



What's So Super About Supercomputing?



activity book for kids of all ages

About the Ohio Supercomputer Center

The Ohio Supercomputer Center (OSC) empowers Ohio higher education institutions and private industry by providing capable, accessible, reliable and secure computational services enhanced by training, consulting and research partnership. Through OSC's high performance computing resources, the State of Ohio leverages significant economies of scale resulting in better services and cost savings. OSC helps position Ohio's higher education institutions and companies as world leaders with a computationally enabled workforce and research endeavors.

OSC is a member of the Ohio Technology Consortium (OH-TECH), the technology and information division of the Ohio Department of Higher Education.

Credits

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Big Numbers

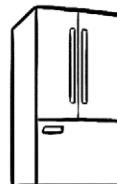
Compared with a U.S. Penny

Any discussion of supercomputers involves really big numbers. Because it's hard to read and write lots of digits, scientists and engineers use special names for really large numbers. To imagine the size of these big numbers, let's compare them to a common object such as a penny.

Draw lines to match the numbers on the left with objects that many pennies would fill up.

Kilo: 1 Thousand
1,000

A refrigerator



Mega: 1 Million
1,000,000

A container ship



Giga: 1 Billion
1,000,000,000

A house



Tera: 1 Trillion
1,000,000,000,000

All the trucks
in the U.S.



Peta: 1 Quadrillion
1,000,000,000,000,000

A water bottle

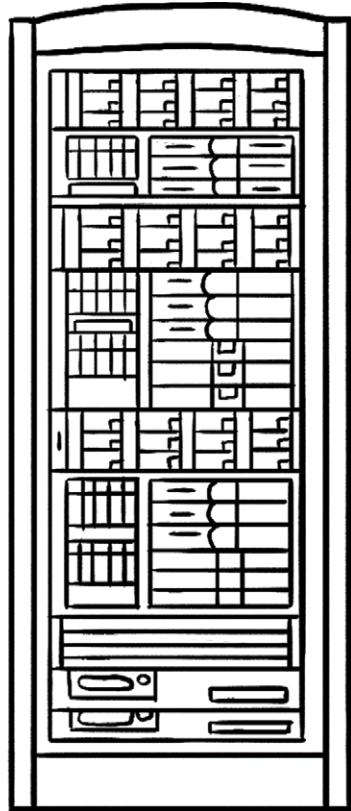
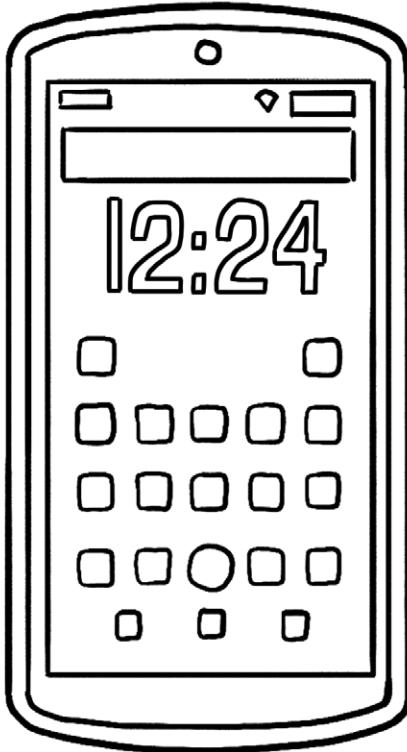
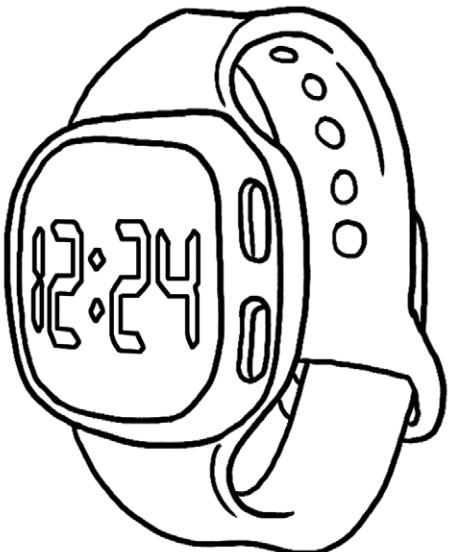


Exa: 1 Quintillion
1,000,000,000,000,000,000

Lake Erie



What is a Supercomputer?



SMART!

\$50

100 Megabytes

10 Apps

SMARTER!

\$500

100 Gigabytes

100 Apps

SMARTEST!

\$5,000,000

100 Terabytes

1,000 Apps

A supercomputer is just a computer that is more powerful than the majority of other computers that currently exist. In the same way a smartphone has a lot more features than a digital watch, a supercomputer has many more features than a smartphone. Just like how you get smarter as you get older, supercomputers also get smarter over time.

Why Use a Supercomputer?

Scientists come up with theories and conduct experiments to test them. But it's hard to perform experiments on things that are **too small** or **too big** or **too remote** to see and measure, or when processes are **too fast** or **too complex** or **too dangerous**. Scientists often can solve these types of challenges by simulating the experiments on a supercomputer.

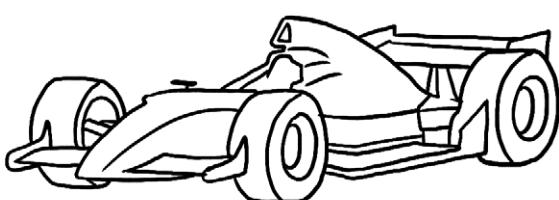
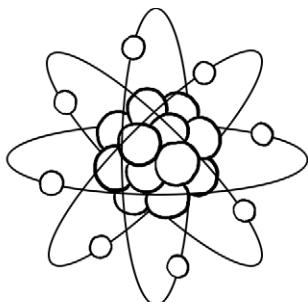
Can you match these pictures with the terms in the word bank below?

WORD BANK

small
fast

big
complex

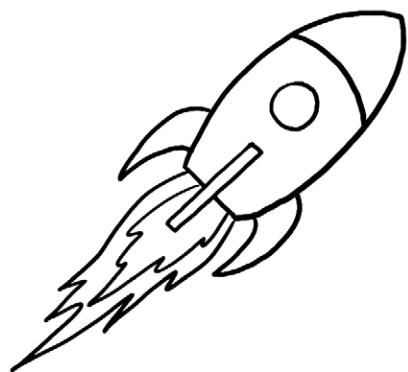
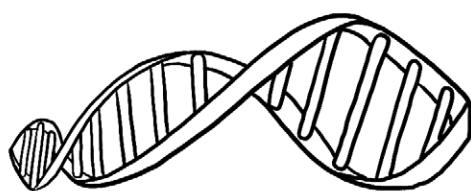
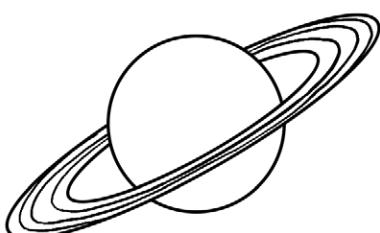
remote
dangerous



Too _____

Too _____

Too _____



Too _____

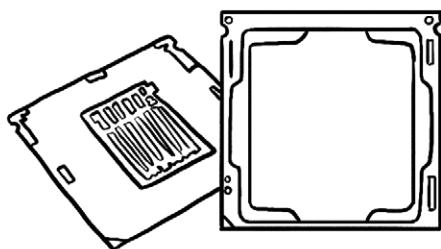
Too _____

Too _____

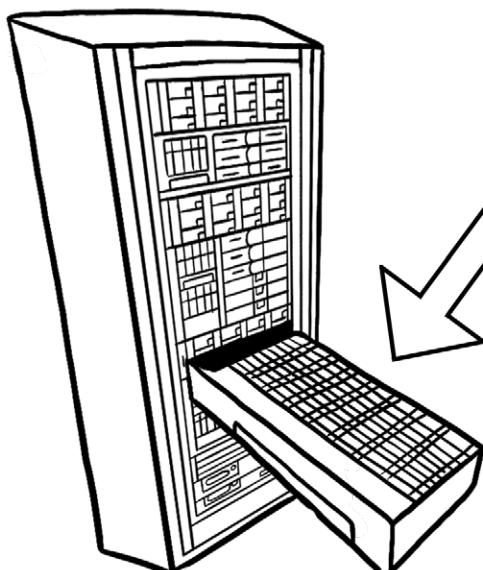
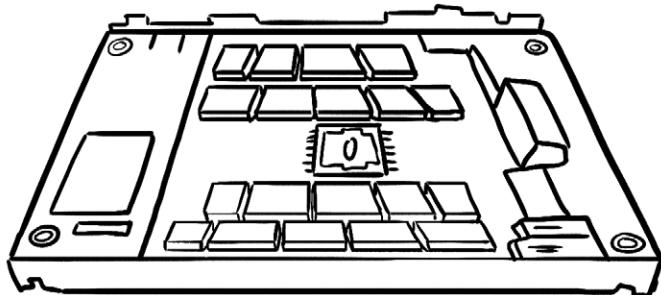
Supercomputer Terminology

Modern supercomputers are built using the same basic components that go into commonly available desktop, laptop and tablet computers. They just contain a lot more of them! They require special buildings called data centers to house them and provide lots of space, power and air conditioning to cool them.

Core: The processing chips that are the brains of a computer



Node: A box that is equivalent to a single high-end computer



Cluster: A group of nodes connected by a high-speed network

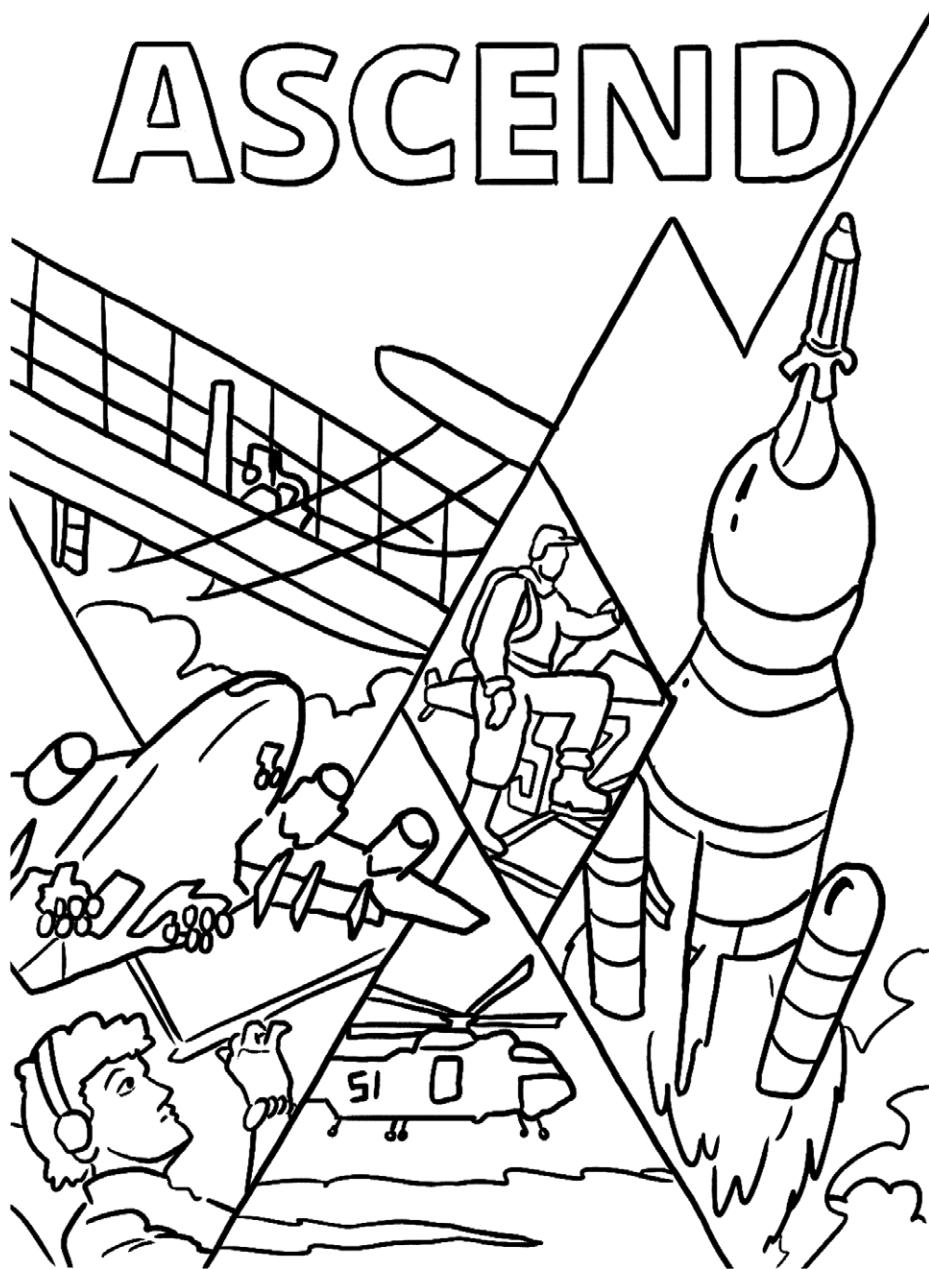


Rack: A single cabinet that contains many nodes

OSC's Supercomputers

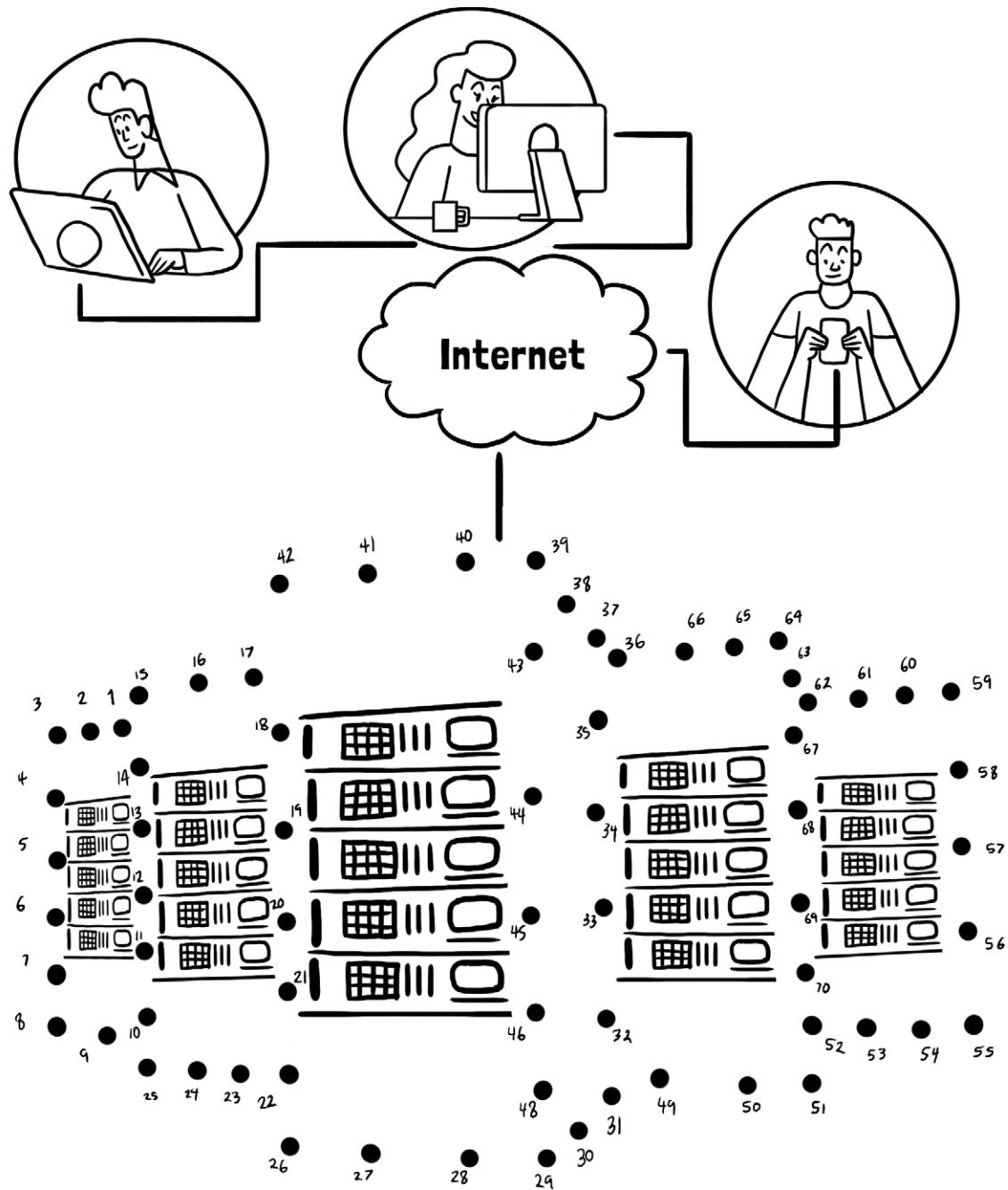
As of 2023, OSC has three supercomputers that cost more than \$16 million and contain more than 1,500 individual nodes and more than 55 thousand cores. OSC also has storage systems with a combined capacity of 20 Petabytes. OSC's newest supercomputer is called Ascend, which is inspired by Ohio's many aviation- and aerospace-related heroes and achievements.

**How many can you identify in the picture
that is on the side of the supercomputer?**



How to Use a Supercomputer

Connect the dots!



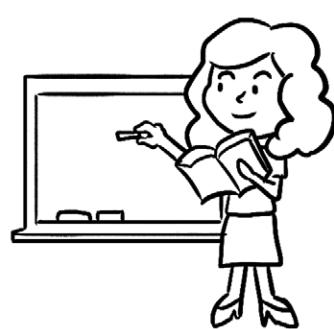
Researchers remotely connect to supercomputers over the internet using a standard web browser. They rely on a special software developed by OSC called Open OnDemand that is used by hundreds of supercomputers all over the world. Once connected to a supercomputer researchers use the same types of technical software they run on their personal computers.

Who Uses OSC's Supercomputers?

OSC's motto is "supercomputing for anyone, anywhere" because that represents the thousands of people from all over the world who use OSC's systems.

**Find examples of people and organizations
that use OSC in the grid below.**

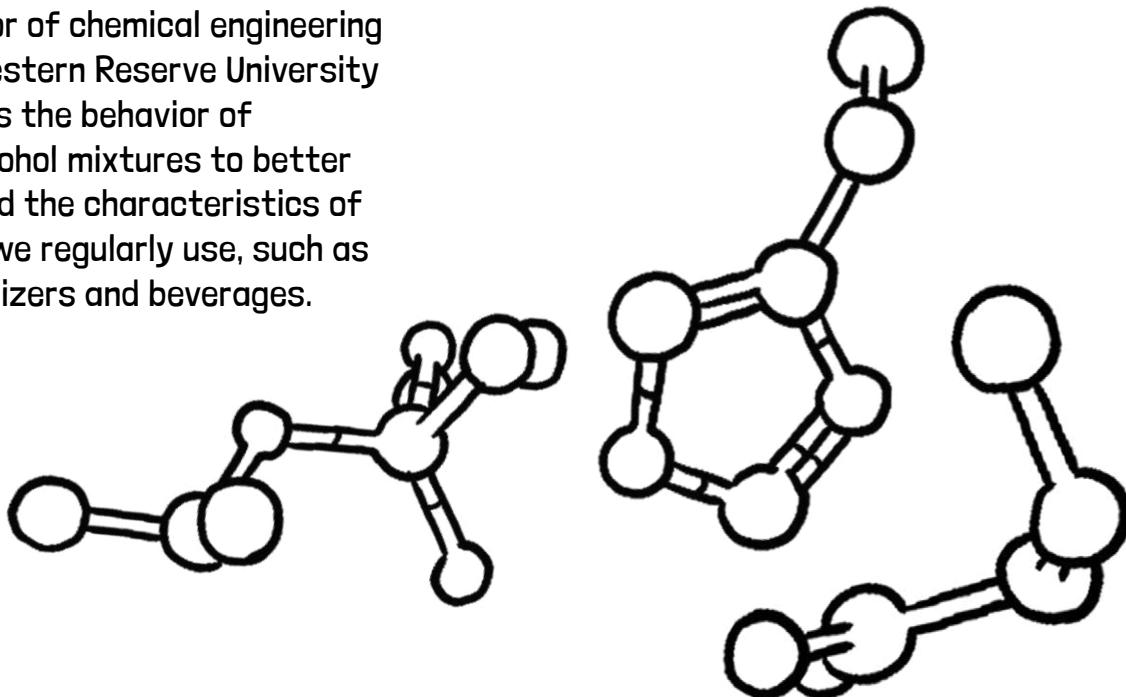
S	T	H	T	S	R	R	A	A	U	E	T	L	O		Anyone
T	G	G	O	V	E	R	N	M	E	N	T	B	E		Business
I	R	E	S	E	A	R	C	H	E	R	S	S	T		Engineers
F	I	N	S	C	H	O	O	L	S	E	S	T	I		Faculty
O	N	G	Y	T	D	S	D	N	C	S	R	U	S		Government
R	D	I	T	D	S	E	H	R	O	T	E	D	T		Hospitals
P	U	N	L	A	E	K	I	D	S	D	H	E	S		Industry
N	S	E	U	T	N	N	E	P	I	O	C	N	I		Kids
O	T	E	C	C	E	S	S	B	I	F	A	T	T		Nonprofits
N	R	R	A	A	E	N	O	Y	N	A	E	S	N		Researchers
O	Y	S	F	E	D	L	S	S	N	E	T	E	E		Schools
S	E	I	T	I	S	R	E	V	I	N	U	O	I		Scientists
H	O	S	P	I	T	A	L	S	T	T	S	S	C		Students
Y	I	B	U	S	I	N	E	S	S	G	S	G	S		Teachers
															Universities



OSC's Supercomputers in Action!

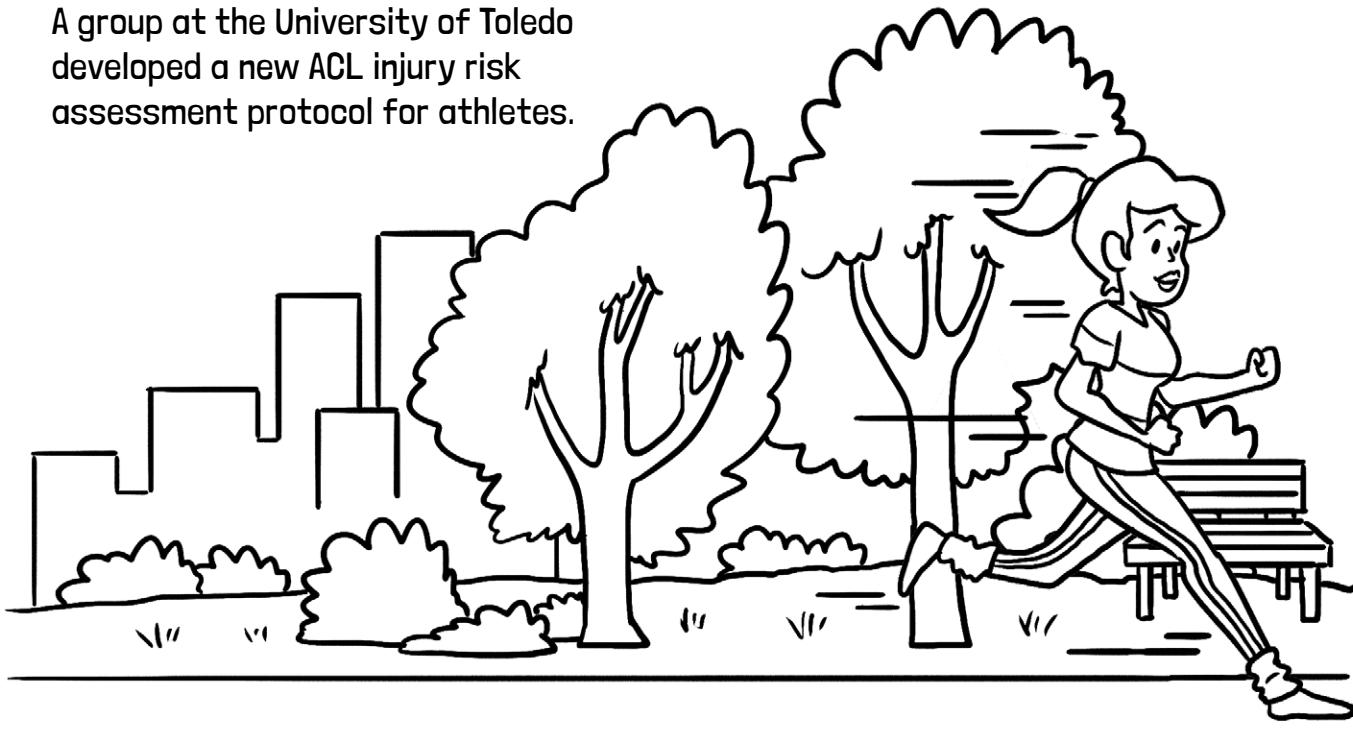
Scientific Research

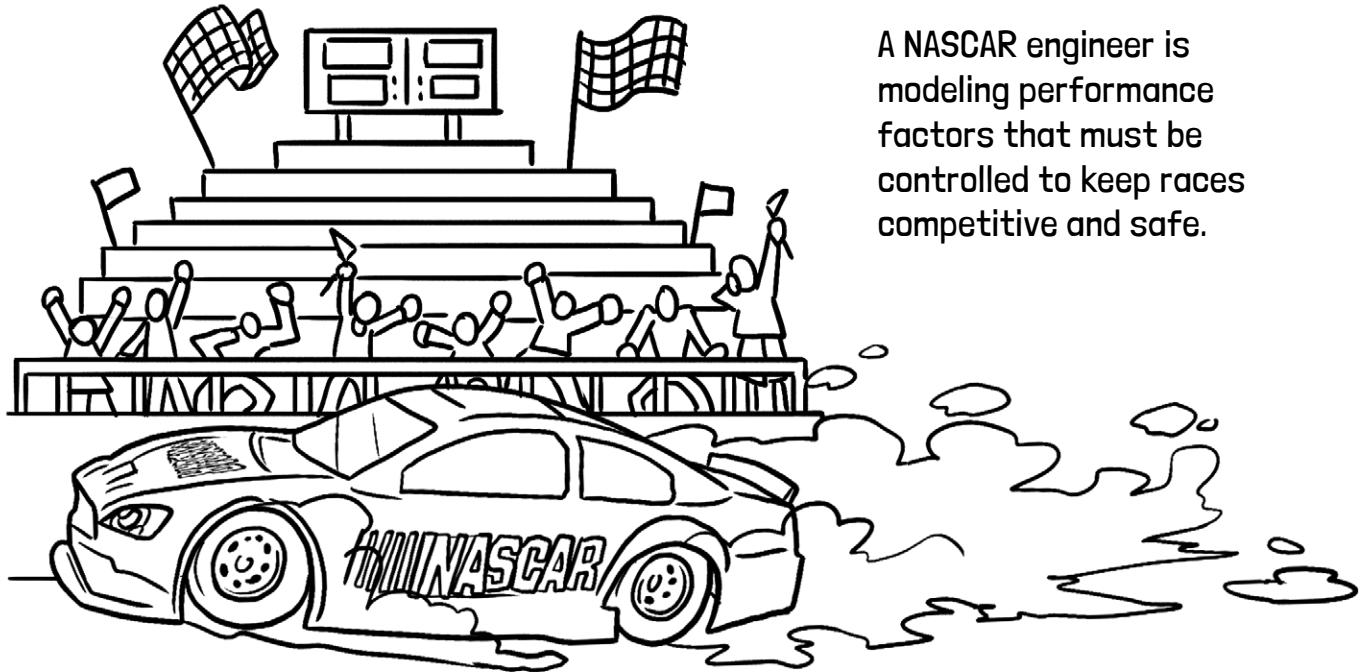
A professor of chemical engineering at Case Western Reserve University researches the behavior of water-alcohol mixtures to better understand the characteristics of products we regularly use, such as hand sanitizers and beverages.



Health Care

A group at the University of Toledo developed a new ACL injury risk assessment protocol for athletes.



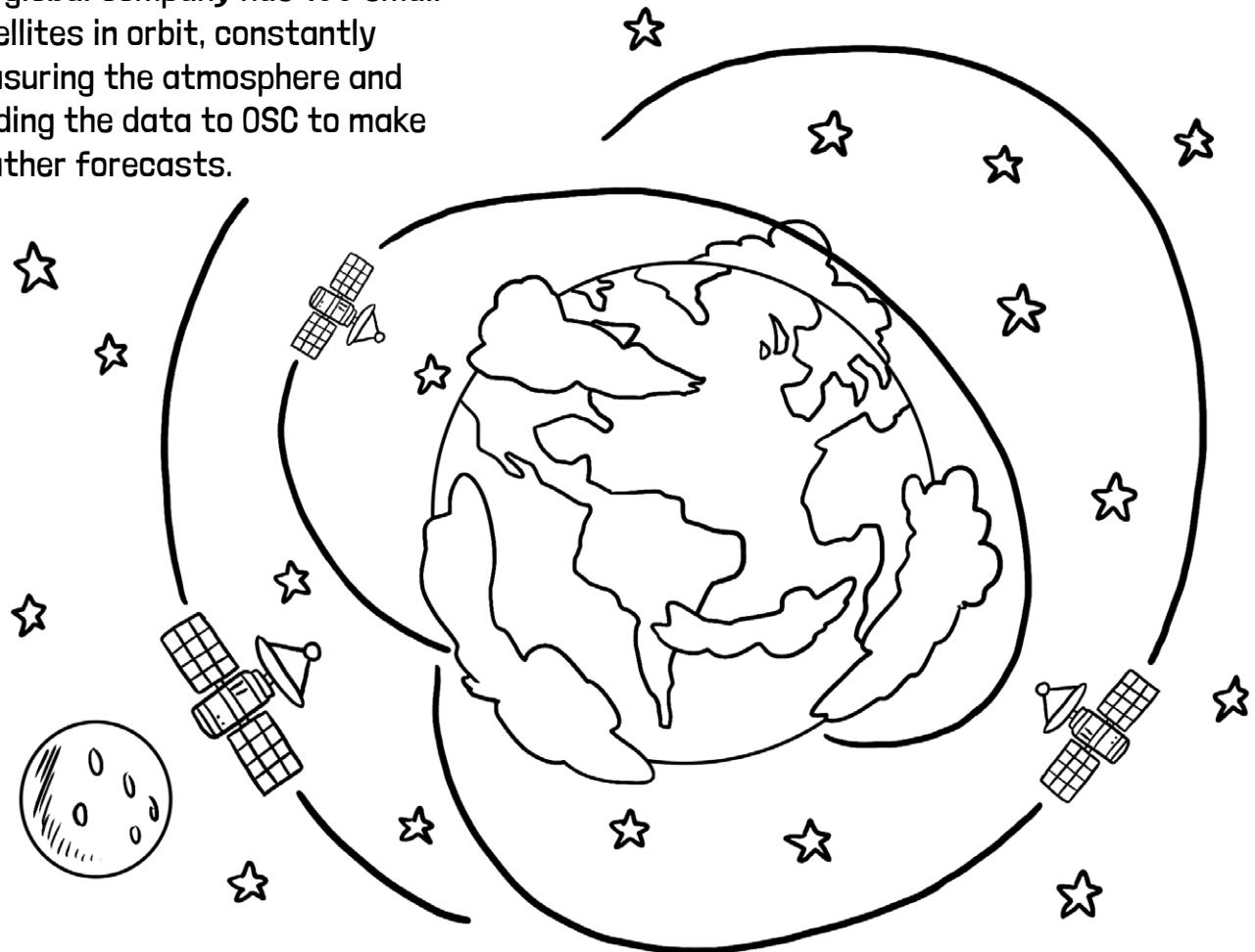


Vehicle Design

A NASCAR engineer is modeling performance factors that must be controlled to keep races competitive and safe.

Weather and Climate

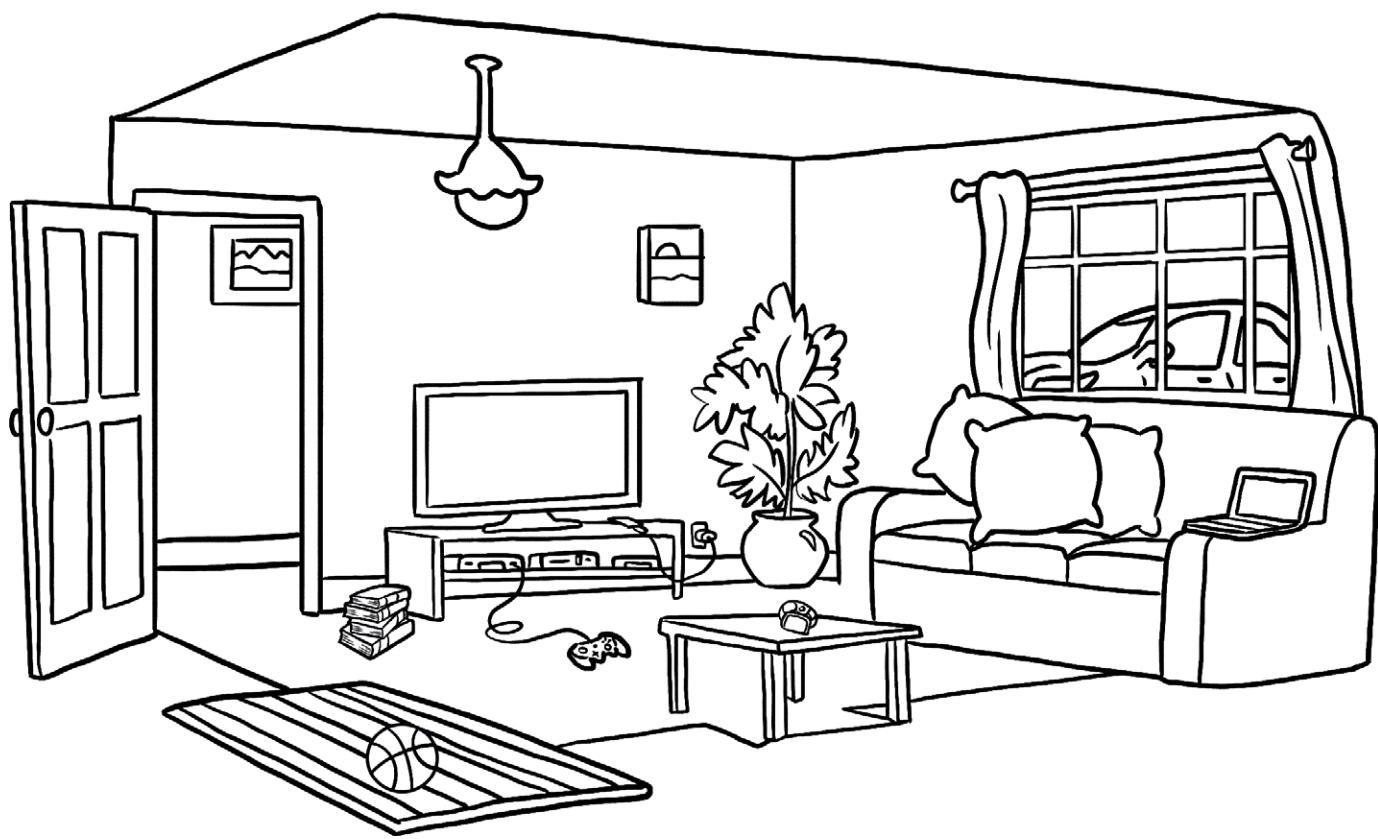
One global company has 100 small satellites in orbit, constantly measuring the atmosphere and sending the data to OSC to make weather forecasts.



What's Next for Supercomputers?

Computer technology is constantly evolving. For example, a modern smartphone charger (just the power adapter itself) has 1,000 times the speed and double the memory of the Apollo Lunar Module that landed on the moon 50 years ago. Imagine all the amazing things everyday devices that contain computers will be capable of 50 years from now!

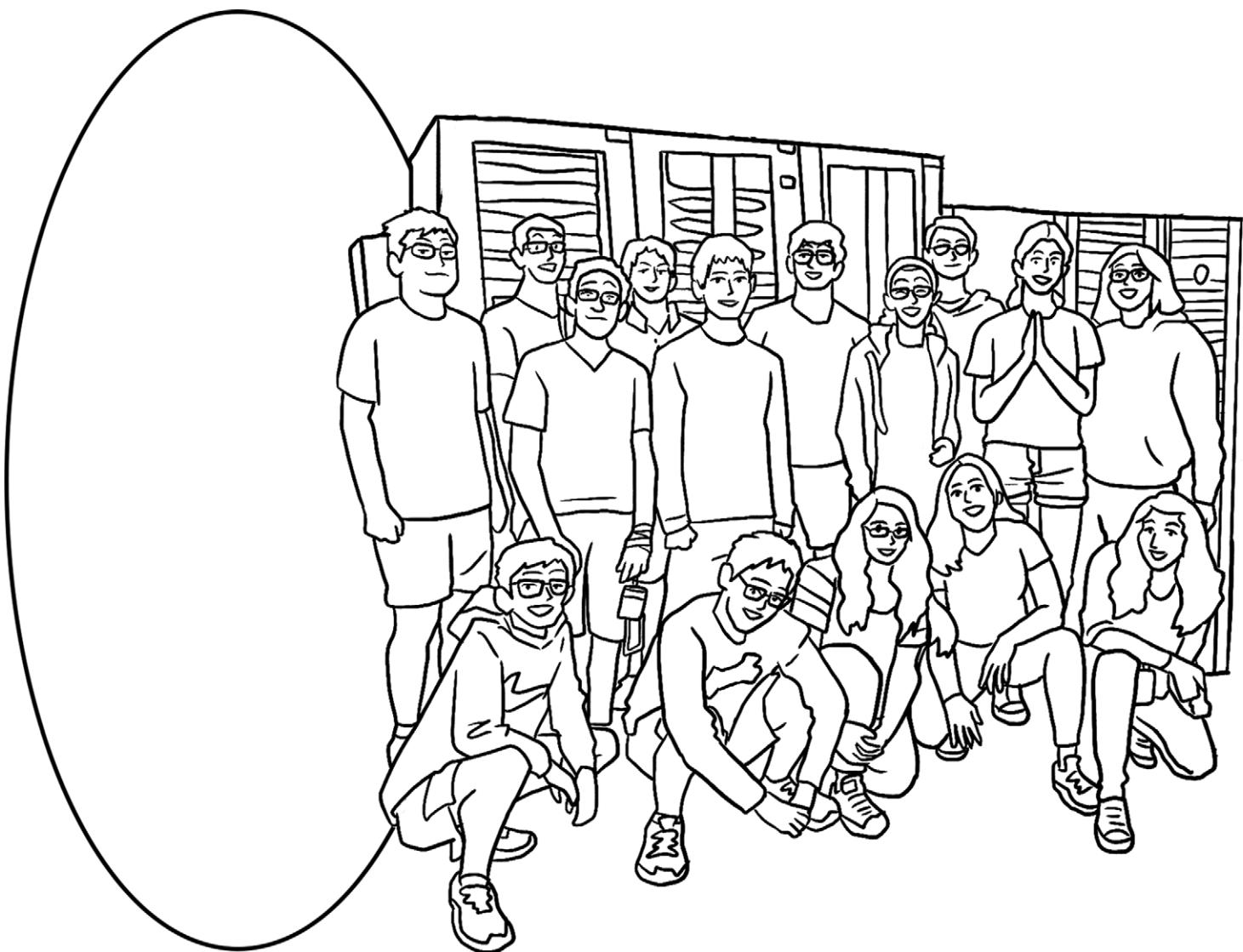
Find common technology devices in the picture below.



Who Will Use OSC in the Future?

It could be you! Want to get started? OSC runs educational programs for students of all ages, including our summer programs for middle school and high school students, the Young Women's Summer Institute and Summer Institute. We also offer group tours of our facilities. Many of the students who participate in these programs will pursue careers that involve using supercomputers!

Draw yourself here!

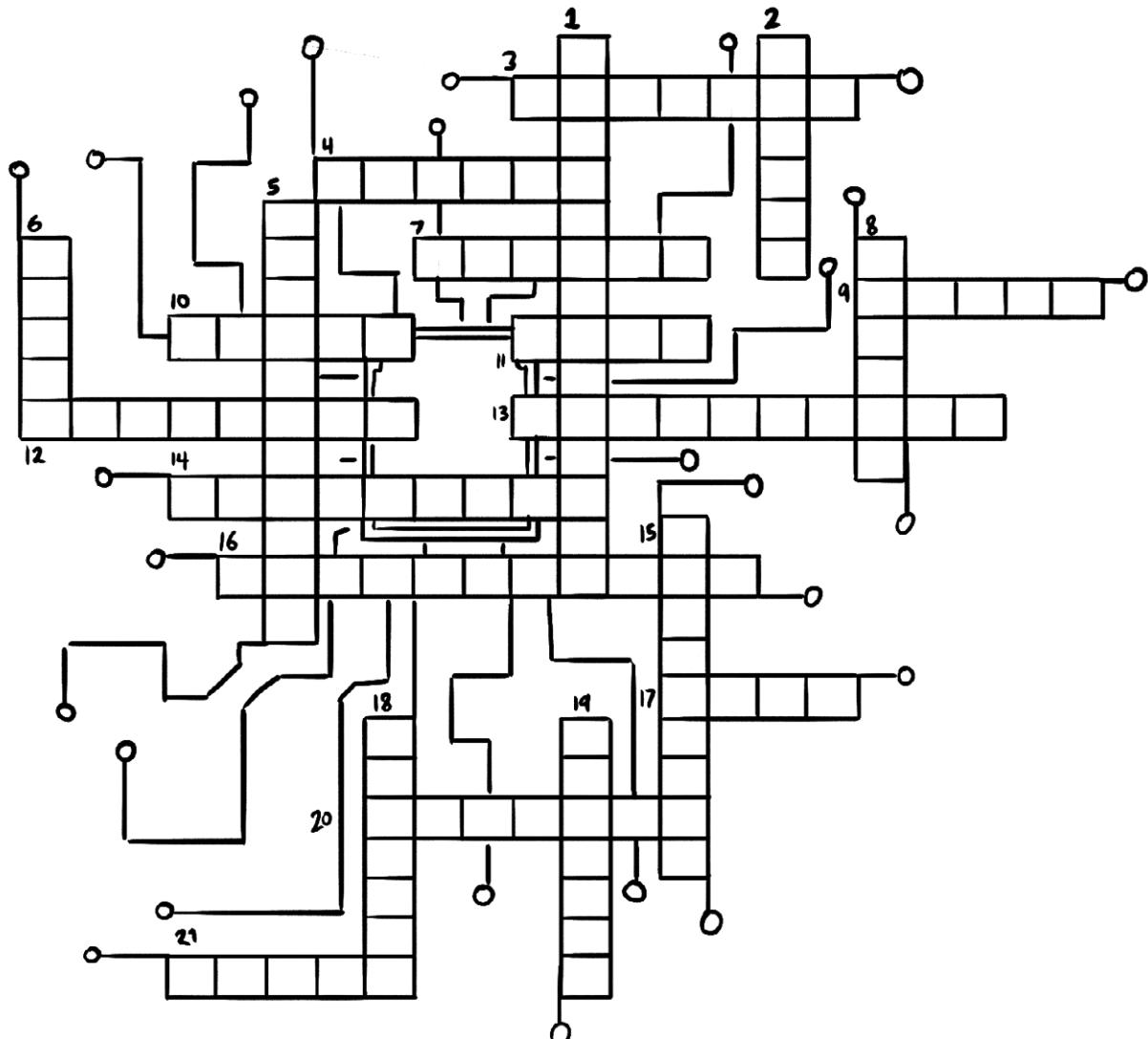


Visit osc.edu/summer to apply for one of OSC's programs and be part of the next group!

Technology Quotes

Use the bold words in the quotes below to fill in the crossword puzzle.

- Arthur C. Clarke: "Advanced **technology** is indistinguishable from **magic**."
- Isaac Asimov: "I do not fear **computers**. I fear the **lack** of them."
- Grace Hopper: "To me **programming** is more than an important practical art. It is also a gigantic undertaking in the foundations of **knowledge**."
- Bill Gates: "The **microprocessor** is a **miracle**."
- Stephen Hawking: "To pursue a **career** in the 21st century, basic computer programming is an essential **skill** to learn."
- Katherine Johnson: "There will always be **science**, **engineering**, and **technology**."
- Steve Jobs: "Computers themselves, and **software** yet to be developed, will revolutionize the way we **learn**."



Activity Answers

Page 1

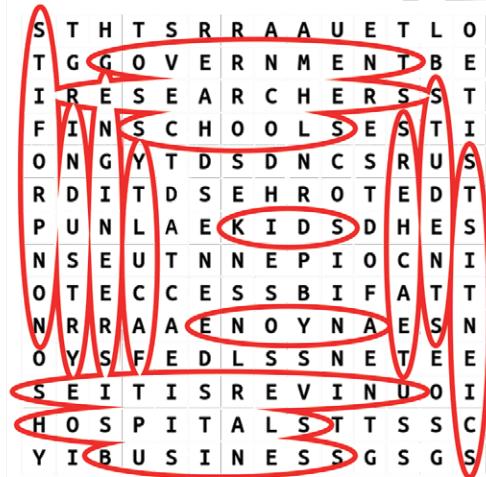
Kilo : Bottle
Mega : Refrigerator
Giga : House
Tera : Ship
Peta : Trucks
Exa : Lake

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Atom : Small
DNA : Complex
Racecar : Fast
Rocket : Dangerous
Saturn : Remote
Tornado : Big

There are other possible solutions

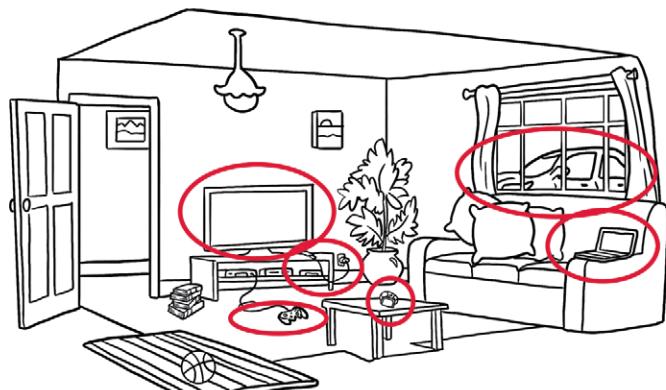
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Page 5

Astronaut: Kathryn Sullivan
Cargo Plane: U.S. Airforce C-17
Helicopter: U.S. Navy HRS-1
Pilot: Colonel Benjamin O. Davis, Jr.
Plane: 1908 Wright flyer
Rocket: NASA Orion capsule / SLS
See osc.edu/ascend-launch
for more details

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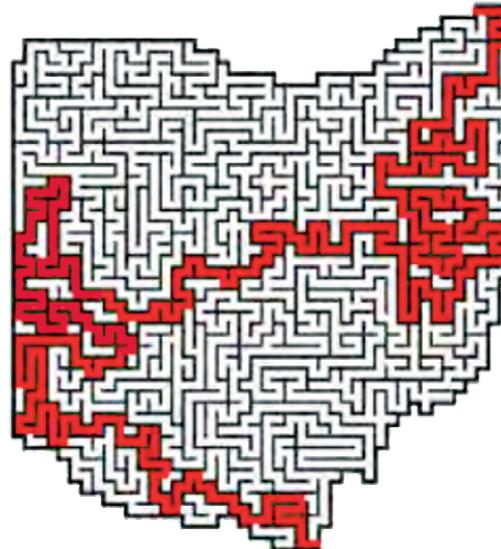
Across

- 3. Miracle
- 4. Career
- 7. Hopper
- 9. Skill
- 10. Magic
- 11. Jobs
- 12. Software
- 13. Technology
- 14. Computers
- 16. Engineering
- 17. Lack
- 20. Hawking
- 21. Learn

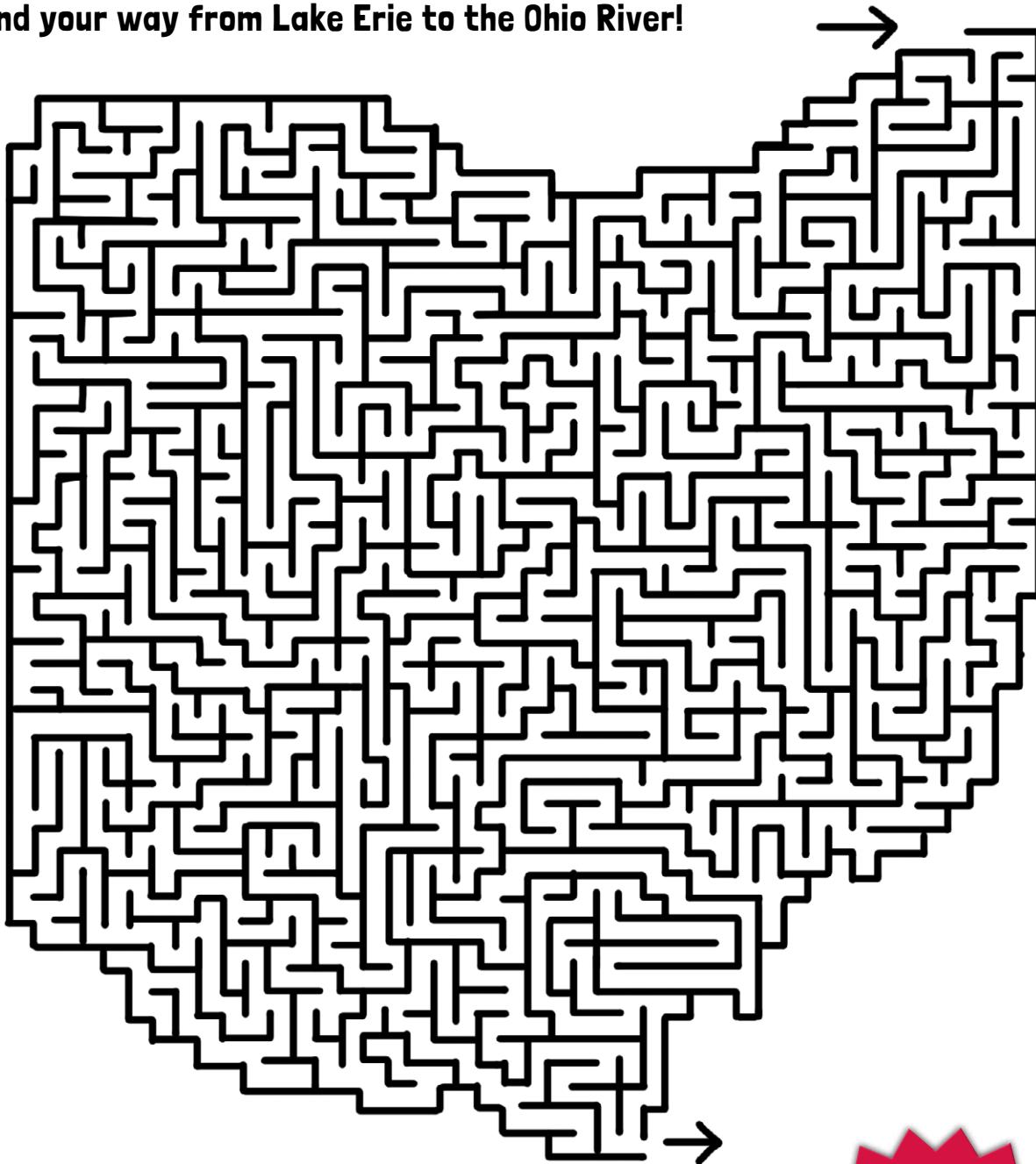
Down

- 1. Microprocessor
- 2. Clarke
- 5. Programming
- 6. Gates
- 8. Asimov
- 15. Knowledge
- 18. Johnson
- 19. Science

Back Cover



Find your way from Lake Erie to the Ohio River!



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