Dell™
Chromebook™ 5190
with an
Intel® Celeron®
processor N3350

**Convert model 27% faster**
in Tinkercad

**Export music as .WAV 31% faster**
in Flat

**Insert graph 24% faster**
in EquatIO

# Invest in academic success with the Intel Celeron processor-powered Dell Chromebook 5190

## A Chromebook™ powered by the Intel® Celeron® processor N3350 could boost student engagement for a supportive learning environment

A child's education is cumulative—experiences now can build the foundation for a successful academic future. To that end, fast Chromebooks could be the gateway to knowledge for a new generation of students. Teachers can fine-tune their lessons using subject-specific apps that keep students eager to explore, engage, and find their passion. The Chromebooks you select for your school or school district should be responsive enough to keep students on task today while setting students on a path that allows them to skillfully navigate their academic careers.

At Principled Technologies, we discovered that the new Dell Chromebook 5190 with Intel Celeron processor N3350 improved upon a Dell Chromebook 11 3180 with Intel Celeron processor N3060 in standard performance tests. We also noted that it was more responsive on popular apps that kids use throughout their K-12 careers. Selecting the faster-performing device now could mean a better experience for students down the road.

The following pages describe a fictional scenario in which young students use their Intel processor-powered Chromebooks for classroom projects. Though the story is hypothetical, it's based on PT facts. For more detailed testing information, see the appendices beginning on .

## A principal's story—How new tech affects classroom learning

Jamila Sanders is the principal of a K-8 school in the city. Her school recently upgraded their older devices based on the Intel Celeron processor N3350, and today she's observing several classrooms to determine how the school's new Dell Chromebooks are affecting student learning. Read on to see what Jamila and the rest of the faculty thinks about their new Dell Chromebook 5190 devices, powered by the Intel Celeron processor N3350.

**Dell Chromebook 5190**

**Principal**
*Jamila Sanders*

**24%**
**less time**

**Insert graph into Google Drawings**
in EquatIO

**19%**
**less time**

**Create new code project**
in Code.org

**23%**
**less time**

**Open local presentation**
in Explain Everything

# Math and computer science with a Chromebook powered by the Intel Celeron processor N3350

A flurry of meeting requests, complaints, and updates await Principal Sanders when she arrives to school—a Monday morning tradition. She answers all the messages she can before moving on to the bulk of today's mission.

For Jamila, today is Technology Day. She's meeting with teachers and observing classes to see how the school's tech upgrade initiative affects student learning. In particular, Jamila wants to know if the new Dell Chromebooks powered by Intel Celeron processors N3350 are faster than their old devices powered by the Intel Celeron processor.

First on her agenda is a meeting with one of the computer science teachers, Ms. Lovelace. In her opinion, the new Chromebooks get high marks. She tells Principal Sanders that the kids love interacting with the new touchscreen devices.

The new Chromebooks have been helpful with speeding up classroom activities, allowing students to work with graphs and code projects quickly. They've also been a huge help for her own work—Ms. Lovelace loves how quickly her presentations load on her Dell Chromebook powered by the Intel Celeron N3350 processor.

## EquatIO

Rating: 3.5/5 stars[1]
Users: 1,000,000+[1]

A web tool that allows students to input math equations into fields in their web browser (such as for use with Google Docs). Students can either type or handwrite mathematical expressions.[1]

## Code.org

Users: 1,800,000+[2]

Code.org is a nonprofit organization that supports underrepresented students in their quest to learn computer science. Over 1.8 million users have created over 24 million projects with the Code.org web apps.[3]

Code.org has partnered with 180 of the largest school districts in the U.S. to add computer science to the curriculum. Their courses are available in over 50 languages, and they're used in over 180 countries.[3]

## Explain Everything

Users: 6,000,000+[4]

Explain Everything is an interactive whiteboard app where teachers and students can collaborate in real time. According to Tech Crunch, the Los Angeles public school district installed it on 70,000 educational tablets. The software can also be found on 50 percent of all educational iPads in the UK.[5]
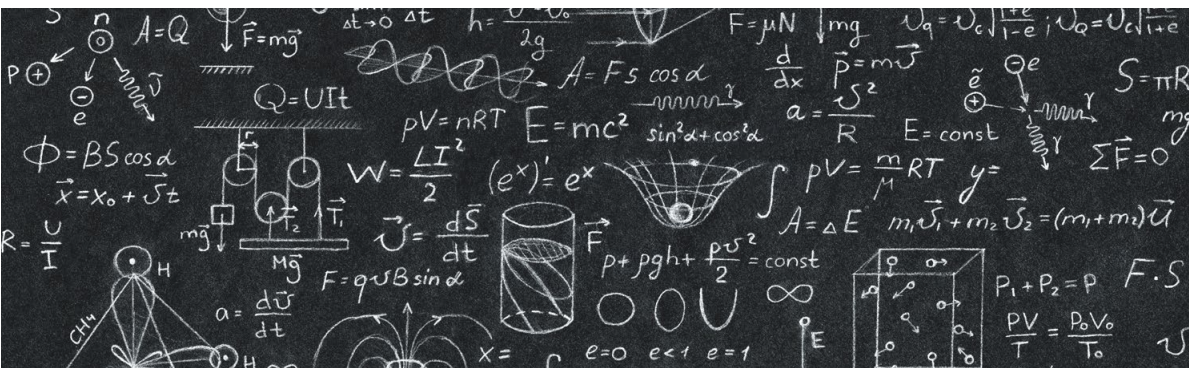
**16%**
**less time**

### Render 720p video
in WeVideo

**22%**
**less time**

### Render science report video
in Toontastic

### Stop Motion Studio

Rating: 4.1/5 stars[10]
Users: 1,000,000+[10]

Stop Motion Studio allows students to create their own stop-motion animations. Common Sense Media gave the app a favorable review, praising its simplicity and ease of use.[11]

**21%**
**less time**

### Render stop-motion video
in Stop Motion Studio

# Faster video exports with Dell Chromebooks powered by the Intel Celeron N3350 processor

Next on Principal Sanders' agenda are a few classroom observations, since it's important for her to see how the Chromebooks work in real classrooms.

Jamila heads to Mr. Kurosawa's video elective class, where students are hard at work putting together videos that show off creative storytelling. Jamila looks around and sees lots of colorful videos—even stop-motion animations.

As the children work, Mr. Kurosawa gives Jamila a glowing review of the new Chromebooks powered by the Intel Celeron processor N3350.

> "All the video projects go by so much faster."

Mr. Kurosawa says that his students are able to export their videos faster, which makes the export-and-revise cycle seem less daunting. It's also improved class focus—faster render times have led to less boredom and fewer opportunities for kids to get distracted and off-topic, though it hasn't gotten rid of them completely.

"Kids are still kids, after all," Mr. Kurosawa says with a smile, just as a few of his students get out of their seats to chat and gawk at one another's work.

### WeVideo

Rating: 4.1/5 stars[6]
Users: 5,000,000+[6]

Featured on tech journalism sites such as TechCruch, Wired, CNET, and more, the WeVideo Video Editor enables users to create beautiful videos and sync edits across different devices. In February 2018, the Video Editor app earned the distinction of an Android Excellence App.[7]

### Toontastic

Rating: 4.5/5 stars[8]
Users: 500,000+[8]

Toontastic is an interactive storytelling studio that enables young students to create their own adventure stories, science reports, or anything else they can think of.[9]

**23%**
**less time**

### Render stop-motion video as GIF
in Stop Motion Studio

**19%**
less time

**Merge tracks**
in Soundtrap

**14%**
less time

**Create new piano scores**
in Flat

**31%**
less time

**Export music as .WAV**
in Flat

# Collaborative music with Chromebooks powered by the Intel Celeron processor N3350

Principal Sanders passes by the band room on her way to her next scheduled observation, but she stops when she sees the kids are working on their computers instead of instruments.

The music teacher, Dr. Joplin, is out sick. Because the substitute isn't familiar with the student repertoire, he decided to check out a cart of Chromebooks and introduce the kids to the world of music composition. All around the room, kids are collaborating on digital bars of black and white. Some are even working on wholly electronic creations.

Jamila wishes these technologies had been around when she was a child. Maybe she would have stuck with music longer if she'd been able to interact and collaborate as the kids are doing now.

Jamila only stays a few minutes before quietly slipping out the door. It's apparent that the Intel Celeron N3350 processor-powered Dell Chromebooks are helping kids in unexpected ways.

### Flat

Rating: 4/5 stars[11]
Users: 115,000+[11]

Flat is a collaborative online music notation app that lets students write music together. Flat is compliant with the Children's Online Privacy Protection Act (COPPA) and the Family Educational Rights and Privacy Act (FERPA).[12] It is also fully integrated with Google Classroom apps.[13]

### Soundtrap®

Rating: 4.1/5 stars[14]
Users: 100,000+[14]

Soundtrap is a web application for creating digital audio creations such as music, podcasts, language studies, and more. According to Soundtrap, more than 10,000 teachers worldwide trust their educational program.[15]

## BlocksCAD

BlocksCAD is a 3D modeling program aimed at young students of design, computer science, and visual mathematics. BlocksCAD also offers an Education program that allows teachers to create classes, manage student accounts, and more.[16]

## Tinkercad

Rating: 3.6/5 stars[17]
Users: 380,000+[17]

Tinkercad is a browser-based program for computer-aided design. Common Sense Media gave Tinkercad a 4/5-star rating, praising the app's pedagogical implications.[18]

## Faster, more interactive 3D modeling with a Chromebook powered by the Intel Celeron N3350 processor

Last on Jamila's classroom tour is Mrs. Hadid's CAD class—computer-assisted design. Here, students are working with 3D modeling, expanding their minds with yet another subject Jamila could only have dreamed of as a child. LEGO blocks must have inspired scores of architects, designers, and inventors. Maybe there are a few in this little classroom too.

Mrs. Hadid has only great things to say about her class' experience with the new Chromebooks. The responsive touchscreen has been instrumental in helping kids grasp the spatial reasoning required for designing in three dimensions. Students find their projects load, convert, and render faster than before, helping to streamline the first part of class.

**21% less time**

**Create new design** in Tinkercad

**10% less time**

**Open House model** in Tinkercad

**27% less time**

**Convert model to Bricks 3D editor** in Tinkercad

**6% less time**

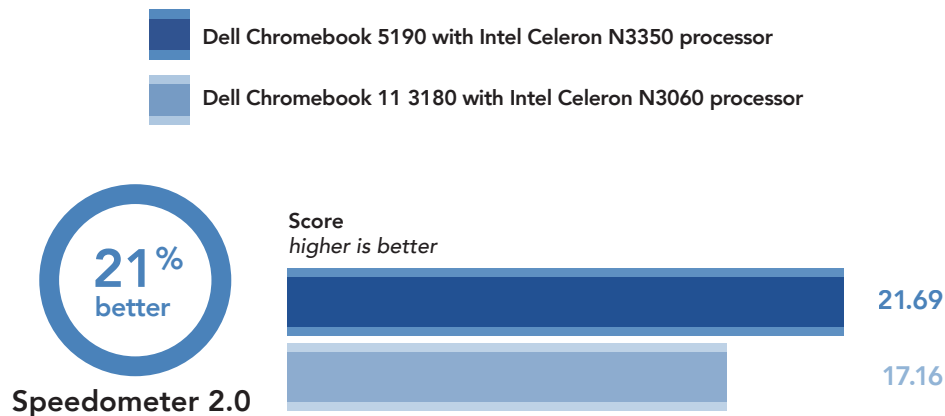**Render House project** in BlocksCAD

# Benchmark results

We ran several benchmark tests to gauge the performance of each Chromebook before timing individual use cases.

## Speedometer 2.0

Speedometer is a browser benchmark that measures the responsiveness of web programs. It simulates real-world user actions via a set of applications. Webkit and Chromium developers collaborated on the 2.0 version to better reflect how the web works today.[19]

■ Dell Chromebook 5190 with Intel Celeron N3350 processor

■ Dell Chromebook 11 3180 with Intel Celeron N3060 processor

**21% better**

**Speedometer 2.0**

Score
*higher is better*

21.69

17.16

## Octane 2.0

Consisting of 17 tests, this benchmark from Google measures webpage JavaScript performance with a suite of tests that tap into a variety of use cases. The developers have selected new tests for this 2.0 version to assess performance on real-world code.[20]

**26% better**

**Octane 2.0**

Score
*higher is better*

10,642

7,905
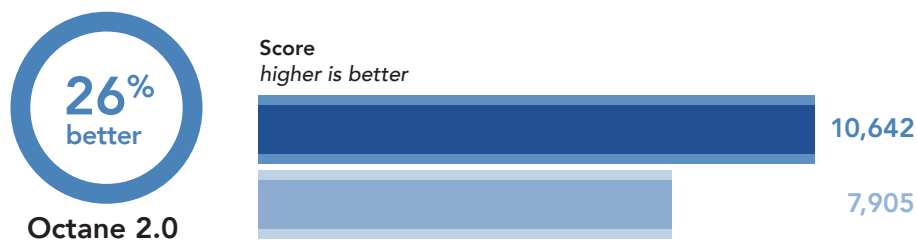
## 3DMark

Often used to assess performance on gaming devices, 3DMark tests the 3D graphics capabilities of smartphones, tablets, notebooks and more. In an academic setting, 3DMark can inform users on how well their device can render items such as CAD models.[21]

**20% better**

**3DMark**

Score
*higher is better*

17,251

13,814
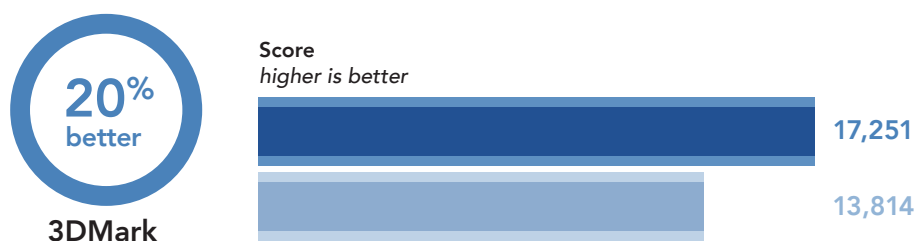
## Conclusion

Each of the teachers Principal Sanders spoke with today had nothing but good things to say about the new Dell Chromebooks. The classrooms themselves were full of students learning in new and exciting ways. The school's Intel Celeron N3350 processor-powered Dell Chromebook 5190 devices have prevented long wait times and kept kids engaged in their work. In her next administrative meeting, Jamila will be sure to mention she believes the new technology has been a good investment for the school—and for her students' education.

1   "EquatIO – Math made digital – Chrome Web Store," accessed April 25, 2018.
    https://chrome.google.com/webstore/detail/equatio-math-made-digital/hjngolefdpdnooamgdldlkjgmdcmcjnc

2   "Projects," accessed April 25, 2018. https://studio.code.org/projects/public

3   "About Us | Code.org," accessed April 25, 2018. https://code.org/about

4   "Explain Everything | Interactive Whiteboard App," accessed April 25, 2018. https://explaineverything.com/

5   John Biggs, "Explain Everything, the digital whiteboard, raises $3.7 million to bring learning to the iPad," accessed April 25, 2018.
    https://techcrunch.com/2016/12/15/explaineverything-the-digital-whiteboard-raises-3-7-million-to-bring-learning-to-the-ipad/

6   "Video Editor – Apps on Google Play," accessed April 25, 2018.
    https://play.google.com/store/apps/details?id=com.wevideo.mobile.android

7   "WeVideo Awarded as Android Excellence App by Google," accessed April 25, 2018. http://www.prweb.com/releases/2018/02/pr-web15220090.htm

8   Toontastic 3D – Apps on Google Play. https://play.google.com/store/apps/details?id=com.google.toontastic

9   "Toontastic 3D | Creative Storytelling App," accessed April 25, 2018. https://toontastic.withgoogle.com/

10  "Stop Motion Studio – Apps on Google Play," accessed April 25, 2018
    https://play.google.com/store/apps/details?id=com.cateater.stopmotionstudio

11  "Stop Motion Studio App Review," accessed April 25 2018. https://www.commonsensemedia.org/app-reviews/stop-motion-studio

12  "Flat – Music scores and guitar tabs editor," accessed April 25, 2018
    https://chrome.google.com/webstore/detail/flat-music-scores-and-gui/mgfkpiieempkmppimblkblmlcmbdkbcg

13  "We care about your privacy," accessed April 25, 2018. https://flat.io/edu#privacy-coppa

14  "Teach music to your students," accessed April 25, 2018. https://flat.io/edu#google-classroom

15  "Soundtrap – Make Music Online – Google Play Store," accessed April 25, 2018
    https://play.google.com/store/apps/details?id=com.soundtrap.studioapp

16  "Educators | BlocksCAD," accessed April 25, 2018. https://www.blockscad3d.com/educators

17  "Tinkercad – Chrome Web Store," accessed April 25, 2018
    https://chrome.google.com/webstore/detail/tinkercad/bhggmehigifnpflipbkdfcjiacpcgidn

18  "Tinkercad Review for Teachers | Common Sense Education," accessed April 25, 2018
    https://www.commonsense.org/education/website/tinkercad

19  Addy Osmani et al., "Speedometer 2.0: A Benchmark for Modern Web App Responsiveness," accessed April 26, 2018
    https://webkit.org/blog/8063/speedometer-2-0-a-benchmark-for-modern-web-app-responsiveness/

20  "The Benchmark | Octane | Google Developers," accessed April 26, 2018. https://developers.google.com/octane/benchmark

21  Ed Lopategui, "Benchmarks: time to put your CAD workstation to the test," accessed April 26, 2018
    https://blog.grabcad.com/blog/2016/03/16/benchmarks-cad-workstation/

On April 2, 2018, 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 April 16, 2018.

## Appendix A: System configuration information

| System configuration information | Dell Chromebook 11 3180 | Dell Chromebook 5190 2-in-1 |
| --- | --- | --- |
| Processor | Intel Celeron N3060 | Intel Celeron N3350 |
| Processor freq (GHz) | 1.6-2.48 | 1.1-2.4 |
| Processor cores | 2 | 2 |
| Memory (GB) | 4 | 4 |
| Storage (GB) | 32 | 32 |
| Battery type | Li-Ion | Li-Ion |
| Battery capacity (Wh) | 42 | 42 |
| Display | 11.6" 1,366x768 (no touch) | 11.6" 1,366x768 (touchscreen) |
| Wireless | 802.11 AC | 802.11 AC |
| Bluetooth | 4.0 | 4.0 |
| USB ports | 2x USB 3.1 Gen 1 | 2x USB 3.1 Gen 1, 2x USB Type-C |
| System weight (lbs.) | 2.7 | 3.1 |
| OS (version) | 65.0.3325.184 | 64.0.3282.190 |
| Build/firmware | Kefka.7287.379.0 | Coral.10068.34.0 |

# 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.

    - reddit.com/r/pics
    - instagram.com/intel
    - simple.wikipedia.org
    - 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.

## WeVideo Video Editor

**Render 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.  Star the timer, and click Save with watermark.
9.  Stop the timer when the saving completes.

## Soundtrap

**Merge tracks**

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

## Explain Everything

**Open local presentation (Immune System)**

1.  Install Explain Everything from the Google Play Store, and pin the app to the shelf.
2.  From the shelf, click the Explain Everything icon to launch the app.
3.  Start the timer, and click the Immune System local project.
4.  Stop the timer when the project fully loads.

## Tinkercad

### Create new Design

1. Install Tinkercad from the Google Chrome Store, and pin the app to the shelf.
2. Launch the app from the shelf.
3. Start the timer, and click Create new design.
4. Stop the timer when the design editor fully loads.

### Open house model

1. Launch the app from the shelf, and click Gallery.
2. From the model Gallery, locate the house 3D model, and click to open the model preview.
3. Start the timer, and click Duplicate and Tinker.
4. Stop the timer when the model has fully loaded in the editor.

### Convert model to Bricks 3D editor

1. Launch the app from the shelf, and click Gallery.
2. From the model Gallery, locate the house 3D model, and click to open the model preview.
3. Start the timer, and click Duplicate and Tinker.
4. Stop the timer when the model has fully loaded in the editor.

## Stop Motion Studio

### Render 100-frame stop-motion video

1. Install Stop Motion Studio from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click New Movie.
3. Click the Camera icon.
4. To make testing fair between devices, we pointed the camera at a static, non-moving scene before capturing our photos. Click and capture 100 photos.
5. Click the play button.
6. From the movie preview, click the share icon.
7. From the share menu, click Export Movie. Click Save As.
8. Start the timer, and click HD – 720p.
9. Stop the timer when the export process completes.

### Render 100-frame stop-motion video as GIF

1. Launch the app from the shelf, and click New Movie.
2. Click the Camera icon.
3. To make testing fair between devices, we pointed the camera at a static, non-moving scene before capturing our photos. Click and capture 100 photos.
4. Click the play button.
5. From the movie preview, click the share icon.
6. From the share menu, click Animated GIF.
7. Start the timer, and click Save As.
8. Stop the timer when the GIF finishes saving.

## Toontastic

### Render one-minute Science Report video

1. Install Toontastic from the Google Play Store, and pin the app to the shelf.
2. Launch the app from the shelf, and click the + icon to start a new project.
3. Click the Science Report template.
4. Click the Experiment section.
5. Click the Tunich's Temple setting.
6. Click and add seven characters: City, Space, Fruit Ninja, Explorers, Pirates, Atlantis, and Spy. Click Next.
7. Click Start to record the scene.
8. When the scene completes recording, click the Check icon to confirm the mood.
9. From the overview section, click Finish.
10. Enter a Title and Director name, and click the Check icon.
11. When the movie preview completes, start the timer, and click Export.
12. Stop the timer when the export process completes.

## BlocksCAD

### Load 3D pineapple project

1. From the Chrome browser, navigate to blockscad3d.com.
2. Click Gallery.
3. In the search field, search for Pineapple.
4. Click the Pineapple project to open the model preview.
5. From the model preview, start the timer and click Create my own.
6. Stop the timer when the model fully loads into the editor.

### Render house project (smooth: High)

1. From the Chrome browser, navigate to blockscad3d.com.
2. Click Gallery.
3. In the search field, search for House.
4. Click the House project to open the model preview.
5. From the model preview, click Create my own.
6. Click the radio button in the Smooth settings from Medium to High.
7. Start the timer, and click Render.
8. Stop the timer when the rendering process completes.

## Code.org

### Create new project

1. From the Chrome browser, navigate to www.code.org.
2. Scroll to the Start a new project section.
3. Start the timer, and click Artist.
4. Stop the timer when the project editor fully loads.

## EquatIO

**Insert graph into Google Drawings**

1.   Install the EqautIO extension from the Chrome Store.
2.   From the Chrome Browser, navigate to drawings.google.com.
3.   When the drawing editor loads, click the EqautIO extension icon.
4.   Click the Graph Editor icon.
5.   In the graph equation field, enter the following equation: $Y = (1/x^3)$
6.   Start the timer, and click Insert Graph.
7.   Stop the timer when the graph fully loads into Google Drawings.

## Flat

**Export sheet music as lossless .WAV file**

1.   From the Chrome Browser, navigate to flat.io.
2.   From the profile page, click Create a new Private Score.
3.   Enter a title for the document, and click Continue.
4.   From the Strings section, add a Contrabass and Violoncello.
5.   Click Create.
6.   Using an image of the original score for reference, adjust the time signature, and recreate the first 10 measures of Für Elise.
7.   Click the Export icon.
8.   From the drop-down menu, select Audio lossless (*.wav).
9.   Leaving Full score with all the parts selected, start the timer, and click Export.
10.  Stop the timer when the export process completes.