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# What Americans Know About AI, Cybersecurity and Big Tech

*Most U.S. adults can correctly identify a secure password. Far fewer can recognize an example of two-factor authentication*

**BY** *Olivia Sidoti and Emily A. Vogels*

**FOR MEDIA OR OTHER INQUIRIES:**

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## How we did this

Pew Research Center conducted this study to understand Americans' knowledge on various digital topics. For this analysis, we surveyed 5,101 U.S. adults from May 15 to May 21, 2023. Everyone who took part in the survey is a member of the Center's American Trends Panel (ATP), an online survey panel that is recruited through national, random sampling of residential addresses. This way, nearly all U.S. adults have a chance of selection. The survey is weighted to be representative of the U.S. adult population by gender, race, ethnicity, partisan affiliation, education and other categories. Read more about the [ATP's methodology](#).

Here are the [questions used for this report](#), along with responses, and its [methodology](#).

# What Americans Know About AI, Cybersecurity and Big Tech

*Most U.S. adults can correctly identify a secure password. Far fewer can recognize an example of two-factor authentication*

Digital literacy is [widely seen as an essential skill](#). But Americans' understanding of digital topics varies notably depending on the subject. For example, majorities of U.S. adults know what cookies on websites do and can identify a secure password. Far fewer can recognize an example of two-factor authentication – a cybersecurity practice that [makes signing into online accounts more secure](#).

In addition, much larger shares know [Elon Musk was running Tesla and Twitter](#) in April 2023 than understand the technology behind ChatGPT. ([Twitter was recently renamed X](#) in July 2023, after the survey was conducted.)

Overall, Americans answer a median of five out of nine questions correctly on a digital knowledge survey that Pew Research Center conducted among 5,101 U.S. adults from May 15 to May 21, 2023. The questions span a range of topics, including cybersecurity practices, facts about major technology companies, artificial intelligence and federal online privacy laws.

## What is a median?

Throughout this report, median scores are used to help readers see the overall patterns. The median score is the middle number in a list of all scores sorted from highest to lowest.

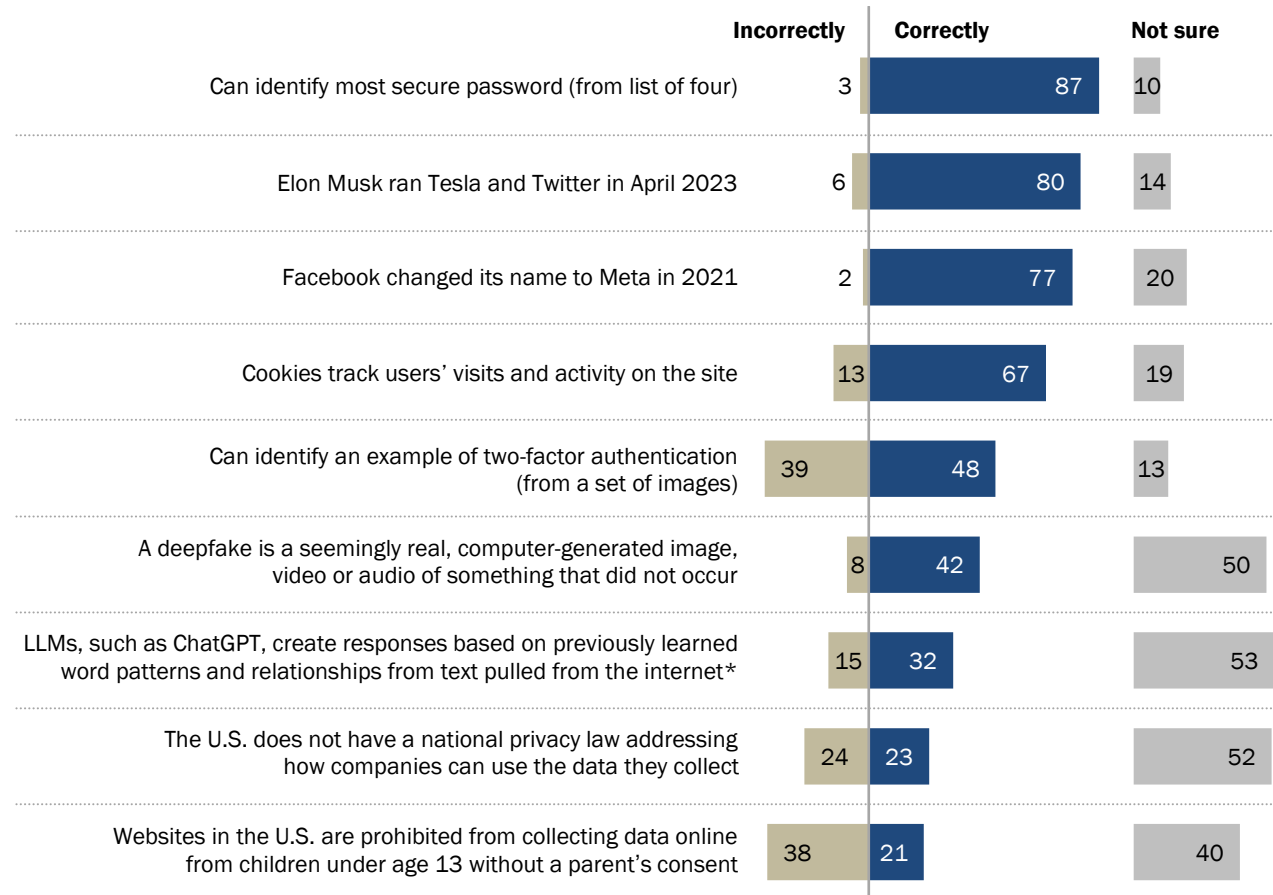
Some 26% of U.S. adults can answer at least seven of the nine questions accurately, but just 4% can correctly answer all nine. And as was the case [in past digital knowledge surveys by the Center](#), the public's understanding of digital issues differs by age and educational attainment. (Refer to the [Appendix](#) for race, ethnicity and gender breaks.)

## How does your digital awareness stack up against other Americans?

Test your own knowledge on these questions by taking [our interactive quiz](#).

## Americans' digital knowledge varies widely by topic

% of U.S. adults answering each question ...



\* "LLMs" refers to large language models.

Note: All questions are multiple choice; for full question wording, refer to the Topline. Those who did not give an answer are not shown.

Source: Survey of U.S. adults conducted May 15-21, 2023.

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## How Americans' digital knowledge varies by topic

### Cybersecurity

- 87% of U.S. adults can correctly identify which password – out of four choices – is the most secure option.
- 67% know that the purpose of cookies is to track visits and activity on a website.
- 48% can correctly identify an example of two-factor authentication from a series of pictures.

Which of the following passwords is the most secure?

SportsFan1983
WTh!58iLf2?9zD
abc12.6.48
1234567890
Not sure

A question from our survey of U.S. adults conducted May 15-21, 2023, asking respondents to identify the most secure password from a list.

### Major technology companies

- 80% know Elon Musk was running Tesla and Twitter in April 2023.<sup>1</sup>
- 77% know Facebook changed its company name to Meta.

### Artificial intelligence

- 42% know a deepfake is a seemingly real image, video or audio of something that didn't occur.
- 32% know large language models, such as ChatGPT, produce answers based on word patterns and relationships they previously learned from text pulled from the internet.

### Federal privacy laws

- 23% know the United States lacks a national privacy law that sets common standards for what companies can do with all of the data their products and services collect.
- 21% know websites in the U.S. are [prohibited from collecting personal data from minors under 13](#).

Still, Americans acknowledge they don't know the answers to some of these questions. When it comes to artificial intelligence, similar shares say they're not sure how large language models work (53%) or what a deepfake is (50%).

<sup>1</sup> Musk has since [stepped down as Twitter's CEO](#) and [renamed the platform to X](#).

Uncertainty is also common when it comes to privacy laws: 52% of adults aren't sure if the U.S. has a national online privacy law. And 40% aren't sure about the age under which minors are protected from websites collecting their data without parental consent.

## How Americans' digital knowledge varies by education level

Americans' digital knowledge differs widely by educational attainment.

Adults with a bachelor's or advanced degree answer a median of six out of nine questions correctly. Those who have some college education answer a median of five questions accurately. And those with a high school diploma or less education correctly answer a median of four questions.

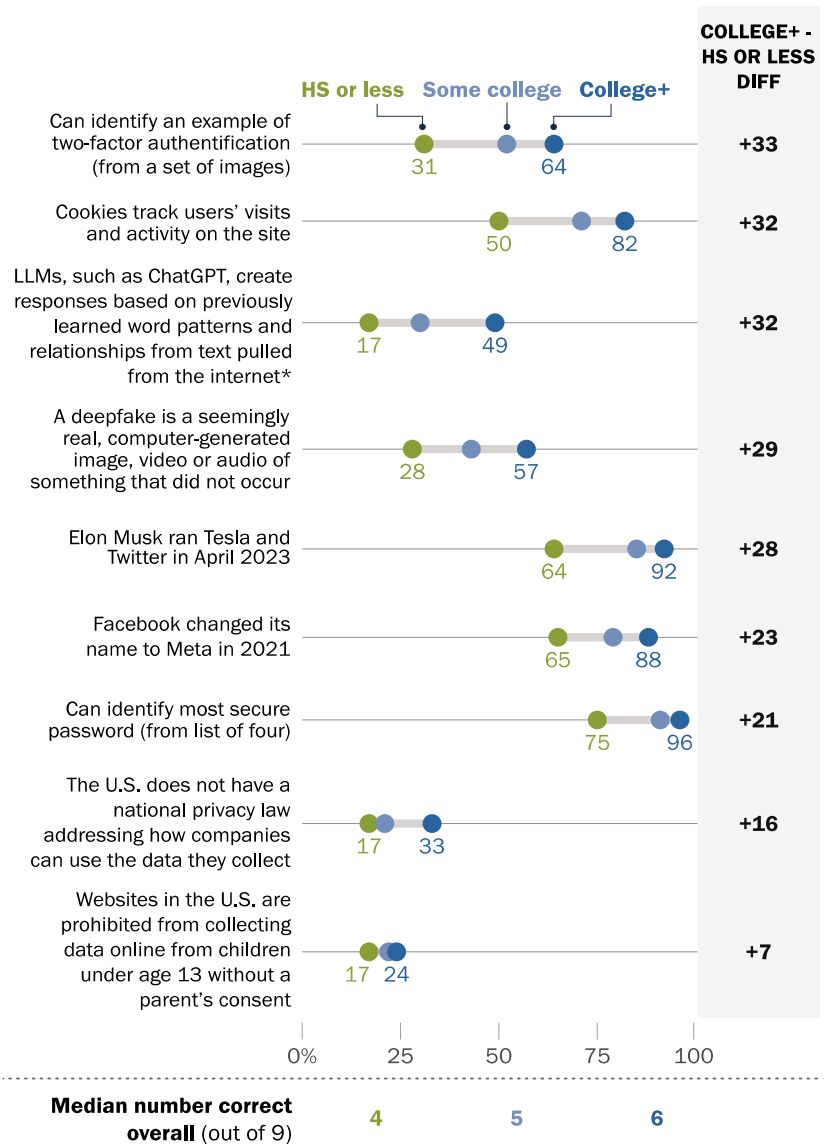
Educational differences appear on all nine questions asked in the survey.

For example, college graduates particularly stand out as more likely to know the answer to each of the following than those who have a high school education or less:

- 64% of college graduates can correctly identify an example of a two-factor authentication, compared with 31% of those with a high school diploma or less education.
- 82% of college graduates know that cookies track

### Digital knowledge in the U.S. differs by educational attainment

% of U.S. adults answering each question correctly



\* "LLMs" refers to large language models.

Note: All questions are multiple choice; for full question wording, refer to the Topline. All DIFF values are statistically significant. Those who did not give an answer are not shown. Source: Survey of U.S. adults conducted May 15-21, 2023.

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users' visits and activity on websites. Half of Americans with a high school diploma or less education know this.

- 49% of college graduates know how large language models, like ChatGPT, create responses, compared with 17% of those with a high school diploma or less education.
- 57% of college graduates can correctly define what a deepfake is, compared with 28% of those with a high school diploma or less education.

While double-digit educational differences are still seen, majorities of U.S. adults – regardless of their formal educational attainment – know what companies Elon Musk was running in April 2023, that Facebook changed its name to Meta, and which password (of four listed) is most secure.

Educational differences are less pronounced when it comes to knowledge of federal legislation. For example, few Americans – regardless of education level – are familiar with the federal protections that are in place to safeguard children's privacy online.

## How Americans’ digital knowledge varies by age

Age differences in Americans’ digital knowledge widely vary depending on the topic. The patterns seen across age groups are not always consistent, but adults under 50 generally fare better than those 50 and older.

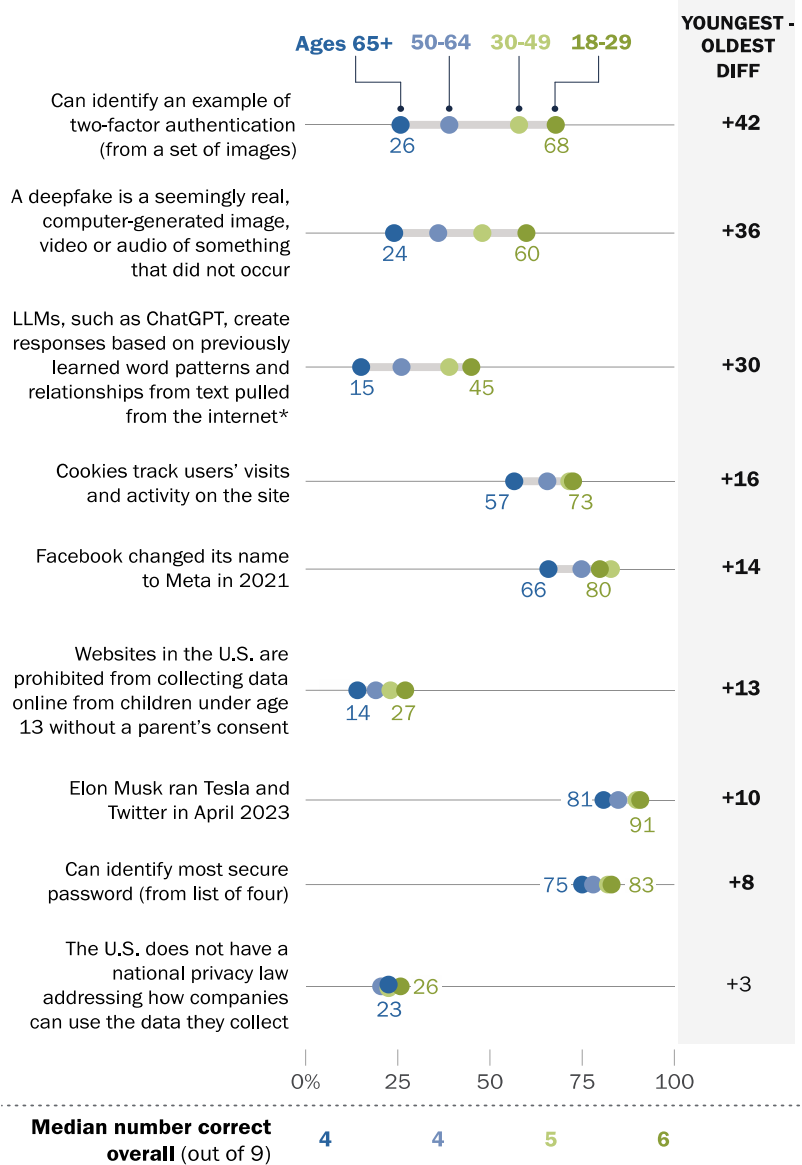
Adults ages 18 to 29 answer a median of six questions correctly. That number drops to 5 among those ages 30 to 49 and to four among those ages 50 to 64 and ages 65 and older.

The most pronounced age differences appear when Americans are asked about two-factor authentication, deepfakes and large language models:

- 68% of adults under 30 can identify an example of two-factor authentication, compared with 26% of those ages 65 and older.
- 60% of Americans under 30 know what a deepfake is, compared with 24% of those 65 and older.
- 45% of those under 30 know how large language models work, compared with 15% of those ages 65 and older.

### Digital knowledge in the U.S. differs by age

% of U. S. adults answering each question correctly



\* “LLMs” refers to large language models.

Note: All questions are multiple choice; for full question wording, refer to the Topline. Statistically significant differences between the oldest and youngest groups are in bold. Those who did not give an answer are not shown.

Source: Survey of U.S. adults conducted May 15-21, 2023. “What Americans Know About AI, Cybersecurity and Big Tech”

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But these gaps are more modest on other questions. Similar shares of older and younger Americans know the U.S. does not have a comprehensive digital privacy law in place. And clear majorities across age groups can correctly identify an example of the most secure password and know Musk was running Tesla and Twitter in April 2023.

## Appendix

### Americans' knowledge about digital topics by gender and race or ethnicity

% of U. S. adults answering each question correctly

	Men	Women	White	Black	Hispanic	Asian*
Can identify most secure password (from list of four)	88	86	89	79	82	90
Elon Musk ran Tesla and Twitter in April 2023	86	74	84	69	68	88
Facebook changed its name to Meta in 2021	82	72	79	69	73	83
Cookies track users' visits and activity on the site	74	61	73	50	56	75
Can identify an example of two-factor authentication (from a set of images)	54	42	50	36	44	65
A deepfake is a seemingly real, computer-generated image, video or audio of something that did not occur	53	31	44	29	37	55
LLMs, such as ChatGPT, create responses based on previously learned word patterns and relationships from text pulled from the internet**	41	23	32	22	32	46
The U.S. does not have a national privacy law addressing how companies can use the data they collect	29	18	25	17	17	30
Websites in the U.S. are prohibited from collecting data online from children under age 13 without a parent's consent	22	20	21	20	18	29
<b>Median number correct overall (out of 9)</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>4</b>	<b>4</b>	<b>6</b>

\* Estimates for Asian adults are representative of English speakers only.

\*\* "LLMs" refers to large language models.

Note: All questions are multiple choice; for full question wording, refer to the Topline. White, Black and Asian adults include those who report being only one race and are not Hispanic. Hispanic adults are of any race. Those who did not give an answer are not shown.

Source: Survey of U.S. adults conducted May 15-21, 2023.

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## Methodology

### The American Trends Panel survey methodology

#### Overview

The American Trends Panel (ATP), created by Pew Research Center, is a nationally representative panel of randomly selected U.S. adults. Panelists participate via self-administered web surveys. Panelists who do not have internet access at home are provided with a tablet and wireless internet connection. Interviews are conducted in both English and Spanish. The panel is being managed by Ipsos.

Data in this report is drawn from ATP Wave 127, conducted from May 15 to May 21, 2023, and includes an [oversample](#) of Hispanic men, non-Hispanic Black men, and non-Hispanic Asian adults in order to provide more precise estimates of the opinions and experiences of these smaller demographic subgroups. These oversampled groups are weighted back to reflect their correct proportions in the population. A total of 5,101 panelists responded out of 5,841 who were sampled, for a response rate of 87%. The cumulative response rate accounting for nonresponse to the recruitment surveys and attrition is 3%. The break-off rate among panelists who logged on to the survey and completed at least one item is 2%. The margin of sampling error for the full sample of 5,101 respondents is plus or minus 1.7 percentage points.

#### Panel recruitment

The ATP was created in 2014, with the first cohort of panelists invited to join the panel at the end of a large, national, landline and cellphone random-digit-dial survey that was conducted in both English and Spanish. Two additional recruitments were conducted using the same method in 2015 and 2017, respectively. Across these three surveys, a total of 19,718 adults were invited to join the ATP, of

#### American Trends Panel recruitment surveys

Recruitment dates	Mode	Invited	Joined	Active panelists remaining
Jan. 23 to March 16, 2014	Landline/ cell RDD	9,809	5,338	1,498
Aug. 27 to Oct. 4, 2015	Landline/ cell RDD	6,004	2,976	881
April 25 to June 4, 2017	Landline/ cell RDD	3,905	1,628	432
Aug. 8 to Oct. 31, 2018	ABS	9,396	8,778	4,115
Aug. 19 to Nov. 30, 2019	ABS	5,900	4,720	1,466
June 1 to July 19, 2020; Feb. 10 to March 31, 2021	ABS	3,197	2,812	1,541
May 29 to July 7, 2021; Sept. 16 to Nov. 1, 2021	ABS	1,329	1,162	785
May 24 to Sept. 29, 2022	ABS	3,354	2,869	1,691
	<b>Total</b>	<b>42,894</b>	<b>30,283</b>	<b>12,409</b>

Note: RDD is random-digit dial; ABS is address-based sampling. Approximately once per year, panelists who have not participated in multiple consecutive waves or who did not complete an annual profiling survey are removed from the panel. Panelists also become inactive if they ask to be removed from the panel.

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whom 9,942 (50%) agreed to participate.

In August 2018, the ATP switched from telephone to address-based recruitment. Invitations were sent to a stratified, random sample of households selected from the U.S. Postal Service's Delivery Sequence File. Sampled households receive mailings asking a randomly selected adult to complete a survey online. A question at the end of the survey asks if the respondent is willing to join the ATP. In 2020 and 2021 another stage was added to the recruitment. Households that did not respond to the online survey were sent a paper version of the questionnaire, \$5 and a postage-paid return envelope. A subset of the adults who returned the paper version of the survey were invited to join the ATP. This subset of adults received a follow-up mailing with a \$10 pre-incentive and invitation to join the ATP.

Across the five address-based recruitments, a total of 23,176 adults were invited to join the ATP, of whom 20,341 agreed to join the panel and completed an initial profile survey. In each household, one adult was selected and asked to go online to complete a survey, at the end of which they were invited to join the panel. Of the 30,283 individuals who have ever joined the ATP, 12,409 remained active panelists and continued to receive survey invitations at the time this survey was conducted.

The U.S. Postal Service's Delivery Sequence File has been estimated to cover as much as 98% of the population, although some studies suggest that the coverage could be in the low 90% range.<sup>2</sup> The American Trends Panel never uses breakout routers or chains that direct respondents to additional surveys.

### **Sample design**

The overall target population for this survey was noninstitutionalized persons ages 18 and older living in the U.S., including Alaska and Hawaii. It featured a stratified random sample from the ATP in which Hispanic men, non-Hispanic Black men, and non-Hispanic Asian adults were selected with certainty. The remaining panelists were sampled at rates designed to ensure that the share of respondents in each stratum is proportional to its share of the U.S. adult population to the greatest extent possible. Respondent weights are adjusted to account for differential probabilities of selection as described in the Weighting section below.

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<sup>2</sup> AAPOR Task Force on Address-based Sampling. 2016. "[AAPOR Report: Address-based Sampling.](#)"

## Questionnaire development and testing

The questionnaire was developed by Pew Research Center in consultation with Ipsos. The web program was rigorously tested on both PC and mobile devices by the Ipsos project management team and Pew Research Center researchers. The Ipsos project management team also populated test data that was analyzed in SPSS to ensure the logic and randomizations were working as intended before launching the survey.

## Incentives

All respondents were offered a post-paid incentive for their participation. Respondents could choose to receive the post-paid incentive in the form of a check or a gift code to Amazon.com or could choose to decline the incentive. Incentive amounts ranged from \$5 to \$20 depending on whether the respondent belongs to a part of the population that is harder or easier to reach. Differential incentive amounts were designed to increase panel survey participation among groups that traditionally have low survey response propensities.

## Data collection protocol

The data collection field period for this survey was May 15-21, 2023. Postcard notifications were mailed to all ATP panelists with a known residential address on May 15.

Invitations were sent out in two separate launches: soft launch and full launch. Sixty panelists were included in the soft launch, which began with an initial invitation sent on May 15. The ATP panelists chosen for the initial soft launch were known responders who had completed previous ATP surveys within one day of receiving their invitation. All remaining English- and Spanish-speaking sampled panelists were included in the full launch and were sent an invitation on May 16.

All panelists with an email address received an email invitation and up to two email reminders if they did not respond to the survey. All ATP panelists who consented to SMS messages received an SMS invitation and up to two SMS reminders.

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### Invitation and reminder dates, ATP Wave 127

	<b>Soft launch</b>	<b>Full launch</b>
Initial invitation	May 15, 2023	May 16, 2023
First reminder	May 18, 2023	May 18, 2023
Final reminder	May 20, 2023	May 20, 2023

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## Data quality checks

To ensure high-quality data, the Center’s researchers performed data quality checks to identify any respondents showing clear patterns of satisficing. This includes checking for very high rates of leaving questions blank, as well as always selecting the first or last answer presented. As a result of this checking, five ATP respondents were removed from the survey dataset prior to weighting and analysis.

## Weighting

The ATP data is weighted in a multistep process that accounts for multiple stages of sampling and nonresponse that occur at different points in the survey process. First, each panelist begins with a base weight that reflects their probability of selection for their initial recruitment survey. These weights are then rescaled and adjusted to account for changes in the design of ATP recruitment surveys from year to year. Finally, the weights are calibrated to align with the population benchmarks in the accompanying table to correct for nonresponse to recruitment surveys and panel attrition. If only a subsample of panelists was invited to participate in the wave, this weight is adjusted to account for any differential probabilities of selection.

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### American Trends Panel weighting dimensions

Variable	Benchmark source
Age (detailed)	2021 American Community Survey (ACS)
Age x Gender	
Education x Gender	
Education x Age	
Race/Ethnicity x Education	
Born inside vs. outside the U.S. among Hispanics and Asian Americans	
Years lived in the U.S.	
Census region x Metro/Non-metro	2021 CPS March Supplement
Volunteerism	2021 CPS Volunteering & Civic Life Supplement
Voter registration	2018 CPS Voting and Registration Supplement
Party affiliation	2022 National Public Opinion Reference Survey (NPORS)
Frequency of internet use	
Religious affiliation	
<i>Additional weighting dimensions applied within Black adults</i>	
Age	2021 American Community Survey (ACS)
Gender	
Education	
Hispanic ethnicity	
Voter registration	2018 CPS Voting and Registration Supplement
Party affiliation	2022 National Public Opinion Reference Survey (NPORS)
Religious affiliation	

Note: Estimates from the ACS are based on non-institutionalized adults. Voter registration is calculated using procedures from Hur, Achen (2013) and rescaled to include the total U.S. adult population.

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Among the panelists who completed the survey, this weight is then calibrated again to align with the population benchmarks identified in the accompanying table and trimmed at the 1st and 99th

percentiles to reduce the loss in precision stemming from variance in the weights. Sampling errors and tests of statistical significance take into account the effect of weighting.

The following table shows the unweighted sample sizes and the error attributable to sampling that would be expected at the 95% level of confidence for different groups in the survey.

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### Sample sizes and margins of error, ATP Wave 127

Group	Unweighted sample size	Plus or minus ...
Total sample	5,101	1.7 percentage points
High school or less	1,304	3.4 percentage points
Some college	1,600	2.9 percentage points
College+	2,179	2.4 percentage points
Ages 18-29	626	4.8 percentage points
30-49	1,771	2.9 percentage points
50-64	1,456	3.1 percentage points
65+	1,227	3.2 percentage points

Note: This survey includes oversamples of Hispanic men, non-Hispanic Black men, and non-Hispanic Asian adults. Unweighted sample sizes do not account for the sample design or weighting and do not describe a group's contribution to weighted estimates. Read the Sample design and Weighting sections for details.

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Sample sizes and sampling errors for other subgroups are available upon request. In addition to sampling error, one should bear in mind that question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of opinion polls.

## Dispositions and response rates

### Final dispositions, ATP Wave 127

	AAPOR code	Total
Completed interview	1.1	5,101
Logged on to survey; broke off	2.12	88
Logged on to survey; did not complete any items	2.1121	18
Never logged on (implicit refusal)	2.11	627
Survey completed after close of the field period	2.27	2
Completed interview but was removed for data quality		5
Screened out		0
<b>Total panelists sampled for the survey</b>		<b>5,841</b>
Completed interviews	I	5,101
Partial interviews	P	0
Refusals	R	738
Non-contact	NC	2
Other	O	0
Unknown household	UH	0
Unknown other	UO	0
Not eligible	NE	0
<b>Total</b>		<b>5,841</b>
AAPOR RR1 = $I / (I+P+R+NC+O+UH+UO)$		87%
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### Cumulative response rate as of ATP Wave 127

	Total
Weighted response rate to recruitment surveys	12%
% of recruitment survey respondents who agreed to join the panel, among those invited	71%
% of those agreeing to join who were active panelists at start of Wave 127	48%
Response rate to Wave 127 survey	87%
<b>Cumulative response rate</b>	<b>3%</b>
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## Topline

**2023 PEW RESEARCH CENTER'S AMERICAN TRENDS PANEL  
WAVE 127 INTERNET TOPLINE  
MAY 15-21, 2023  
N=5,101**

**THE QUESTIONS PRESENTED BELOW ARE PART OF A LARGER SURVEY CONDUCTED ON THE AMERICAN TRENDS PANEL. OTHER QUESTIONS ON THIS SURVEY HAVE BEEN RELEASED OR ARE BEING HELD FOR FUTURE RELEASE.**

**NOTE: ALL NUMBERS ARE PERCENTAGES UNLESS OTHERWISE NOTED. THE PERCENTAGES LESS THAN 0.5% ARE REPLACED BY AN ASTERISK (\*). ROWS/COLUMNS MAY NOT TOTAL 100% DUE TO ROUNDING.**

	<b>Sample size</b>	<b>Margin of error at 95% confidence level</b>
U.S. adults	5,101	+/- 1.7 percentage points

**DISPLAY TO ALL:**

We are interested in what people know off the top of their head about some topics. You may find some of these questions easy and others difficult. (If you don't know the answer, select "Not sure.") As far as you know...

**[RANDOMIZE QUESTION ORDER DKQ1 – DKQ10]**

**ASK ALL:**

DKQ1 As of April 2023, which of the following companies did Elon Musk run? **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**

May 15-21, 2023

80	Tesla and Twitter {correct}
1	Uber and Snapchat
4	Twitter and Uber
1	Snapchat and Tesla
14	Not sure
*	No answer

**ASK ALL:**

DKQ2 If a website uses cookies, it means that the site can... **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**

May 15-21, 2023

3	Protect your computer from getting viruses
8	Send you pop-up advertisements
3	Look at files saved on your computer
67	Track your visits and activity on the site {correct}
19	Not sure
*	No answer

**ASK ALL:**DKQ3 What is a "deepfake"? **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**May 15-21, 2023

42	A seemingly real, computer-generated image, video or audio of something that did not occur {correct}
4	A text-based chatbot that tricks people into thinking that they are talking to another person
1	A system that records and protects information online
2	A program that makes it look like people are using the internet from a different location
50	Not sure
*	No answer

**ASK ALL:**DKQ4 In 2021, Facebook changed its company name to... **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**May 15-21, 2023

77	Meta {correct}
1	Alphabet
*	Cisco
1	Horizon
20	Not sure
*	No answer

**ASK ALL:**DKQ5 Which of the following passwords is the most secure? **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**May 15-21, 2023

1	SportsFan1983
87	WTh!58iLf2?9zD {correct}
1	abc12.6.48
1	1234567890
10	Not sure
*	No answer

**ASK ALL:**DKQ7 How do large language models, such as ChatGPT, come up with answers to questions users submit? **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**May 15-21, 2023


3	Randomly generate sentences that reorganize and reuse keywords found in the submitted question
9	Search the internet and summarize what the top results say on that topic
32	Create a response based on word patterns and relationships it previously learned from text pulled from the internet {correct}
4	Use a pre-written response that plugs in keywords from the question without any understanding of what was being asked
53	Not sure
*	No answer

**ASK ALL:**  
DKQ8

Some websites and online services use a security process known as two-step or two-factor authentication. Which of the following images is an example of two-factor authentication? **[RANDOMIZE OPTIONS 1-4, WITH 5 ALWAYS LAST]**

May 15-21, 2023

## Enter code

 If  matches the last 4 digits of the phone number on your account, we'll send you a code.

Don't ask me again on this device

Verify

48

{correct}



4

## Please answer your security questions.

These questions help us verify your identity.

What was your childhood nickname?

answer

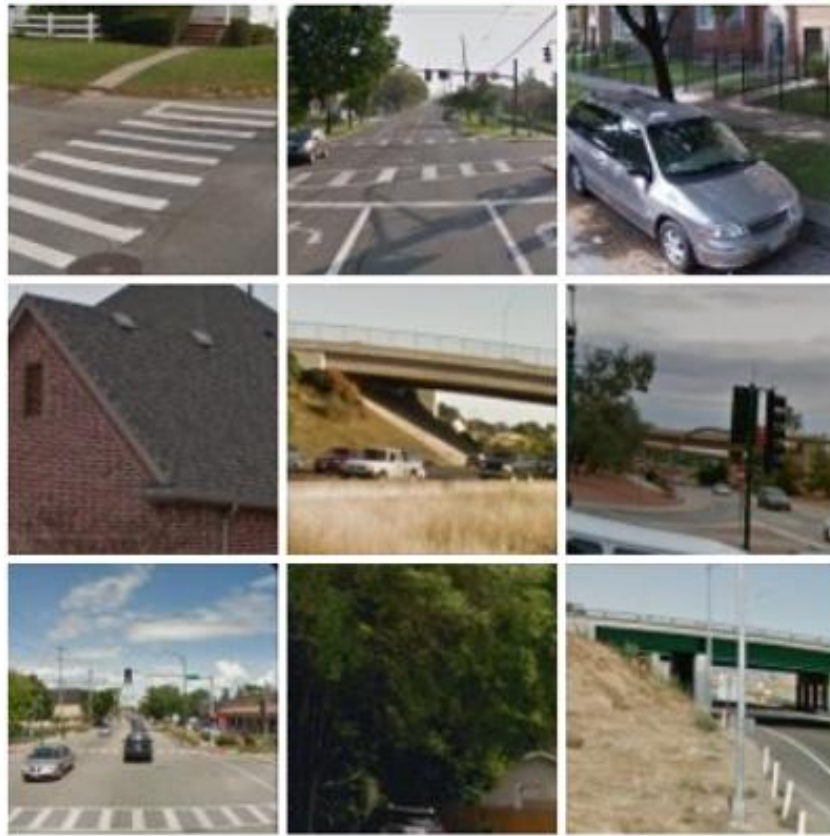
What was the name of your first manager?

answer

Forgot your answers? [Send reset security info email to](#) 

21

Select all images with  
**crosswalks**  
Click verify once there are none left.



VERIFY

14  
13  
1

Not sure  
No answer

**ASK ALL:**

DKQ9

Websites in the United States are prohibited from collecting data online from children under what age without a parent's consent? **[RANDOMIZE HALF ORDER 1-5 OR 5-1, WITH 6 ALWAYS LAST]**

May 15-21, 2023

1	5
1	10
21	13 {correct}
8	16
27	18
40	Not sure
1	No answer

**ASK ALL:**

DKQ10

Does the United States have a national privacy law that sets common standards for what companies can do with all data their products and services collect?

May 15-21, 2023

24	Yes, it does
23	No, it does not {correct}
52	Not sure
1	No answer