The science behind the report:

Lenovo ThinkBook 13x Gen 2: Amplify performance without spending more

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 Lenovo ThinkBook 13x Gen 2: Amplify performance without spending more.

We concluded our hands-on testing on October 26, 2023. 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 12, 2023 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.

Performance benchmark results

Table 1: The table below represents our benchmark results in detail. Higher benchmark scores are better. We report the median score of three runs for each test.

	Lenovo® ThinkBook 13x Gen 2	13-inch Apple® MacBook® Air
Cinebench R23 vR23.200 (score, higher is better)		
Single-core	1,651	1,593
Single-core (sustained)	1,615	1,590

System and application responsiveness results

Table 2: The table below represents our hand-timed test findings in detail. Lower times are better. We report the median time of three runs for each test.

	Lenovo® ThinkBook 13x Gen 2	13-inch Apple® MacBook® Air
System boot and shutdown (seconds, lower is better)		
Time to boot	16.91	18.44
Microsoft Office Word (seconds, lower is better)		
Time to launch	1.1	1.3
Time to open 90MB Word document	1.1	1.2
Microsoft Office Excel (seconds, lower is better)		
Time to open 650KB 10K row Excel spreadsheet	0.9	1.2
Time to insert 3-D 100% Stacked Column Chart	18.5	23.0

Audio testing

Table 3: The table below represents our audio findings in detail. Lower percentage of maximum volume output to reach target dB is better. We report the median score of three runs for each test.

	Lenovo® ThinkBook 13x Gen 2	13-inch Apple® MacBook® Air
Speaker volume output required to reach 64 dB		
Volume (percent, lower is better)	46	75

System configuration information

Table 4: Detailed information on the systems we tested.

System configuration information	Lenovo ThinkBook 13x Gen 2 13"	Apple MacBook Pro 13
Processor		
Vendor	Intel®	Apple
Model number	Core® i7-1255U	M2
Core frequency	3.5-4.70 GHz	3.49 GHz
Number of cores	10	8
Logical processors	12	N/A
Memory		
Amount	16 GB	16 GB
Type	LPDDR5	Unified
Graphics #1		
Vendor	Intel	Apple
Model number	Intel Iris® Xe Graphics	M2 10-core GPU
Storage		
Amount	1 TB	1 TB
Type	SSD	SSD
Connectivity/expansion		
Wireless internet	Intel Wi-Fi 6E AX211	Wi-Fi 6E (802.11ax)
Bluetooth	5.3	5.3
USB	1 x Thunderbolt™ 4 ports 2 x USB-C	1 x MagSafe3 port 2 x Thunderbolt 4 ports
Battery		
Type	Integrated Lithium-polymer	Integrated Lithium-polymer
Rated capacity	56 Whr	52.6 Whr
Display		
Size	13.2"	13.6"
Resolution	2,560 x 1,600	2,560 x 1,664
Operating system		
Vendor	Microsoft	Apple
Name	Windows 11 Pro	macOS® Ventura
Version	22H2 Build 22621.2134	13.5.1
BIOS		
BIOS name and version	Lenovo HXCN54WW	8422.141.2

System configuration information	Lenovo ThinkBook 13x Gen 2 13"	Apple MacBook Pro 13
Dimensions		
Height (in)	1.4	0.44
Width (in)	7	11.97
Depth (in)	7.2	8.46
Weight (system) lbs.	2.10	2.11

How we tested

Setting up the system (Windows)

Setting up and updating the OEM image

1. Boot the system under test (SUT).
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set the Windows (plugged in) Power Mode to Best Performance.
4. Set Screen and Sleep options to Never:

   a. Right-click the desktop, and select Display settings.
   b. From the left column, select System.
   c. Click Power & Battery.
   d. For all power options listed under Screen and Sleep, select Never.

5. Disable User Account Control notifications:

   a. Select Windows Start, type `UAC`, and press Enter.
   b. Move the slider control to Never notify, and click OK.

6. Run Windows Update, and install all updates available.
7. Verify the date and time are correct, and synchronize the system clock with the time server.
8. Pause Automatic Windows Updates:

   a. Click the Windows Start button.

9. Type `Windows Update settings` and press Enter.

   a. From the Pause updates drop-down menu, select Pause for 5 weeks.

Setting up the system (macOS)

Setting up and updating the OEM image

1. Boot the SUT.
2. Follow the on-screen instructions to complete installation, using the default selections when appropriate.
3. Set Screen and Sleep options to Never:

   a. Select System Settings.
   b. Select Screensaver.
   c. Set Lock Screen Settings to Never.
   d. Return to System Settings, and select Battery.
   e. Set On power adapter setting to High Power.

4. Disable Automatically adjust brightness:

   a. Select System Settings.
   b. Select Display.
   c. Disable Automatically adjust brightness.

5. Run Software Update, and install all updates available.
6. Verify the date and time are correct.
7. Enable Automatic log in:

   a. Select System Settings.
   b. Click Users & Groups.
   c. Select the drop-down menu next to the Automatically log in as setting, and select the User account.

8. Disable Automatic Mac Updates:

   a. Select System Settings.
   b. Click General.
   c. Click Software Update.
   d. Click the information icon next to Automatic updates.
   e. Disable Check for updates.

Performance benchmark testing

Cinebench R23 benchmark testing

Setting up the Cinebench R23 test (Windows & macOS)

1. Download and install Cinebench from https://www.maxon.net/en/downloads/cinebench-r23-downloads.

Running the Cinebench R23 benchmark (Windows & macOS)

1. Launch Cinebench.
2. Select File→Advanced benchmark.
3. Set the Minimum Test Duration to Off.
4. Select either CPU (Multi Core) or CPU (Single Core), and click Start.
5. Record the result.
6. Wait 15 minutes before re-running.
7. Repeat steps 1 through 6 two more times.

Hand-timed boot testing

Notes:

- A stopwatch is necessary for timing purposes.
- On the Windows system, configure Windows Hello. On the Mac system, configure Touch ID.

Running the test (Windows & macOS)

1. Simultaneously start the timer and boot the system.
2. Stop the timer when the Windows Taskbar or macOS Dock appears.
3. Record the result as the Boot time.
4. Allow the system to remain booted for 2 minutes.
5. Shut down the system.
6. Repeat steps 1 through 5 two more times, and report the median of the three runs.

Hand-timed custom workflow testing and multitasking scenarios

Time to complete the hand-timed Microsoft PowerPoint scenario

We recorded how long it took to export a 180MB PPTX to PDF. A stopwatch is required for this test.

We used the following application:

- Microsoft PowerPoint (Windows v16.0.16731.20194 & macOS v16.76.1.23082301)

Running the test (Windows & macOS)

1. Browse to where the test PowerPoint file is located.
2. Click File→Export→Create PDF/XPS.
3. Simultaneously start the timer and click Publish.
4. Stop the timer when the PDF has been created, and record the results.
5. Repeat steps 1 through 4 two more times.

Time to complete the hand-timed Microsoft Excel scenario

We recorded how long it took to open a 650KB 10K row Excel XLSX and insert a 3D 100% stacked column chart into the 10K row spreadsheet. A stopwatch is required for this test.

We used the following application:

• Microsoft Excel (Windows v16.0.16731.20194 & macOS v16.76.23081101)

Running the test (Windows & macOS)

1. Launch Excel, and browse to where the test Excel 10K row file is located.
2. Simultaneously start the timer and open the 10K row file.
3. Stop the timer when the Excel file has loaded.
4. Click Insert, and select the drop-down menu next to the Insert Column or Bar Chart icon.
5. At the bottom of the drop-down menu, select More Column Charts.
6. Under the Column section, choose 3-D 100% Stacked Column.
7. Simultaneously start the timer and click Ok.
8. Stop the timer when the 3-D 100% Stacked Column Chart appears.
9. Repeat steps 1 through 8 two more times.

Time to complete the hand-timed Microsoft Word scenario

We recorded how long it took to launch Word and open a 90MB Word DOCX file. A stopwatch is required for this test.

We used the following application:

• Microsoft Word (Windows v16.0.16731.20194 & macOS v16.49.23082301)

Running the test (Windows & macOS)

1. Simultaneously start the timer and launch Word.
2. Stop the timer when Word has loaded.
3. Locate the test Word file.
4. Simultaneously start the timer and open the Word file.
5. Stop the timer when the Word document has fully loaded.
6. Repeat steps 1 through 5 two more times.

Web-camera quality testing

1. Set each system brightness as close as possible to 200 nits without going below that level.
2. Using a Digital light meter (Dr.meter LX1330B), measure the room brightness.
3. For the Windows 11 system, open the Camera App. For macOS systems, open the Photo Booth App.
4. When positioned correctly, take a picture.

Audio quality testing

Note: We conducted testing in an audio room with an enclosed sound booth. In addition to the SUTs, we used one additional system, located in the audio room. We connected this system to the speaker in the sound booth.

Pre-test setup

1. Install Audacity on each SUT, and confirm that there are no issues with on-board mic recording.
2. Install VLC media player as a consistent media player on all SUTs.
3. Trim the sample song so that a roughly 20-second sample of the loudest part of the song remains.
4. Load the sample song file onto each SUT using a USB drive.

Microphone noise reduction

Setup

1. Place the Yamaha speaker in the sound booth, near the position where a laptop user would be speaking. Connect the speaker to the audio room computer, on which you have loaded a speaking sample representative of normal conversation. Use this same sample for each test for consistency.
2. Set the input volume of the onboard microphone to approximately 98%.
3. Place the SUT on the desk in the sound booth, and open Audacity. Measure the angle of screen tilt to maintain consistency across all SUTs. Press Record, and exit the sound booth.
4. On the audio room computer, press Play to play the speaking sample (roughly 20 seconds long).
5. Enter the sound booth, and stop recording in Audacity.
6. Transfer the recorded file to the audio room computer to analyze in Pro tools.
7. To match the stereo format of the Lenovo device recording, duplicate the Mac's mono audio file and combine the two mono duplicates into a single stereo track.
8. Use FabFilter Pro L2 in the Integrated setting in Loudness mode to measure the average loudness of both clips. Using clip gain as needed, level match clips to -21.1 LUFS. Note the volume difference of each system.
9. Add a fan in back corner of the sound booth, roughly 5 feet from the speaker. Keep the fan on and running at consistent speed during tests.

Testing

1. Place the SUT on the desk in the sound booth, and open Audacity. Measure the angle of screen tilt to maintain consistency across all SUTs. Press Record, and exit the sound booth.
2. Record at least 20 seconds of only fan noise.
3. Enter the sound booth, and stop recording in Audacity.
4. Transfer the recorded file to the audio room computer to analyze in Pro tools.
5. Level match recordings from both SUTs using the adjustment parameter from the "Setup" section.
6. Measure the volume level of fan noise using FabFilter Pro L2 using the Integrated setting in Loudness mode.

Maximum speaker volume output

Setup

1. Load VLC on each of the 12 SUTs with the file comprising the sample song clip.
2. Place Cirrus SPL meter in the audio booth in the same location as the speaker from Test 1.

Testing

1. Place the SUT on the desk in the sound booth. Measure the angle of screen tilt to maintain consistency across all SUTs.
2. Using the sample song clip and Cirrus SPL meter, adjust the output volume of each SUT to 64 dB. Measure SPL of all SUTs from the same distance and position. Document volume output level of SUT (0 percent to 100 percent).

Read the report at https://facts.pt/pp9st4G ▶

This project was commissioned by Lenovo.