Wait less and stay unplugged longer using Microsoft Windows 10 laptops with SSDs

Choose solid-state drives over hard disk drives to improve your Windows 10 laptop experience

When choosing your next Microsoft® Windows® 10 laptop, you have hundreds of options with a wide array of features, form factors, and hardware specs. But there's one thing that affects everything from user experience to performance and even battery life: storage. Choosing the right storage option can help narrow the field and make it more likely you'll be happy with your new device. So, which type of storage—solid-state drive (SSD) or hard disk drive (HDD)—has the most potential to improve your day-to-day experience? And how does storage impact battery life?

Our hands-on testing and review of 38 Windows 10 laptops[†] reveals a consistent story: Choosing a Windows 10 laptop with SSD storage over HDD storage reduces the time it takes your laptop to boot up, shut down, launch programs, and get on the web. Plus, the battery life on laptops equipped with SSDs was longer than the battery life on most of the laptops with HDD storage.

Read on to see how choosing a Windows 10 laptop with SSD storage can make the difference between a great experience and a mediocre one.

* Based on HDD and SSD averages

[†] Link to a list of laptops we tested

Stay unplugged up to
2X longer*

Start up and shut down up to
3X faster*

Access the web up to
48% faster*

Jump to the next task up to
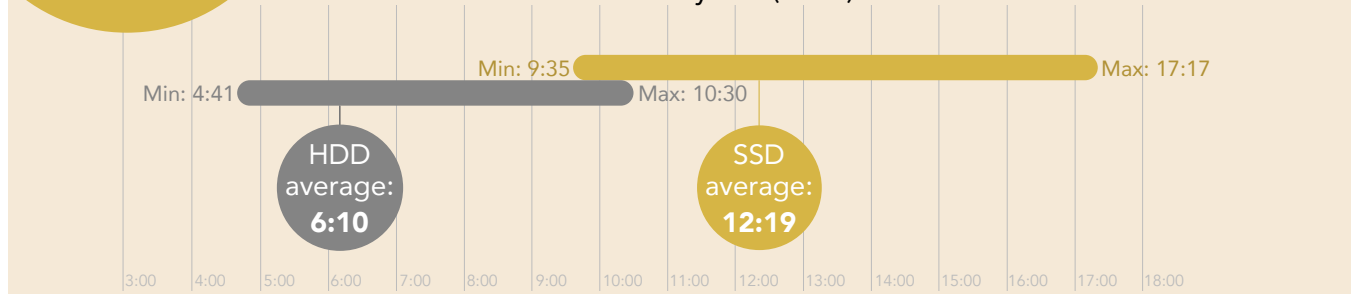## 52% faster*

Get more even when you spend less

Take full advantage of the internet without breaking the bank

Many people don't need to edit videos or do comprehensive financial analyses that require a terabyte (TB) of storage—they just need an entry-level Windows 10 laptop they can use to keep track of their schedules, create budgets, and access online resources. Our tests show that if price-conscious users choose an entry-level laptop with 64 GB of Embedded MultiMediaCard (eMMC) SSD storage, they get a laptop that accesses the web and online content faster than they could on a system powered by an HDD with 1 TB of storage.[†] Plus, most SSD laptops can also stay unplugged for at least a full 9-hour day according to our video playback results.
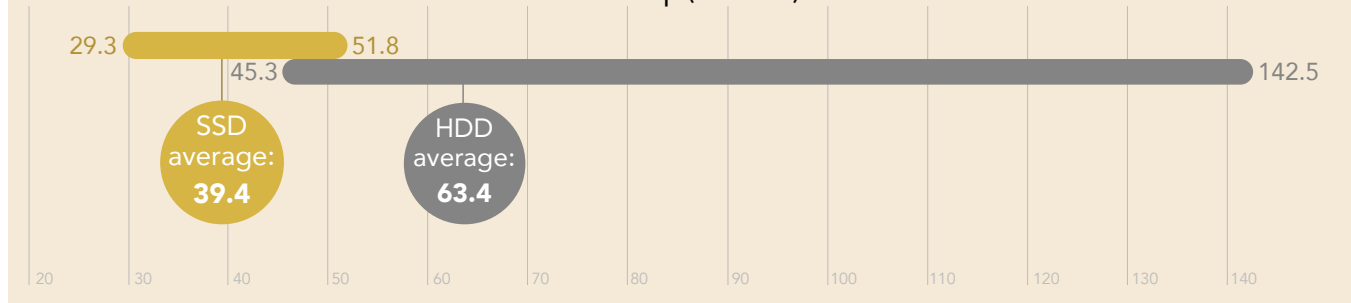
Entry-level laptops
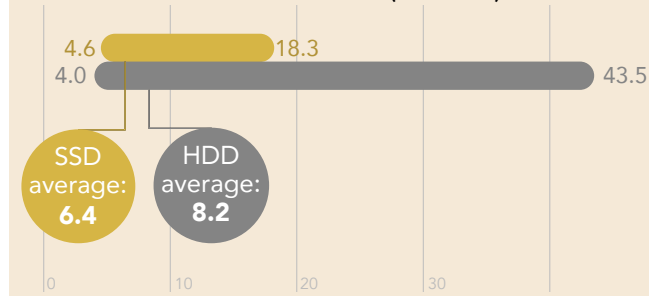
Stay unplugged up to 2X longer

Video battery life* (hours)

Min: 4:41   Min: 9:35   Max: 10:30   Max: 17:17

HDD average: **6:10**

SSD average: **12:19**

3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00

Start up and shut down up to 37% faster

Fast startup (seconds)**

29.3   51.8   45.3   142.5

SSD average: **39.4**

HDD average: **63.4**

20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140

Access the web up to 21% faster

Launch internet browsers (seconds)**

4.6   18.3   4.0   43.5

SSD average: **6.4**

HDD average: **8.2**

0 | 10 | 20 | 30

Jump to the next task up to 48% faster

Launch Microsoft Office programs (seconds)**

3.4   11.3   3.8   32.3

SSD average: **6.0**

HDD average: **11.7**

0 | 10 | 20 | 30
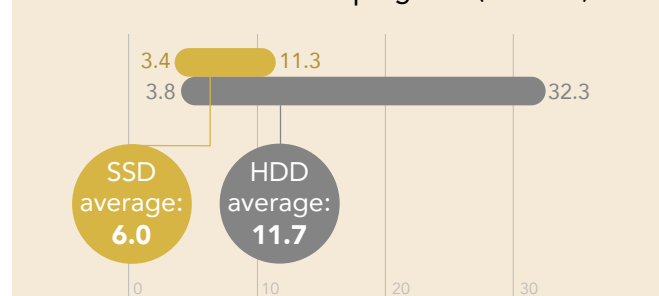
*Longer unplugged times are better
**Shorter wait times are better
[†] Link to entry-level laptop results
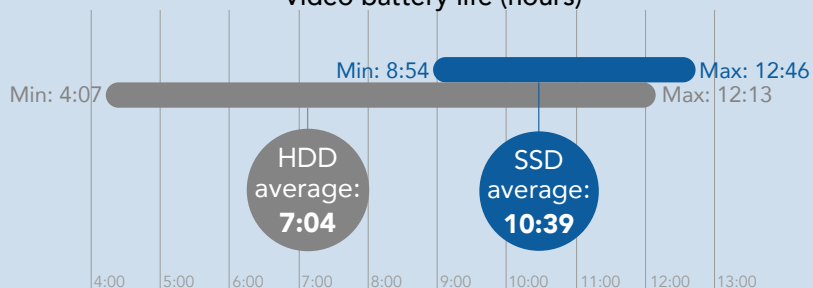
A hard lesson you can learn from

The amount of storage you get isn't as important as the type of storage you get

Imagine you're walking into a retail store to purchase a new computer and you see a mainstream Windows 10 laptop with a 1TB HDD that's on sale. If staying unplugged is important to you, don't be tempted by that high-capacity laptop—our test results show you may need to plug in a mainstream laptop with HDD storage after as few as four hours, whereas every mainstream laptop with SSD storage we tested ran unplugged a full eight-hour workday or longer.[†] HDD-powered laptop users may also have to wait up to 83 seconds every time they power up their machines.
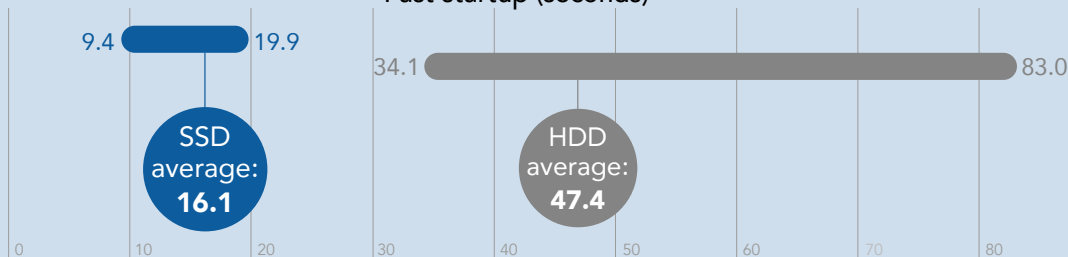
Mainstream laptops

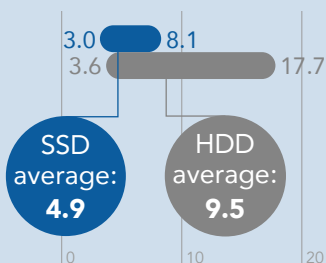### Stay unplugged up to 50% longer

Video battery life (hours)*

Min: 8:54   Max: 12:46
Min: 4:07   Max: 12:13

HDD average: 7:04

SSD average: 10:39

4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00

Start up and shut down up to 3X faster

Fast startup (seconds)**

9.4   19.9

SSD average: 16.1

34.1   83.0

HDD average: 47.4

0   10   20   30   40   50   60   70   80

Access the web up to 48% faster

Launch internet browsers (seconds)**

3.0   8.1
3.6   17.7

SSD average: 4.9

HDD average: 9.5

0   10   20

Jump to the next task up to 52% faster

Launch Microsoft Office programs (seconds)**

2.1   4.8
3.2   18.7

SSD average: 3.2

HDD average: 6.8

0   10   20
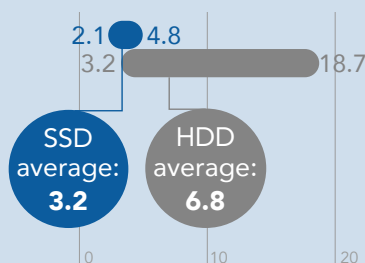
*Longer unplugged times are better
**Shorter wait times are better
[†] Link to mainstream laptop results
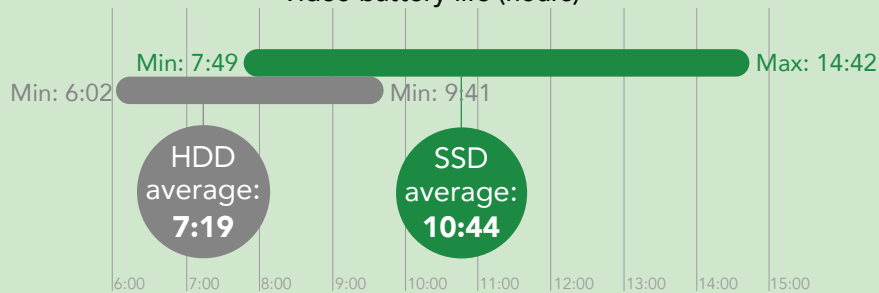
Stop spinning your wheels

Do what you want, where you want, for as long as you want

Do you need a Windows 10 laptop that excels at everything from mobile office work to effective client presentations? Our tests show that, if a performance-conscious user buys a premium Windows 10 laptop with a 256GB SSD, they could attack their to-do list, keep track of their finances, and write new project ideas in less time than they could on a system powered with a 1TB HDD.[†] And the premium laptops with SSDs we tested come with a minimum of almost eight hours of battery life. Less time waiting or looking for a power plug means you have more time to get important stuff done.

Premium laptops

Stay unplugged up to 46% longer

Video battery life (hours)*

Min: 7:49   Max: 14:42
Min: 6:02   Min: 9:41

HDD average: **7:19**

SSD average: **10:44**

6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00

Start up and shut down up to 2.8X faster

Fast startup (seconds)**

9.4   21.5
34.7   43.1

SSD average: **14.1**

HDD average: **40.5**

0   10   20   30   40   50
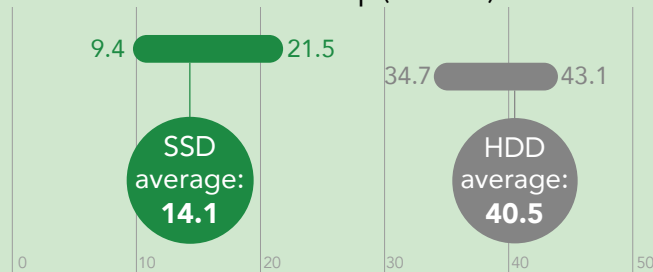
Access the web up to 34% faster

Launch internet browsers (seconds)**

2.8 6.0
2.5   11.4

SSD average: **4.0**

HDD average: **6.1**

0   10
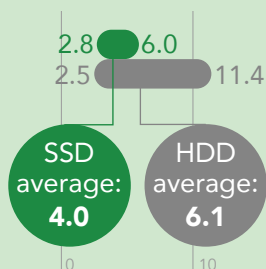
Jump to the next task up to 28% faster

Launch Microsoft Office programs (seconds)**

2.0 3.9
2.8 5.3

SSD average: **2.7**

HDD average: **3.8**

0   10
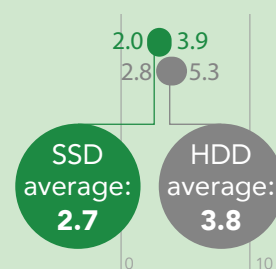
*Longer unplugged times are better
**Shorter wait times are better
[†] Link to premium laptop results

Conclusion

If our test results don't convince you that choosing a laptop that provides SSD storage over a HDD is a good idea, just think about how inconvenient it is to find a place to plug in your laptop while you're out and about. Even more convincing: do an experiment. Count the number of times you jump on your laptop daily, whether it's to research something or work on a project, and multiply that number by 1,095 (the number of days in three years). Now consider how many seconds you could be losing every time you start up and shut down, access the web, or jump to the next task. Those seconds turn into minutes and hours very quickly. Think about what you can accomplish in that time.

We concluded our hands-on testing on May 4, 2018. 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 21, 2018 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

What we tested

Entry-level laptop model	MSRP	Processor	Memory	Drive
Acer® Aspire® E5-522-89W6	$349.00	AMD A8-7410	4 GB	500GB HDD
Acer Aspire E5-575-33BM	$340.00	Intel® Core® i3	4 GB	1 TB HDD
Acer Aspire ES1-432-C3RG	$269.99	Intel Celeron®	4 GB	500GB HDD
Asus VivoBook Max	$279.99	Intel Pentium®	4 GB	500GB HDD
Dell™ Inspiron™	$279.99	Intel Pentium	4 GB	500GB HDD
HP® 14-bw010nr	$284.99	AMD E2-9000e	4 GB	500GB HDD
HP 15 2UE58UA	$425.00	Intel Core i3	8 GB	1TB HDD
HP 15-BA015WM	$279.99	AMD E2-7110	4 GB	500GB HDD
HP 15-f233wm	$280.00	Intel Celeron	4 GB	500GB HDD
Lenovo™ IdeaPad® 320	$269.00	Intel Celeron	4 GB	1 TB HDD
Lenovo IdeaPad 320	$299.00	Intel Pentium	4 GB	1 TB HDD
HP Stream 11"	$199.00	Intel Celeron	4 GB	32GB eMMC
HP Stream 14"	$229.00	Intel Celeron	4 GB	32GB eMMC
Lenovo IdeaPad 120S	$149.99	Intel Celeron	2 GB	32GB eMMC
Acer Spin 1 SP111-32N	$249.99	Intel Pentium	4 GB	64GB eMMC
Asus VivoBook S14	$349.99	Intel Celeron	4 GB	64GB eMMC
HP Stream 14"	$249.00	Intel Celeron	4 GB	64GB eMMC

Mainstream laptop model	MSRP	Processor	Memory	Drive
HP Pavilion 15t	$799.99	Intel Core i5	8 GB	1TB HDD
Acer Aspire 3 A315-51-31GK	$349.99	Intel Core i3	4 GB	1TB HDD
Acer Aspire 3 A315-51-56GT	$499.99	Intel Core i5	4 GB	1TB HDD
Lenovo IdeaPad 110 14"	$399.99	Intel Celeron	4 GB	500GB HDD
Dell Inspiron 15 3000	$449.99	Intel Core i3	8 GB	1TB HDD
Lenovo ThinkPad® E580	$699.99	Intel Core i5	4 GB	500GB HDD
HP ProBook 440 G5	$866.00	Intel Celeron	4 GB	500GB HDD
Lenovo IdeaPad 320 15"	$379.00	Intel Core i3	4 GB	500GB HDD

Mainstream laptop model	MSRP	Processor	Memory	Drive
HP Laptop 15z	$564.99	AMD A-Series	8 GB	1TB HDD
Lenovo IdeaPad 320S 14"	$579.99	Intel Core i3	4 GB	1TB HDD
Lenovo IdeaPad 320 15"	$449.99	Intel Pentium	4 GB	1TB HDD
Acer Aspire 5 A515-51G-515J	$599.99	Intel Core i5	8 GB	256GB SSD
HP Laptop 15t	$764.99	Intel Core i3	8 GB	256GB SSD
Lenovo Flex 6 14"	$599.99	Intel Core i3	4 GB	128GB SSD

Premium laptop model	MSRP	Processor	Memory	Hard Drive
Dell Inspiron 15 5000	$849.99	Intel Core i7	8 GB	1TB HDD
Lenovo Legion Y520	$849.99	Intel Core i5	8 GB	1TB HDD
Toshiba Tecra Z50-E-BTO	$1,454.00	Intel Core i7	4 GB	1TB HDD
Lenovo IdeaPad 320 15"	$849.99	Intel Core i7	16 GB	1TB HDD
Dell Inspiron 15 5000	$829.99	Intel Core i7	8 GB	256GB SSD
Dell 15 7000 Gaming	$1,049.99	Intel Core i5	8 GB	256GB SSD
Lenovo Flex 5 15"	$859.99	Intel Core i5	8 GB	256GB SSD

Result averages

Entry-level laptops	Average of entry-level laptop times SSD	Average of entry-level laptop times HDD	Average entry-level laptop time difference	Average entry-level laptop percentage difference
Local full-screen video playback				
Video battery life (minutes)	739	370	369	99.7%
Boot performance (fast startup)				
Shutdown duration	14.65	17.07	2.42	14.2%
BIOS initialization duration	3.96	5.81	1.85	31.8%
Total boot (no BIOS) duration	39.42	63.40	23.98	37.8%
Hand-timing tests average*				
Microsoft® Word	8.0	20.3	12.3	60.6%
Microsoft Excel™	5.3	7.8	2.5	32.1%
Microsoft PowerPoint™	4.7	6.9	2.2	31.9%
Microsoft Edge® browser	6.4	8.2	1.8	22.0%
Google® Chrome® browser	9.2	12.8	3.6	28.1%
Mozilla® FireFox® browser	12.7	18.6	5.9	31.7%
Microsoft Internet Explorer® browser	7.6	12.2	4.6	37.7%

Mainstream laptops	Average of mainstream laptop times SSD	Average of mainstream laptop times HDD	Average mainstream laptop time difference	Average mainstream laptop percentage difference
Local full-screen video playback				
Video battery life (minutes)	639	424	215	50.7%
Boot performance (fast startup)				
Shutdown duration	6.17	16.42	10.25	62.4%
BIOS initialization duration	1.94	5.47	3.53	64.5%
Total boot (no BIOS) duration	16.05	47.44	31.39	66.2%
Hand-timing tests average*				
Microsoft Word	4.5	11.2	6.7	59.8%
Microsoft Excel	2.5	4.9	2.4	49.0%
Microsoft PowerPoint	2.5	4.4	1.9	43.2%
Microsoft Edge browser	3.5	5.1	1.6	31.4%
Google Chrome browser	5.3	10.8	5.5	50.9%
Mozilla FireFox browser	6.5	13.6	7.1	52.2%
Microsoft Internet Explorer browser	4.4	8.4	4.0	47.6%

*All timed results are in seconds unless otherwise noted.

Premium laptops	Average of premium laptop times SSD	Average of premium laptop times HDD	Average premium laptop time difference	Average premium laptop percentage difference
Local full-screen video playback				
Video battery life (minutes)	644	439	205	46.7%
Boot performance (fast startup)				
Shutdown duration	5.59	18.63	13.04	70.0%
BIOS initialization duration	4.56	5.46	0.90	16.5%
Total boot (no BIOS) duration	14.05	40.53	26.48	65.3%
Hand-timing tests average *				
Microsoft Word	3.5	5.1	1.6	31.4%
Microsoft Excel	2.2	3.4	1.2	35.3%
Microsoft Powerpoint	2.3	3.0	0.7	23.3%
Microsoft Edge browser	3.0	3.0	0.0	0.0%
Google Chrome browser	4.8	7.2	2.4	33.3%
Mozilla Firefox browser	5.1	9.7	4.6	47.4%
Microsoft Internet Explorer browser	3.0	4.5	1.5	33.3%

Entry-level laptop results

"Stay unplugged up to 2X longer"

Entry-level laptop findings*	Acer Aspire E5-522-89W6	Acer Aspire E5-575-33BM	Acer Aspire ES1-432-C3RG	Asus VivoBook Max	Dell Inspiron	HP 14-bw010nr
Local full-screen video playback						
Battery life (min.)	299	517	630	323	367	308

Entry-level laptop findings (cont.)*	HP 15 2UE58UA	HP15-BA015WM	HP 15-f233wm	Lenovo IdeaPad 320 (Celeron)	Lenovo IdeaPad 320 (Pentium)	HP Stream 11"
Local full-screen video playback						
Battery life (min.)	380	335	343	288	281	633

Entry-level laptop findings (cont.)*	HP Stream 14"	Lenovo ideaPad 120S	Acer Spin 1	Asus VivoBook	HP Stream 14"
Local full-screen video playback					
Battery life (min.)	640	575	596	1037	954

*All timed results are in seconds unless otherwise noted.

"Start up and shut down up to 37% faster"

Entry-level laptop findings*	Acer Aspire E5-522-89W6	Acer Aspire E5-575-33BM	Acer Aspire ES1-432-C3RG	Asus VivoBook Max	Dell Inspiron	HP 14-bw010nr
Boot performance (fast startup)						
Shutdown duration	13.83	14.48	16.98	15.11	18.34	24.36
BIOS initialization duration	3.74	4.66	7.66	6.41	5.56	6.30
Total boot (no BIOS) duration	48.2	59.05	52.08	45.35	78.33	142.50

Entry-level laptop findings (cont.)*	HP 15 2UE58UA	HP15-BA015WM	HP 15-f233wm	Lenovo IdeaPad 320 (Celeron)	Lenovo IdeaPad 320 (Pentium)	HP Stream 11"
Boot performance (fast startup)						
Shutdown duration	16.13	17.57	21.31	14.88	14.76	18.70
BIOS initialization duration	4.27	6.56	6.22	6.13	6.44	2.86
Total boot (no BIOS) duration	48.88	50.96	56.48	46.51	69.08	51.79

Entry-level laptop findings (cont.)*	HP Stream 14"	Lenovo ideaPad 120S	Acer Spin 1	Asus VivoBook	HP Stream 14"
Boot performance (fast startup)					
Shutdown duration	18.37	13.78	11.23	14.72	11.10
BIOS initialization duration	2.82	6.25	4.30	3.33	4.22
Total boot (no BIOS) duration	46.36	37.19	29.30	35.29	36.62

"Access the web up to 21% faster"

Entry-level laptop findings*	Acer Aspire E5-522-89W6	Acer Aspire E5-575-33BM	Acer Aspire ES1-432-C3RG	Asus VivoBook Max	Dell Inspiron	HP 14-bw010nr
Google Chrome browser	9.3	7.5	12.2	10.5	10.4	34.1
Mozilla FireFox browser	13.7	12.0	18.9	16.1	18.6	43.5
Microsoft Internet Explorer browser	10.8	6.8	9.8	10.5	14.2	25.3
Microsoft Edge browser	7.4	4.0	6.6	6.2	6.4	26.1

*All timed results are in seconds unless otherwise noted.

Entry-level laptop findings (cont.)*	HP 15 2UE58UA	HP15-BA015WM	HP 15-f233wm	Lenovo IdeaPad 320 (Celeron)	Lenovo IdeaPad 320 (Pentium)	HP Stream 11"
Google Chrome browser	7.7	11.4	13.3	9.7	14.3	11.2
Mozilla FireFox browser	11.7	19.8	23.1	13.1	14.4	15.3
Microsoft Internet Explorer browser	7.5	11.7	15.6	10.2	11.3	9.0
Microsoft Edge browser	5.1	8.6	7.9	6.2	6.2	7.3

Entry-level laptop findings (cont.)*	HP Stream 14"	Lenovo ideaPad 120S	Acer Spin 1	Asus VivoBook	HP Stream 14"
Google Chrome browser	10.6	11.7	6.6	9.0	6.2
Mozilla FireFox browser	14.3	18.3	7.9	12.1	8.1
Microsoft Internet Explorer browser	7.3	9.8	6.6	7.8	4.8
Microsoft Edge browser	6.5	8.4	4.7	6.9	4.6

"Jump to the next task up to 48% faster"

Entry-level laptop findings*	Acer Aspire E5-522-89W6	Acer Aspire E5-575-33BM	Acer Aspire ES1-432-C3RG	Asus VivoBook Max	Dell Inspiron	HP 14-bw010nr
Microsoft Word	23.2	11.5	24.5	10.3	28.7	22.2
Microsoft Excel	7.3	4.3	8.6	6.4	8.6	15.3
Microsoft PowerPoint	6.3	3.8	7.1	5.1	6.8	14.0

Entry-level laptop findings (cont.)*	HP 15 2UE58UA	HP15-BA015WM	HP 15-f233wm	Lenovo IdeaPad 320 (Celeron)	Lenovo IdeaPad 320 (Pentium)	HP Stream 11"
Microsoft Word	11.8	32.2	25.0	18.5	15.6	10.9
Microsoft Excel	4.7	8.3	9.5	6.4	6.5	6.0
Microsoft PowerPoint	4.9	7.4	8.7	5.8	5.8	5.6

Entry-level laptop findings (cont.)*	HP Stream 14"	Lenovo ideaPad 120S	Acer Spin 1	Asus VivoBook	HP Stream 14"
Microsoft Word	11.3	11.1	4.6	6.1	4.0
Microsoft Excel	5.7	6.6	3.9	5.7	4.0
Microsoft PowerPoint	5.2	5.8	3.4	4.9	3.5

*All timed results are in seconds unless otherwise noted.

Mainstream laptop results

"Stay unplugged up to 50% longer"

Mainstream laptop findings*	HP Pavilion 15t HDD	Acer Aspire 3 A315-51-31GK HDD	Acer Aspire 3 A315-51-56GT HDD	Lenovo IdeaPad 110 HDD	Dell Inspiron 15 3000 HDD	Lenovo ThinkPad E580 HDD	HP ProBook 440 G5 HDD
Local full-screen video playback							
Battery life (min.)	390	502	479	247	432	513	733

Mainstream laptop findings (cont.)*	Lenovo IdeaPad 320 Core i3 HDD	HP Laptop 15z HDD	Lenovo IdeaPad 320S HDD	Lenovo IdeaPad 320 Pentium HDD	Acer Aspire 5 A515-51G-515J SSD	HP Laptop 15t SSD	Lenovo Flex 6 SSD
Local full-screen video playback							
Battery life (min.)	399	308	366	296	618	534	766

"Start up and shut down up to 3X faster"

Mainstream laptop findings*	HP Pavilion 15t HDD	Acer Aspire 3 A315-51-31GK HDD	Acer Aspire 3 A315-51-56GT HDD	Lenovo IdeaPad 110 HDD	Dell Inspiron 15 3000 HDD	Lenovo ThinkPad E580 HDD	HP ProBook 440 G5 HDD
Boot performance (fast startup)							
Shutdown duration	20.050	14.044	14.739	14.166	31.305	13.878	13.281
BIOS initialization duration	2.975	4.908	4.840	4.575	10.513	7.077	5.389
Total boot (no BIOS) duration	43.455	41.578	45.564	83.017	48.765	34.100	43.679

Mainstream laptop findings (cont.)*	Lenovo IdeaPad 320 Core i3 HDD	HP Laptop 15z HDD	Lenovo IdeaPad 320S HDD	Lenovo IdeaPad 320 Pentium HDD	Acer Aspire 5 A515-51G-515J SSD	HP Laptop 15t SSD	Lenovo Flex 6 SSD
Boot performance (fast startup)							
Shutdown duration	14.195	16.650	13.915	14.367	7.316	5.213	5.995
BIOS initialization duration	4.361	5.140	3.996	6.419	1.711	2.188	1.922
Total boot (no BIOS) duration	50.096	49.905	35.970	45.716	9.351	19.892	18.912

"Access the web up to 48% faster"

Mainstream laptop hand-timing findings*	HP Pavilion 15t HDD	Acer Aspire 3 A315-51-31GK HDD	Acer Aspire 3 A315-51-56GT HDD	Lenovo IdeaPad 110 HDD	Dell Inspiron 15 3000 HDD	Lenovo ThinkPad E580 HDD	HP ProBook 440 G5 HDD
Google Chrome browser	6.9	8.2	15.9	12.1	8.5	8.3	12.5
Mozilla FireFox browser	11.1	8.7	15.6	17.7	13.0	12.5	14.6
Microsoft Internet Explorer browser	6.6	6.8	8.7	12.9	9.8	6.8	8.6
Microsoft Edge browser	3.6	4.5	3.8	6.2	3.7	6.5	4.8

*All timed results are in seconds unless otherwise noted.

Mainstream laptop hand-timing findings (cont.)*	Lenovo IdeaPad 320 Core i3 HDD	HP Laptop 15z HDD	Lenovo IdeaPad 320S HDD	Lenovo IdeaPad 320 Pentium HDD	Acer Aspire 5 A515-51G-515J SSD	HP Laptop 15t SSD	Lenovo Flex 6 SSD
Google Chrome browser	8.8	11.6	9.3	16.8	4.4	5.6	5.8
Mozilla FireFox browser	13.2	14.1	13.0	16.5	4.6	8.1	6.9
Microsoft Internet Explorer browser	7.3	8.3	7.4	9.3	3.6	4.7	4.8
Microsoft Edge browser	4.4	6.0	4.5	7.6	3.0	4.2	3.2

"Jump to the next task up to 52% faster"

Mainstream laptop hand-timing findings*	HP Pavilion 15t HDD	Acer Aspire 3 A315-51-31GK HDD	Acer Aspire 3 A315-51-56GT HDD	Lenovo IdeaPad 110 HDD	Dell Inspiron 15 3000 HDD	Lenovo ThinkPad E580 HDD	HP ProBook 440 G5 HDD
Microsoft Word	5.1	5.8	5.4	10.7	16.6	9.1	15.0
Microsoft Excel	3.7	4.5	5.0	6.1	4.7	3.8	5.5
Microsoft PowerPoint	3.2	3.8	4.1	5.8	4.7	3.3	4.7

Mainstream laptop hand-timing findings (cont.)*	Lenovo IdeaPad 320 Core i3 HDD	HP Laptop 15z HDD	Lenovo IdeaPad 320S HDD	Lenovo IdeaPad 320 Pentium HDD	Acer Aspire 5 A515-51G-515J SSD	HP Laptop 15t SSD	Lenovo Flex 6 SSD
Microsoft Word	16.5	6.7	13.7	18.7	4.0	4.8	4.7
Microsoft Excel	4.8	4.9	4.8	5.6	2.1	2.8	2.7
Microsoft PowerPoint	4.6	4.0	4.6	5.4	2.1	2.7	2.8

Premium laptop results

"Stay unplugged up to 46% longer"

Premium laptop findings*	Dell Inspiron 15 5000 HDD	Lenovo Legion Y520 HDD	Toshiba Tecra Z50-E-BTO HDD	Lenovo IdeaPad 320 HDD	Dell Inspiron 15 5000 SSD	Dell 15 7000 Gaming SSD	Lenovo Flex 5 SSD
Local full-screen video playback							
Battery life (min.)	362	364	581	447	469	581	882

*All timed results are in seconds unless otherwise noted.

"Start up and shut down up to 2.8X faster"

Premium laptop findings*	Dell Inspiron 15 5000 HDD	Lenovo Legion Y520 HDD	Toshiba Tecra Z50-E-BTO HDD	Lenovo IdeaPad 320 HDD	Dell Inspiron 15 5000 SSD	Dell 15 7000 Gaming SSD	Lenovo Flex 5 SSD
Boot performance (fast startup)							
Shutdown duration	28.957	17.421	14.080	14.053	5.968	7.104	3.687
BIOS initialization duration	7.755	4.607	5.385	4.082	6.142	5.287	2.248
Total boot (no BIOS) duration	43.122	42.031	34.664	42.311	11.191	21.544	9.402

"Access the web up to 34% faster"

Premium laptop hand-timing findings*	Dell Inspiron 15 5000 HDD	Lenovo Legion Y520 HDD	Toshiba Tecra Z50-E-BTO HDD	Lenovo IdeaPad 320 HDD	Dell Inspiron 15 5000 SSD	Dell 15 7000 Gaming SSD	Lenovo Flex 5 SSD
Google Chrome browser	7.7	6.9	6.4	7.9	4.7	5.0	4.7
Mozilla FireFox browser	10.6	9.0	11.4	7.7	4.7	6.0	4.5
Microsoft Internet Explorer browser	4.1	4.7	3.9	5.1	3.0	3.2	2.8
Microsoft Edge browser	3.1	3.3	2.5	3.2	3.1	3.0	3.0

"Jump to the next task up to 28% faster"

Premium laptop hand-timing findings*	Dell Inspiron 15 5000 HDD	Lenovo Legion Y520 HDD	Toshiba Tecra Z50-E-BTO HDD	Lenovo IdeaPad 320 HDD	Dell Inspiron 15 5000 SSD	Dell 15 7000 Gaming SSD	Lenovo Flex 5 SSD
Microsoft Word	4.8	5.2	5.3	4.9	3.9	3.9	2.8
Microsoft Excel	3.4	3.5	3.7	2.8	2.0	2.3	2.4
Microsoft PowerPoint	3.0	3.1	3.0	2.8	2.3	2.2	2.4

How we tested

This document details the methodologies we followed in testing the systems

Setting up the system

1. Complete the OOBE on each system.
2. Run Windows Updates.
3. Uninstall any vendor-provided applications. If anti-virus is on the system, leave it and update to latest version.
4. If no anti-virus is installed, install McAfee LiveSafe™.
5. Set the homepage to open to https://www.amazon.com, and install the following browsers:
   a. Microsoft Edge
   b. Google Chrome
   c. Mozilla FireFox
   d. Microsoft Internet Explorer
6. Install and launch the following applications:
   a. Adobe® Acrobat® Reader
   b. RARLAB WinRAR x64
   c. Microsoft Office 365 Word
   d. Microsoft Office 365 Excel
   e. Microsoft Office 365 PowerPoint
   f. Microsoft Windows® ADK Windows Assessment Toolkit
   g. Microsoft Windows ADK Windows Performance Toolkit

Running the tests

Local Full Screen Video Playback (FSVP) assessment

1. Copy the Microsoft-provided Performance Assessment Toolkit directory (Perf2.4) to the "C" drive.

Running the Local Full Screen Video Playback assessment

You will use the Movies & TV app to play media clips locally, so verify that it is the default application to handle MP4 file extensions.

1. Press the Windows Key, and type Powershell.
2. To Run as Administrator, right-click the powershell.exe.
3. To access the Performance Assessment Toolkit directory, type `cd C:\Users\<User name>\Perf2.4`
4. To launch the script, type `.\performance_assessments.cmd`
5. To run the system preparation script, type P, and the system will reboot. (Note: Do this once per day or after making a configuration change.)
6. After the system reboots, repeat steps 1 through 4.
7. To execute the Battery Life assessment, type 5.
8. After the Battery Life assessment is complete, to analyze the performance result, type A, and record the result.
9. Repeat steps 1 through 8 two more times.

Windows ADK fast startup performance assessment

1. Launch the Windows Assessment Console.
2. Click Options→New Job.
3. Click Create Custom Job.
4. Click Add Assessments, and add the following assessment:
   a. Boot performance (fast startup)
5. In the left-hand column, select this assessment, and uncheck the "Use recommended settings" box.
6. For this assessment, change the number of iterations to 10.
7. Click Run.
8. Click Start.
9. When the tests finish, record the results, and shut down the system.

Browser and Office application launch times

1. Boot the system and bring up an administrative command prompt:
   a. Type `CMD`
   b. To open App options , right-click the Command Prompt app.
   c. Click the"Run as administrator" button.
2. Type `Cmd.exe /c start /wait Rundll32.exe advapi32.dll,ProcessIdleTasks`
   a. Do not interact with the system until the command completes.
3. After the command completes, wait five minutes before running the test.
4. Simultaneously start the timer and launch the Microsoft Edge browser.
5. When the browser page loads, stop the timer.
6. Record the result.
7. Simultaneously start the timer and launch the Google Chrome browser.
8. When the browser page loads, stop the timer.
9. Record the result.
10. Simultaneously start the timer and launch the Mozilla FireFox browser.
11. When the browser page loads, stop the timer.
12. Record the result.
13. Simultaneously start the timer and launch the Microsoft Internet Explorer browser.
14. When the browser page loads, stop the timer.
15. Record the result.
16. Simultaneously start the timer and launch Microsoft Office 365 Word.
17. When the template page loads, stop the timer.
18. Record the result.
19. Simultaneously start the timer and launch Microsoft Office 365 Excel.
20. When the template page loads, stop the timer.
21. Record the result.
22. Simultaneously start the timer and launch Microsoft Office 365 PowerPoint.
23. When the template page loads, stop the timer.
24. Record the result.
25. Shut down the system.
26. Repeat steps 1 through 25 two more times, and report the mean average of the three runs.

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