



The science behind the report:

Help students connect and collaborate to finish creative assignments with Intel Core processor-powered Chromebooks™

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 [Help students connect and collaborate to finish creative assignments with Intel Core processor-powered Chromebooks](#).

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 25, 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 11 G3 EE	ASUS Chromebook C434T	ASUS Chromebook C436F	Percentage win ASUS Chromebook C434T vs. HP Chromebook x360 11 G3 EE	Percentage win ASUS Chromebook C436F vs. ASUS Chromebook C434T	Percentage win ASUS Chromebook C436F vs. HP Chromebook x360 11 G3 EE
CodeHS						
Creating a new Python program	4.1	3.8	3.1	7%	18%	24%
Multitasking with Google Meet						
Print previewing a PDF from Google Drive	36.0	32.3	27.7	10%	14%	23%
Opening a large DOCX file in Google Docs	16.3	11.0	6.5	33%	41%	60%
Saving and opening a DOCX to Google Docs	32.2	13.7	11.5	57%	16%	64%
Opening a shared Google Slides project	42.6	13.1	9.4	69%	28%	78%

Task	HP Chromebook x360 11 G3 EE	ASUS Chromebook C434T	ASUS Chromebook C436F	Percentage win ASUS Chromebook C434T vs. HP Chromebook x360 11 G3 EE	Percentage win ASUS Chromebook C436F vs. ASUS Chromebook C434T	Percentage win ASUS Chromebook C436F vs. HP Chromebook x360 11 G3 EE
Lexis Audio Editor						
Exporting an edited audio file	85.1	59.2	41.1	30%	31%	52%
Opening a 50MB audio file	15.6	9.7	8.4	38%	12%	46%
Soundtrap						
Entering the studio	8.5	5.8	4.3	32%	26%	49%
Tinkercad						
Opening the Retail Row model	26.9	25.6	21.8	5%	15%	19%

System configuration information

Table 2: Detailed information on the systems we tested.

System	HP Chromebook x360 11 G3 EE	ASUS Chromebook C434T	ASUS Chromebook C436F
Processor	Intel Celeron N4020	Intel Core m3-8100Y	Intel Core i3-10110U
Processor frequency (GHz)	1.1	1.1	2.1
Processor cores	2	2	2
Memory (GB)	4	4	8
Storage (GB)	32	64	128
Bluetooth	5.0	4.0	4.2
USB	2x USB 3.1 Type-C 2x USB 3.1 Gen 1	1x USB 3.1 2x USB Type-C	2x USB 3.1 Type-C
Battery type	Lithium-Ion	Lithium-Ion	Lithium-Ion
Battery capacity (Wh)	47	48	47
Display	11.6" 1366 x 768	14" 1920 x 1080	14" 1920 x 1080
OS (version)	81.0.4044.103	81.0.4044.141	81.0.4044.141
System weight (lbs.)	3.19	3.19	3.09

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](https://forbes.com)
 - [Markets.ft.com/data](https://markets.ft.com/data)
 - [Arstechnica.com](https://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 all devices have fully loaded the same content.

Testing the applications

CodeHS

Creating a new Python program

1. From the Chrome browser, navigate to codehs.com.
2. Sign in with your Google account.
3. Click Sandbox.
4. Under Create New Program, type a name and click Create Program.
5. Select Python.
6. Simultaneously start the timer and click Create Program.
7. When the project editor fully loads, stop the timer.

Lexis Audio Editor

Opening a 50MB audio file

1. Install Lexis Audio Editor from the Google Play store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. Click Allow to enable app access to photos, media, and files on the device.
4. Close and reopen the app.
5. Click Open.
6. Navigate to the device's download folder, and select the test audio file.
7. Start the timer, and click Open.
8. Stop the timer when the audio file has fully loaded.

Exporting an edited audio file

1. Launch the app from the shelf.
2. Click Open.
3. Navigate to the device's download folder, and select the test audio file.
4. Click Save.
5. From the Save menu, enter a file name. Start the timer, and click Save.
6. Stop the timer when saving completes.

Tinkercad

Opening the Retail Row 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

Entering the studio

1. Install Soundtrap from the Google Play store, and pin the app to the shelf.
2. Launch the SoundTrap app from the shelf.
3. Simultaneously start the timer and click Create New Project.
4. When the studio fully loads, stop the timer.

Multitasking with Google Meet

For our multitasking tests, we opened Google Meet in Chrome, 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.

Print previewing a PDF from Google Drive

1. From the Chrome browser, navigate to drive.google.com.
2. To preview the PDF test document, double-click its icon.
3. Simultaneously start the timer and click the Print icon.
4. When the print preview has fully loaded, stop the timer.

Saving and opening a DOCX to Google Docs

1. From the Chrome browser, navigate to drive.google.com.
2. To preview the DOCX test document, double-click its icon.
3. Click Open with Google Docs.
4. Click File.
5. Simultaneously start the timer and click Save as Google Docs.
6. When the new document has fully loaded, stop the timer.

Opening a large DOCX file In Google Docs

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

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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