



The science behind the report:

# Power through your high school course load with a responsive Chromebook

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 [Power through your high school course load with a responsive Chromebook](#).

We concluded our hands-on testing on September 15, 2021. 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 September 7, 2021 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

## Our results

To learn more about how we have calculated the wins in this report, go to <http://facts.pt/calculating-and-highlighting-wins>. Unless we state otherwise, we have followed the rules and principles we outline in that document.

Table 1: Results of our hand-timed testing.

Task	HP x360 Chromebook™ 14ct-cc000 with an Intel® Core™ i3-1125G4 processor	Acer Spin 512 Chromebook R853TA-P3R1 with an Intel Pentium® Silver N6000 processor	Acer Spin 513 Chromebook CP513-1H-S60F with a Qualcomm Snapdragon 7c processor	HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor	Chromebook with Core i3 processor vs. Chromebook with Qualcomm processor	Chromebook with Core i3 processor vs. Chromebook with MediaTek processor	Chromebook with Pentium Silver processor vs. Chromebook with Qualcomm processor	Chromebook with Pentium Silver processor vs. Chromebook with MediaTek processor
<b>Scenario 1 (median sum of all tasks)</b>	<b>47.9</b>	<b>83.3</b>	<b>102.7</b>	<b>159.0</b>	<b>53%</b>	<b>69%</b>	<b>18%</b>	<b>47%</b>
<b>Zoom</b>								
Launching the application	0.6	0.9	1.1	1.3	45%	53%	18%	30%
Launching a meeting	2.9	3.5	4.5	4.6	35%	36%	22%	23%
<b>Google Drive™</b>								
Opening a PDF preview from Google Drive	1.9	2.5	3.5	3.9	45%	51%	28%	35%

Task	HP x360 Chromebook™ 14ct-cc000 with an Intel® Core™ i3-1125G4 processor	Acer Spin 512 Chromebook R853TA-P3R1 with an Intel Pentium® Silver N6000 processor	Acer Spin 513 Chromebook CP513-1H-S60F with a Qualcomm Snapdragon 7c processor	HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor	Chromebook with Core i3 processor vs. Chromebook with Qualcomm processor	Chromebook with Core i3 processor vs. Chromebook with MediaTek processor	Chromebook with Pentium Silver processor vs. Chromebook with Qualcomm processor	Chromebook with Pentium Silver processor vs. Chromebook with MediaTek processor
Viewing a print preview of a PDF	5.4	5.8	6.0	6.3	10%	14%	3%	7%
Google Sheets™								
Opening a Microsoft Excel document from Google Drive	2.7	3.2	4.2	5.2	35%	48%	23%	38%
Opening a Microsoft Excel file with Google Sheets™	21.6	31.2	40.6	61.4	46%	64%	23%	49%
Inserting a bar graph in Google Sheets	1.6	3.1	4.3	7.0	62%	77%	27%	55%
Google Slides								
Opening Google Slides presentation	10.4	31.8	36.4	67.0	71%	84%	12%	52%
Copying and pasting a graph into Google Slides presentation	0.8	1.3	2.1	2.3	61%	65%	38%	43%
<b>Scenario 2 (median sum of all tasks)</b>								
Google desktop								
Unzipping 280 .JPG photos to desktop	11.3	18.2	37.3	44.9	69%	74%	51%	59%
Adobe® Lightroom®								
Importing 280 .JPG photos	277.3	256.9	378.0	601.5	26%	53%	32%	57%
Batch processing 280 .JPG photos	55.4	91.1	97.8	116.9	43%	52%	6%	22%

Task	HP x360 Chromebook™ 14ct-cc000 with an Intel® Core™ i3-1125G4 processor	Acer Spin 512 Chromebook R853TA-P3R1 with an Intel Pentium® Silver N6000 processor	Acer Spin 513 Chromebook CP513-1H-S60F with a Qualcomm Snapdragon 7c processor	HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor	Chromebook with Core i3 processor vs. Chromebook with Qualcomm processor	Chromebook with Core i3 processor vs. Chromebook with MediaTek processor	Chromebook with Pentium Silver processor vs. Chromebook with Qualcomm processor	Chromebook with Pentium Silver processor vs. Chromebook with MediaTek processor
Exporting 280 .JPG photos	234.2	295.6	463.1	718.5	49%	67%	36%	58%
<b>Individually timed tasks in Chrome OS</b>								
TinkerCAD								
Copying and tinkering a project	11.1	12.8	19.6	27.6	43%	59%	34%	53%
Rendering blocks from the model	4.2	6.1	10.4	17.7	59%	76%	41%	65%
Minecraft: Education Edition								
Launching application	4.6	5.3	6.6	8.9	30%	48%	19%	40%

Table 2: WebXPRT 3 benchmark test results.

Task	HP x360 Chromebook 14ct-cc000 with an Intel Corei3-1125G4 processor	Acer Spin 512 Chromebook R853TA-P3R1 with an Intel Pentium Silver N6000 processor	Acer Spin 513 Chromebook CP513-1H-S60F with a Qualcomm Snapdragon 7c processor	HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor	Chromebook with Core i3 processor vs. Chromebook with Qualcomm processor	Chromebook with Core i3 processor vs. Chromebook with MediaTek processor	Chromebook with Pentium Silver processor vs. Chromebook with Qualcomm processor	Chromebook with Pentium Silver processor vs. Chromebook with MediaTek processor
WebXPRT 3	254	160	74	61	70%	75%	53%	61%

Table 3: Speedometer 2.0 benchmark test results.

Task	HP x360 Chromebook 14ct-cc000 with an Intel Corei3-1125G4 processor	Acer Spin 512 Chromebook R853TA-P3R1 with an Intel Pentium Silver N6000 processor	Acer Spin 513 Chromebook CP513-1H-S60F with a Qualcomm Snapdragon 7c processor	HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor	Chromebook with Core i3 processor vs. Chromebook with Qualcomm processor	Chromebook with Core i3 processor vs. Chromebook with MediaTek processor	Chromebook with Pentium Silver processor vs. Chromebook with Qualcomm processor	Chromebook with Pentium Silver processor vs. Chromebook with MediaTek processor
Speedometer 2.0	169.00	83.10	45.86	28.48	72%	83%	44%	65%

## System configuration information

Table 4: Detailed information on the system we tested. We obtained pricing information directly from each vendor's website: HP x360 Chromebook (<https://www.hp.com/us-en/shop/pdp/hp-chromebook-x360-14ct-cc000-2e6x3av-1>), Acer Spin 512 (<https://www.acer.com/ac/en/US/content/model/NX.A91AA.002.>), Acer Spin 513 (<https://www.acer.com/ac/en/US/content/model/NX.HWYAA.001>), HP Chromebook 11a (<https://www.hp.com/us-en/shop/pdp/hp-chromebook-11a-na0060nr>).

System	HP x360 Chromebook 14ct-cc000 with an Intel Core i3-1125G4 processor	Acer Spin 512 Chromebook R853TA-P3R1 with an Intel Pentium Silver N6000 processor	Acer Spin 513 Chromebook CP513-1H-S60F with a Qualcomm Snapdragon 7c processor	HP Chromebook 11a-na0060nr with a MediaTek MT8183 processor
Cost at time of writing	\$539.99	\$529.99	\$429.99	\$299.99
Processor	MediaTek MT8183	Qualcomm Snapdragon 7c	Intel Pentium Silver N6000	Intel Core i3-1125G4
Processor frequency (GHz)	2.00	2.40	3.30	3.70
Processor cores	8	8	4	4
Memory (GB)	4	4	8	8
Storage (GB)	32	64	64	128
USB	4.2	5	5	5
Battery type	1x USB 2.0 Type-C, 1x USB 2.0 Type-A	2x USB 3.1 Type-C, 1x USB 3.1 Type-A	2x USB 3.2 Type-C, 2x USB 3.2 Type-A	2x USB 3.1 Type-C, 2x USB 3.1 Type-A
Battery capacity (Wh)	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Display (in.)	37	36	48	58
Display resolution	11.6" 1366x768	13.3" 1920x1080	12" 1366x912	14" 1920x1080
OS (version)	Chrome OS 93.0.4577.69 (32-bit)	Chrome OS 93.0.4577.69 (32-bit)	Chrome OS 91.0.4472.167 (64-bit)	Chrome OS 92.0.4515.162 (64-bit)
System weight (lbs.)	2.36	2.84	2.87	3.35

# How we tested

## Scenario-based testing

For our multitasking tests, we opened the Zoom Meeting application, and joined a four-participant video meeting. We tested each task for a given scenario sequentially.

### Scenario #1

#### Zoom

##### Launching Zoom

1. Simultaneously start the timer and launch the Zoom app from the shelf.
2. When the app fully loads and the webcam preview appears, stop the timer.

##### Launching a new Zoom Meeting

1. From the Zoom main screen, simultaneously start the timer and click New meeting.
2. When the meeting invite code appears and the webcam preview refreshes, stop the timer.
3. Minimize the app. We kept the Zoom meeting running in a four-way video chat session for the remainder of testing.

#### Google Drive

##### Opening a PDF preview from Google Drive

1. From the Zoom chat window, click the link to the test PDF.
2. Simultaneously start the timer and click Proceed.
3. When the PDF preview fully loads in the web browser, stop the timer.

##### Viewing a print preview of a PDF

1. From the Zoom chat window, click the link to the test PDF via Google Drive.
2. When the PDF loads, simultaneously start the timer and click the Print icon.
3. When the print preview fully loads, stop the timer.

#### Google Sheets

##### Opening a shared Excel file with Google Drive

1. From the Zoom chat window, click the link to the test .csv file on Google Drive.
2. Simultaneously start the timer and click Proceed.
3. When the document preview fully loads, stop the timer.

##### Opening an Excel file with Google Sheets

1. From the Google Drive .csv preview, click the drop-down menu named Open with.
2. Simultaneously start the timer and click Google Sheets.
3. When Google Sheets fully loads, stop the timer.

##### Inserting a bar graph into a Google Sheets spreadsheet

1. From Google Sheets, select the range of data, and click Insert.
2. Simultaneously start the timer and click Chart.
3. When the chart fully loads into the document, stop the timer.

#### Google Slides

##### Opening a shared Google Slides Presentation

1. From the Zoom chat window, click the link to the Google Slides test document on Google Drive.
2. Simultaneously start the timer and click Proceed.
3. When the Slides presentation fully loads, stop the timer.

## **Copying and pasting a graph from Google Sheets into a Google Slides presentation**

1. Navigate to the Google Sheets test document tab.
2. Select and copy the bar graph.
3. Navigate to the first slide of the Google Slides presentation.
4. Simultaneously start the timer and paste the bar graph into the first slide.
5. When the bar graph fully loads, stop the timer.

## **Scenario #2**

### **Google System: Unarchiving Photos**

#### **Unzipping 280 photos from the desktop**

1. From the Files application, navigate to the test archive location.
2. Double-click to open the test archive using the default system viewer.
3. Select the contents of the test archive. Click and drag the contents to an empty folder, but do not release the mouse button.
4. Simultaneously start the timer and unclick the dragged content.
5. When the copying files dialog completes, stop the timer.

### **Adobe Lightroom**

#### **Importing 280 photos**

1. From the app shelf, launch Adobe Lightroom from the Chrome.
2. From the Adobe Lightroom home page, click the blue import photos icon.
3. Sort by Device Folders. To select the unarchived test photos, click the checkbox next to the folder name.
4. Simultaneously start the timer and click Add.
5. When the import dialog completes, stop the timer.

#### **Batch-processing 280 photos with a filter preset**

1. From the Adobe Lightroom home page, click the collection containing the test photos.
2. Click the first image.
3. Click the Adjustments icon.
4. To apply auto-adjustments, click Auto.
5. Click the menu button in the top right, and select Copy Settings.
6. Leave the default Copy Settings, and click OK.
7. To return to the collection view, click the back arrow.
8. Long-click the first photo to select it.
9. Click the menu button in the top right, and select Select All.
10. Click the menu button in the top right again, and select Paste Settings.
11. Simultaneously start the timer and click Apply.
12. When the processing dialog closes, and "Changes applied to 280 photos" appears, stop the timer.

#### **Exporting 280 photos**

1. From the Adobe Lightroom home page, click the collection containing the test photos.
2. Long-click the first photo to select it.
3. From the drop-down menu, click to Select All images.
4. With all images selected, click the Share icon.
5. From the Share dialog box, click Export As...
6. Leave the default settings. Simultaneously start the timer and click the checkmark icon.
7. When the export dialog completes, stop the timer.

## Tasks in other apps

### Tinkercad

#### Using the Copy and Tinker function on a project

1. Navigate to <https://tinkercad.com>, and sign in with a test account.
2. Click Gallery.
3. Click to open the Lovell Telescope TinkerCAD project.
4. Simultaneously start the timer and click Copy and Tinker.
5. Stop the timer when the 3D model has fully loaded.

#### Rendering blocks from a model

1. With the Lovell Telescope project opened, simultaneously start the timer and click the pickaxe icon.
2. When the Block view has fully rendered, stop the timer.

### Minecraft: Education Edition

#### Launching the application

1. Simultaneously start the timer and launch the Minecraft: Education Edition app from the shelf.
2. When the app fully loads, stop the timer.

## Benchmark testing

### WebXPRT 3

#### Running WebXPRT 3

1. Power on the device, and log in.
2. To clear any background startup activity, allow the device to idle for 10 minutes.
3. Open the default web browser, and navigate to <https://www.principledtechnologies.com/benchmarkxprt/webxprt/>.
4. Click Run WebXPRT 3.
5. Click Continue.
6. Click Start.
7. When the test completes, record the score.

### Speedometer 2.0 - BrowserBench

#### Running Speedometer 2.0

1. Power on the device, and log in.
2. To clear any background startup activity, allow the device to idle for 10 minutes.
3. Open the default web browser, and navigate to <https://browserbench.org/Speedometer2.0/>.
4. Click Start Test.
5. When the test completes, record the score.

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