Sign in with your Google account.
3. Click Learn.
4. Simultaneously start the timer and click Let's Go under From Blocks to Code.
5. When the project editor fully loads, stop the timer.

Opening the Switch Case Challenge

1. From the Chrome browser, navigate to trinket.io.
2. Sign in with your Google account.
3. Click Learn.
4. Simultaneously start the timer and click Switch Case Challenge.
5. When the project editor fully loads, stop the timer.

Repl.it

Opening the Java editor

1. From the Chrome browser, navigate to repl.it.
2. Sign in with your Google account.
3. Click the red plus icon, and select All languages.
4. Simultaneously start the timer and click Java.
5. When the project editor fully loads, stop the timer.

WeVideo Video Editor

Render a 720p video for free

1. From the Google Play store, install WeVideo. Pin the app to the shelf.
2. Launch the WeVideo app from the shelf.
3. Click the green plus icon.
4. Delete the six-second title text.
5. Click the blue plus icon.
6. Click Gallery.
7. Click Allow to enable access to device media storage.
8. From the folder browser, select the test footage, and click the green checkmark icon.
9. Click the paper airplane icon.
10. Simultaneously start the timer and click Save with watermark.
11. When the video fully renders, stop the timer.

Tinkercad

Loading the design gallery

1. From the Chrome browser, navigate to tinkercad.com.
2. Simultaneously start the timer and click Gallery.
3. When the page fully loads, stop the timer.

Opening the Modern House model

1. From the Chrome browser, navigate to tinkercad.com.
2. Click Gallery.
3. Click the Retail Row design.
4. Simultaneously start the timer and click Copy and Tinker.
5. When the model fully loads, stop the timer.

Soundtrap

Merge tracks

1. From the Google Play store, install Soundtrap. Pin the app to the shelf.
2. Launch the Soundtrap app from the shelf.
3. From the template selection screen, click Dubstep DEMO.
4. From the horizontal dropdown menu, click Settings, and click Merge Tracks…
5. Select all of the instrument tracks.
6. Simultaneously start the timer and click Merge.
7. Stop the timer when merging completes.

Multitasking with Google Meet

To conduct our multitasking tests, we opened Google Meet in the Chrome web browser, and joined a four-participant video meeting. We docked the Google Meet browser window to one half of the screen, and used the other half of the screen to complete the following scenarios. Our Chrome tab contained the background workload we described at the beginning of this section.

Joining a meeting

1. With Chrome open, open a new tab, and enter the meeting URL.
2. Click to join the meeting, and ensure video is connected. For our testing, to ensure the video content was roughly the same across devices, we pointed each Chromebook's camera at a blank ceiling.
3. Dock the Chrome tab to the right side of the screen, and dock the other Chrome window to the left side of the screen.
4. In the left-docked Chrome window, complete the scenarios below.

Previewing a large PDF from Google Drive

1. From the Chrome browser, navigate to drive.google.com.
2. Right click the test document and simultaneously start the timer and click Preview.
3. When the preview has fully loaded, stop the timer.

Opening a large CSV In Google Sheets

1. From the Chrome browser, navigate to drive.google.com.
2. To preview the CSV test document, double-click its icon.
3. Simultaneously start the timer and click Open with Google Sheets.
4. When the new document has fully loaded, stop the timer.

Measuring battery life

CrXPRT 2

1. From the Google Play store, install CrXPRT 2. Pin the app to the shelf.
2. Launch the CrXPRT 2 app from the shelf.
3. From the CrXPRT 2 main menu, select Battery life test, and click Next.
4. Ensure the device is charged to 100%, the brightness is set as close to 200 nits as possible, and that the device's volume is set to 50%.
5. Disconnect the test system from AC power, and click Start. Record the results after the full battery run-down is complete.

Read the report at http://facts.pt/ure4fhu ▶

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