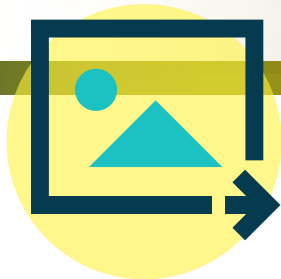




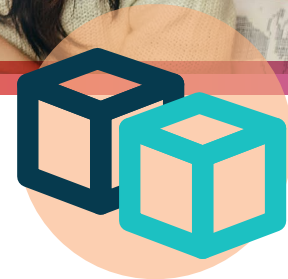
Intel Pentium Silver N6000 processor-powered Chromebook<sup>†‡</sup>



**59%**  
less time  
importing  
photos<sup>†‡</sup>



**55%**  
less time  
opening a presentation while  
video conferencing<sup>†‡</sup>



**33%**  
less time  
copying and opening  
a 3D project<sup>†‡</sup>

## Get a more responsive Chromebook for your virtual classroom

A Chromebook powered by an Intel Pentium Silver N6000 processor completed common tasks in less time than a Chromebook powered by a MediaTek MT8183 processor

At Principled Technologies, we tested two Chromebooks™ powered by the following processors:

- Intel® Pentium® Silver N6000 processor
- MediaTek MT8183 processor

On each Chromebook, we compared the time required to complete tasks in various apps, including Google Slides, Adobe Lightroom®, and Autodesk Tinkercad®. The Intel Pentium Silver N6000 processor-powered Chromebook enabled us to complete these tasks in less time than the MediaTek MT8183 processor-powered Chromebook. The Intel Pentium Silver N6000 processor-powered Chromebook also achieved a better score on the Speedometer 2.0 benchmarking test, suggesting it would be more responsive for students using web-based applications.

With many students still learning from home, having more responsive technology can make for a better experience than they'd get with slower devices.

<sup>†</sup>HP Chromebook 11 G9 EE (pre-production unit) powered by an Intel Pentium Silver N6000 processor compared to an Acer Chromebook Spin 311 CP311-3H-K23X with a MediaTek MT8183 processor

<sup>‡</sup>See [the science behind this report](#) for detailed system configurations and benchmark results.

In this report, text in the **seafoam-colored sections** represents fictional scenarios based on the results of PT testing. Though the people aren't real, the scenarios illustrate the benefits users may see in the real world.

## How we tested

To test the responsiveness of each Chromebook, we hand-timed common tasks in a variety of classroom and creative apps. To reflect a realistic use case of a virtual classroom environment, we performed tasks in Google Drive and Google Slides while each device was participating in a two-way video call in Google Meet. We performed the Adobe Lightroom and Autodesk Tinkercad tasks without a Google Meet call to represent students working on out-of-class assignments.

We also tested each Chromebook with the Speedometer 2.0 responsiveness benchmark. Speedometer 2.0 gauges the responsiveness of web-based applications by simulating user actions in a demo app and measuring the time required to complete those actions.

To learn more, visit <https://browserbench.org/Speedometer2.0>.



*Intel Pentium Silver N6000  
processor-powered Chromebook<sup>†Δ</sup>*

<sup>Δ</sup>See [the science behind this report](#) for detailed system configurations and benchmark results.

Note: Each of the graphs in this report uses a different x axis in order to keep to a consistent size. Please be mindful of each graph's data range as you compare.



Ms. Nakata's middle school students are still adjusting to the growing pains of virtual classrooms, but the new Intel Silver Pentium N6000 processor-powered Chromebooks their school issued this quarter have made it less time consuming and less frustrating to complete certain assignments.

Students aren't the only ones to reap the benefits of the new technology—Ms. Nakata is also enjoying the time savings their Intel Pentium Silver N6000 processor-powered Chromebooks have brought vs. their previous Chromebooks, which were powered by MediaTek MT8183 processors.

## Open documents in less time

In our multitasking test with Google Drive, the MediaTek MT8183 processor-powered Chromebook took 55 seconds to open a Google Slides presentation. The Intel Pentium Silver N6000 processor-powered Chromebook cut that time by more than half—a difference of 55 percent.

### Save 30 seconds opening a presentation during a Google Meet call

with Google Drive, Google Meet, and Google Slides

Time (sec)



- HP Chromebook 11 G9 EE with an Intel Pentium Silver N6000 processor
- Acer Chromebook Spin 311 CP311-3H-K23X with a MediaTek MT8183 processor

Figure 1: Time (in seconds) to open a Google Slides presentation from Google Drive during a Google Meet call. Less time is better. Source: Principled Technologies.

#### Google Meet

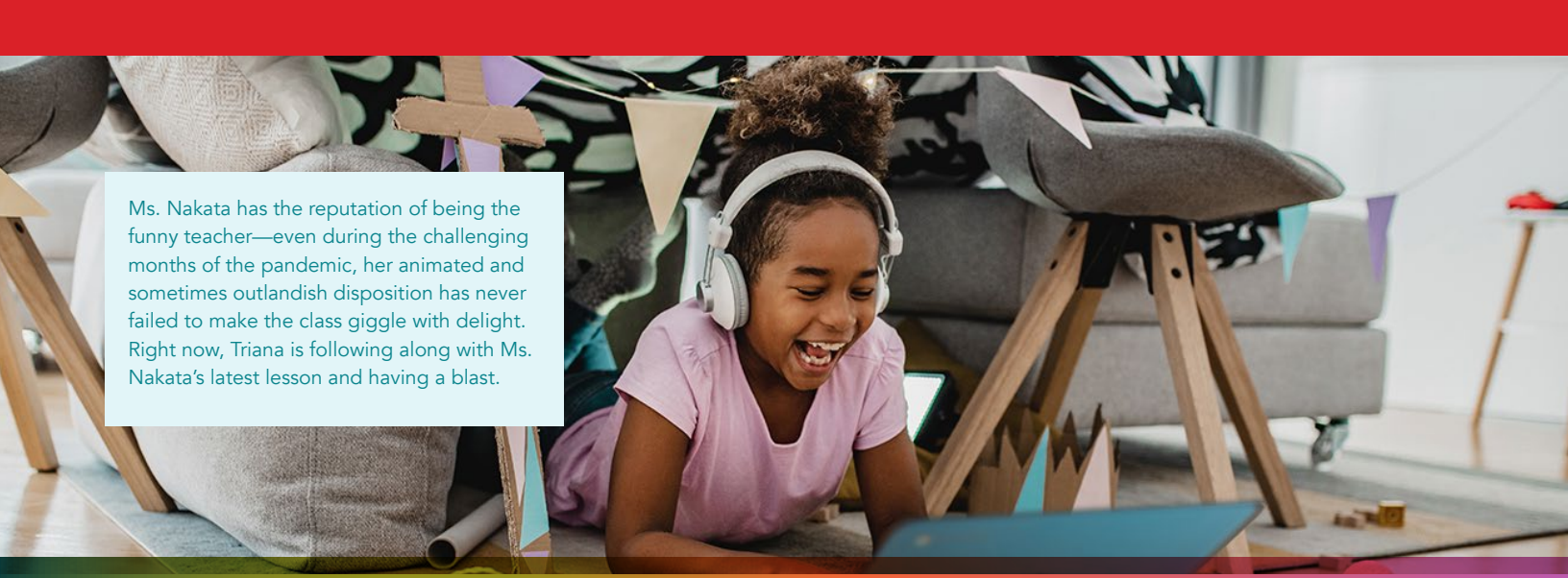
Google has made their premium video conferencing product free and available to the general public. According to Google, the app is used in schools, governments, and companies worldwide.<sup>1</sup>

#### Google Workspace

In October 2020, Google rebranded its G Suite app offerings as Google Workspace—but you'll still get the same productivity and collaboration tools you're used to, including Google Docs, Google Slides, Google Meet, Google Drive, and more.<sup>2</sup>

<sup>Δ</sup>See [the science behind this report](#) for detailed system configurations and benchmark results.





Ms. Nakata has the reputation of being the funny teacher—even during the challenging months of the pandemic, her animated and sometimes outlandish disposition has never failed to make the class giggle with delight. Right now, Triana is following along with Ms. Nakata’s latest lesson and having a blast.

## More responsive in Google Slides and Speedometer 2.0

In our multitasking test with Google Slides, the Intel Pentium Silver N6000 processor-powered Chromebook saved time while changing slides and when copying and pasting a table from one slide to another. Additionally, during the Speedometer 2.0 test of web app responsiveness, the Chromebook powered by an Intel Pentium Silver N6000 processor achieved a 66 percent higher score than the MediaTek MT8183 processor-powered Chromebook.

### Save 1.6 seconds changing slides during a Google Meet call

with Google Slides and Google Meet  
Time (sec)



Figure 2: Time (in seconds) to change slides in Google Slides during a Google Meet call. Less time is better. Source: Principled Technologies.

### Save 1.9 seconds copying and pasting a table during a Google Meet call

with Google Slides and Google Meet  
Time (sec)



Figure 3: Time (in seconds) to copy and paste a table from one Google Slides slide to another during a Google Meet call. Less time is better. Source: Principled Technologies.

### Speedometer 2.0 score

with BrowserBench.org benchmark



- HP Chromebook 11 G9 EE with an Intel Pentium Silver N6000 processor
- Acer Chromebook Spin 311 CP311-3H-K23X with a MediaTek MT8183 processor

Figure 4: Speedometer 2.0 score. Higher score is better. Source: Principled Technologies.

<sup>Δ</sup>See [the science behind this report](#) for detailed system configurations and benchmark results.



With her Intel Pentium Silver N6000 processor-powered Chromebook, Nadia can edit photos with ease. Right now, she's learning how to use the Adobe software Ms. Nakata went over in class. Importing, batch-editing, and exporting the photos from the assignment take much less time than they would have with the MediaTek MT8183 processor-powered Chromebook.

## Edit photos in less time

In our tests with Adobe Lightroom, the Intel Pentium Silver N6000 processor-powered Chromebook saved more than four minutes across three tasks compared to the Chromebook powered by a MediaTek MT8183 processor. The Intel Pentium Silver N6000 processor-powered Chromebook saved more than two minutes while importing a set of 160 photos, 37 seconds while batch-processing the photos, and nearly two minutes while exporting the photo set.

### Save 129 seconds importing 140 photos

with Adobe Lightroom

Time (sec)



### Save 37 seconds batch-processing 140 photos with a filter preset

with Adobe Lightroom

Time (sec)



### Save 117 seconds exporting 140 photos

with Adobe Lightroom

Time (sec)



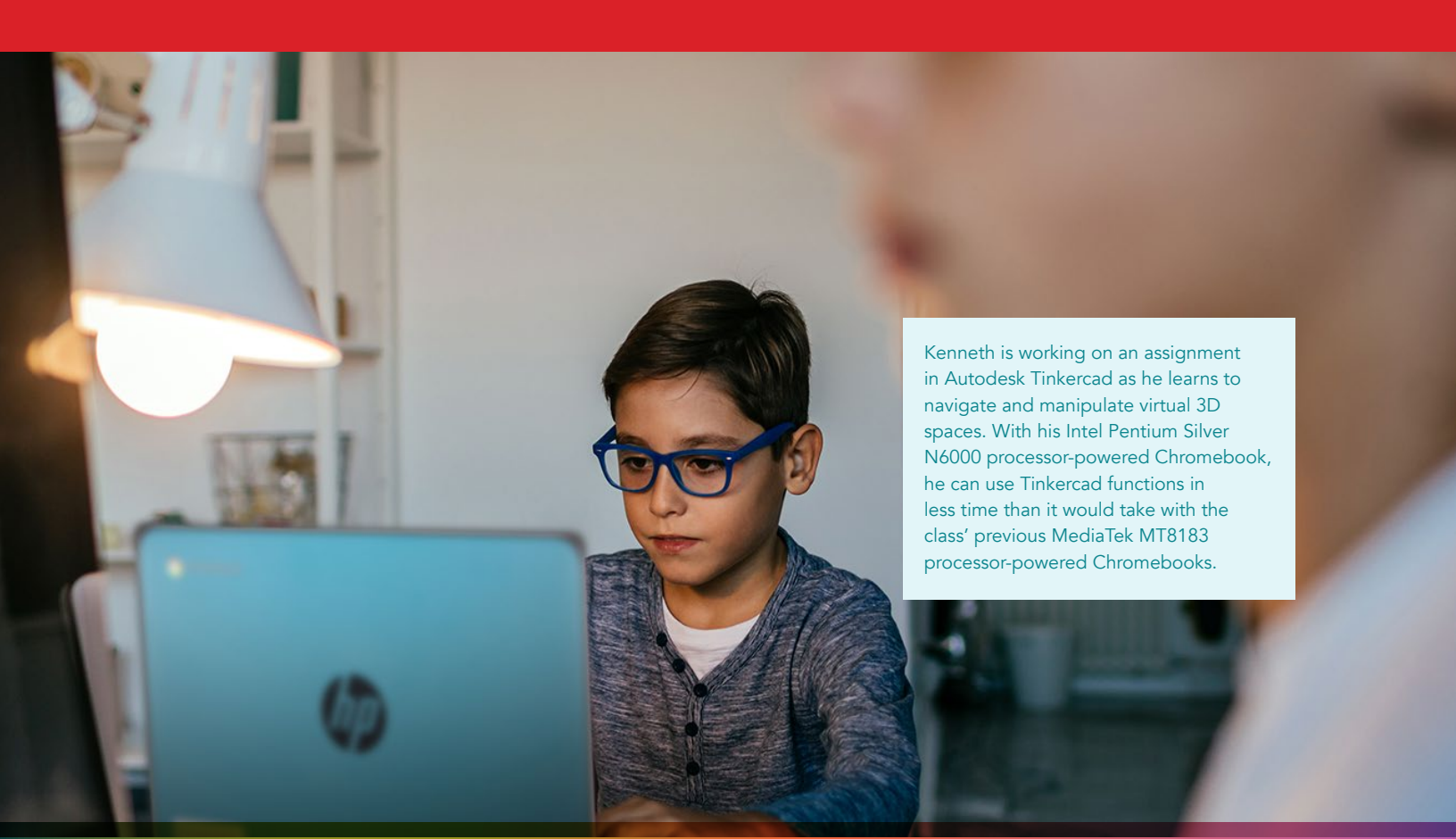
- HP Chromebook 11 G9 EE with an Intel Pentium Silver N6000 processor
- Acer Chromebook Spin 311 CP311-3H-K23X with a MediaTek MT8183 processor

Figure 5: Time (in seconds) to complete tasks in Adobe Lightroom. Less time is better. Source: Principled Technologies.

#### Adobe Lightroom

Adobe Lightroom is a freemium photo editing and camera app that enables you to use customizable filters and other options to create your next photography project.<sup>3</sup>

<sup>3</sup>See [the science behind this report](#) for detailed system configurations and benchmark results.



Kenneth is working on an assignment in Autodesk Tinkercad as he learns to navigate and manipulate virtual 3D spaces. With his Intel Pentium Silver N6000 processor-powered Chromebook, he can use Tinkercad functions in less time than it would take with the class' previous MediaTek MT8183 processor-powered Chromebooks.

## A more responsive computer-assisted design experience

In our test with the computer-assisted design (CAD) app Tinkercad, the Intel Pentium Silver N6000 processor-powered Chromebook enabled us to use the Copy and Tinker function in 13.5 fewer seconds than the MediaTek MT8183 processor-powered Chromebook, a difference of 33 percent.

### Save 13 seconds using the Copy and Tinker function

with Autodesk Tinkercad  
Time (sec)



**33%**  
less time<sup>A</sup>

- HP Chromebook 11 G9 EE with an Intel Pentium Silver N6000 processor
- Acer Chromebook Spin 311 CP311-3H-K23X with a MediaTek MT8183 processor

Figure 6: Time (in seconds) to use the Copy and Tinker function in Tinkercad. Less time is better. Source: Principled Technologies.

#### Autodesk Tinkercad

Tinkercad is a browser-based program for computer-aided design.<sup>4</sup> Common Sense Education® gave Tinkercad a 4 out of 5 star rating, citing the app's pedagogical implications.<sup>5</sup>

<sup>A</sup>See [the science behind this report](#) for detailed system configurations and benchmark results.





## Conclusion

Learning and working within a virtual classroom has its challenges, but wrestling with a sluggish device doesn't have to be one of them. In our tests, an Intel Pentium Silver N6000 processor-powered Chromebook enabled us to complete tasks in various apps in less time than with a MediaTek MT8183 processor-powered Chromebook, including some tasks that took place while on a two-way Google Meet call. The Intel Pentium Silver N6000 processor-powered Chromebook also had stronger performance during the Speedometer 2.0 benchmark test for web app responsiveness.

For more information, visit

<https://www.intel.com/content/www/us/en/education/right-device/chromebooks-for-education.html>.

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- 1 Javier Soltero, "Google Meet premium video meetings—free for everyone," accessed January 8, 2021, <https://www.blog.google/products/meet/bringing-google-meet-to-more-people/>.
  - 2 "Introducing Google Workspaces and a new set of offerings to better meet your needs," accessed January 8, 2021, <https://workspaceupdates.googleblog.com/2020/10/introducing-google-workspace.html>.
  - 3 "Adobe Lightroom," accessed January 8, 2021, [https://play.google.com/store/apps/details?id=com.adobe.lrmobile&hl=en\\_US](https://play.google.com/store/apps/details?id=com.adobe.lrmobile&hl=en_US).
  - 4 Chrome web store, "Tinkercad," accessed January 8, 2021, <https://chrome.google.com/webstore/detail/tinkercad/bhggmehigifnplipbkdfcjjacpcgidn>.
  - 5 Marianne Rogowski, "Tinkercad Review for Teachers," accessed January 8, 2021, <https://www.common sense.org/education/website/tinkercad>.

We concluded our hands-on testing on December 23, 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 December 21, 2020 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 hand-timed tasks for each Chromebook. Time is in seconds. Less time is better. Each result represents the median of three test runs.

Task	HP Chromebook 11 G9 EE with Intel Pentium Silver N6000 processor (pre-production unit)	Acer Chromebook Spin 311 CP311-3H-K23X with MediaTek MT8183 processor	Intel processor-powered Chromebook percentage less time
Opening a Google Slides™ presentation from Google Drive™ during a Google Meet call	24.7	55.1	55%
Changing slides in Google Slides during a Google Meet call	2.1	3.7	43%
Copying and pasting a table in Google Slides during a Google Meet call	3.2	5.1	37%
Importing 140 photos into Adobe Lightroom®	87.3	216.6	59%
Batch-processing 140 photos with a filter preset in Adobe Lightroom	42.5	80.2	47%
Exporting 140 photos from Adobe Lightroom	83.7	201.6	58%
Using the Copy and Tinker function for the Rally Car project in Autodesk® Tinkercad®	27.3	40.8	33%

Table 2: Results of the Speedometer 2.0 benchmarking test for each Chromebook. A higher score is better. Each result represents the median of three test runs.

	HP Chromebook 11 G9 EE with Intel Pentium Silver N6000 processor (pre-production unit)	Acer Chromebook Spin 311 CP311-3H-K23X with MediaTek MT8183 processor	Intel processor-powered Chromebook percent higher score
Speedometer 2.0 score	81.1	27.7	192%



## System configuration information

Table 3: Detailed information on the systems we tested.

System	HP Chromebook 11 G9 EE (pre-production unit)	Acer Chromebook Spin 311 CP311-3H-K23X
Processor	Intel Pentium Silver N6000	MediaTek MT8183
Processor frequency (GHz)	1.10	1.6
Processor cores	4	8
Memory (GB)	4	4
Storage (GB)	64	32
USB	2 x USB 3.1 Type-C 2 x USB 3.1 Gen 1	1 x USB 3.1 Type-C 1 x USB 3.1 Gen 1
Battery type	Lithium ion	Lithium ion
Battery capacity (Wh)	48	38
Display (in.)	11.6	11.6
Display resolution	1366 x 768	1366 x 768
OS (version)	87.0.4280.51	87.0.4280.109
System weight (lbs.)	3.19	2.62

# How we tested

## Application testing

For each scenario, we downloaded, installed, and pinned the requisite apps to the Chrome shelf. For applications that required accounts, we created test profiles and logged in the users on each device. We conducted three test runs for each task. We reset the Chromebook between each run.

### Testing tasks in Adobe Lightroom

#### Importing 140 photos

1. From the Adobe Lightroom home page, click the blue Import Photos icon.
2. Sort by Device Folders, and select the unarchived test photos by clicking the checkbox next to the folder name.
3. Simultaneously start the timer and click Add.
4. When the import dialog completes, stop the timer.

#### Batch-processing 140 photos with 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. In the top right, click the menu button, and select Copy Settings.
6. Leave the default settings, and click OK.
7. To return to the collection view, click the back arrow.
8. To select the first photo, long-click it.
9. In the top right, click the menu button, and select Select All.
10. Click the menu button again, and select Paste Settings.
11. Simultaneously start the timer and click Apply.
12. When the processing dialog closes, and the phrase “Changes applied to 140 photos” appears, stop the timer.

#### Exporting 140 photos

1. From the Adobe Lightroom home page, click the collection containing the test photos.
2. To select the first image, click it.
3. From the drop-down menu, click 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.
7. Simultaneously start the timer and click the checkmark icon.
8. When the export dialog completes, stop the timer.

### Testing in Autodesk Tinkercad

#### Using the Copy and Tinker function on the 3D Rally Car project

1. From the Chrome web browser, navigate to the test project at <https://tinkercad.com/things/4x4r4zQv1bL>.
2. Simultaneously start the timer and click Copy and Tinker.
3. When the 3D model has fully loaded, stop the timer.

## Multitasking with Google Meet

To conduct our multitasking testing, we opened Google Meet in the Chrome web browser and joined a two-participant video meeting.

### Joining the meeting

1. Open the Chrome web browser.
2. Open a new tab, and enter the meeting URL.
3. Click to join the meeting.
4. 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.
5. From the meeting host, share and begin playback of the following YouTube video: <https://www.youtube.com/watch?v=4VQYiksNQFQ>.
6. Open a new tab, and complete the tasks below.

### Opening a Google Slides presentation from Google Drive

1. Navigate to <https://drive.google.com>.
2. Locate the test presentation file. Right-click the file, and hover the cursor over Open With.
3. Simultaneously start the timer and click Google Slides.
4. When the presentation fully loads in Google Slides, stop the timer.

### Changing a slide in the Google Slides presentation

1. With the test presentation open, simultaneously start the timer and click the second slide.
2. When the second slide has fully loaded into the current slide preview, stop the timer.

### Copying and pasting a table in Google Slides

1. With the test presentation open, click a table column to select it.
2. Copy the table column.
3. Click the blank slide.
4. Simultaneously start the timer and paste the table.
5. When the copied content fully loads, stop the timer.

## Testing with Speedometer 2.0

### Running the Speedometer 2.0 benchmark test

1. From the Chrome web browser, navigate to <https://browserbench.org/Speedometer2.0/>.
2. Ensure the browser window fits the required view port size.
3. Click Start Test.
4. When the test completes, record the results.



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.

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Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

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