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KNOWLEDGE ABOVE ALL

COVID CARE

BY SHREEYESH S.

YOU CAN CALCULATE EXACTLY HOW MANY LIVES YOU'LL SAVE BY WEARING A MASK

Did you know homemade face masks made of cotton are about 20 per cent more effective at filtering out small particles like SARS-CoV-2, the virus that causes COVID-19, than silk or flannel? And have you heard that after two weeks of wearing any of these three fabrics over your nose and mouth, you could potentially prevent up to 19 or 20 people from contracting the virus? Two friends in Poland are on a mission to make sure you're aware of these facts—and to dispel misinformation surrounding protective face coverings. And the best way to do that is with a calculator.

Dominik Czernia, a physics Ph.D. student at the Institute of Nuclear Physics in Kraków, and

and Joanna Michałowska, a PhD student at the Poznan University of Medical Sciences, have created their free calculator—hosted on Omni Calculator, a repository of over 1,290 calculators across various kinds of subject matter—to illustrate a few variables around mask-wearing and their consequences. "There are lots of people that don't believe in mask efficiency," Michałowska tells Popular Mechanics. "There are also lots of Facebook posts saying that you can get a fungal infection, or some other disease [from wearing a mask], and none of these things has been proven."

To build the calculator, the pair parsed through data from a few new coronavirus-related research studies. One study, published in the journal ACS Nano in April, shows the effectiveness of a number of different materials used in homemade cloth masks, from cotton to silk, and even chiffon. Those researchers found when it comes to homemade masks, hybrid materials are best—think cotton-silk or cotton-flannel blends.

In Czerniak and Michałowska's calculator, this is accounted for in the drop-down menu for mask type. There are options for N-95 respirators, surgical masks, and scarves, too, if you want to check out how well those coverings filter out small particles.

From there, the other variables include:

- Whether or not you wear a mask
- Initial reproduction number R_0
- Percentage of people that wear masks



ASTRONAUTS PERFORM SPACEWALK TO SWAP STATION BATTERIES

JAYESH SAPKAL
STUDENT

Astronauts performed their second spacewalk in under a week to replace old batteries outside the International Space Station. Commander Chris Cassidy and Bob Behnken quickly tackled the big, boxy batteries. For every two outdated batteries coming out, a new and improved one goes in to supply power to the station on the night side of Earth.

Within a couple of hours, the astronauts had installed another new battery, the third one in this latest series of spacewalks. NASA plans to send the pair out twice more in July to complete the battery swap-outs that began in 2017. The new lithium-ion batteries should last the rest of the space station's life, according to officials.

With their main chore completed, Cassidy and Behnken jumped ahead to loosen the bolts on the remaining outdated batteries. Some of the bolts required extra muscle. "Boy, it put up a good fight," Cassidy radioed. "These batteries, they like their home."

Before floating out, Cassidy attached a spare mirror to his sleeve to replace one that came off and floated away during Friday's spacewalk. Astronauts use wrist mirrors to see the displays on their chest control panel.

NASA wants the battery work completed before Behnken returns to Earth in August aboard a SpaceX capsule. He's one of two test pilots who launched on SpaceX's first astronaut flight in May. Cassidy and Behnken now have eight spacewalks apiece on their resumes. A space tourist might get a chance to join the prestigious spacewalking ranks – for the right price.

Virginia-based Space Adventures Inc. is seeking a paying customer to not only fly to the space station but do a spacewalk with an experienced Russian cosmonaut. Before launching from Kazakhstan, the space tourist would need to undergo extra training in Star City, Russia.

Space Adventures is not divulging the cost of the two-week mission. The flight would take up two tourists in 2023, one of whom would step outside. The Russian rocket company Energia has teamed up with Space Adventures for the expedition. Plenty of specialized training would be needed before someone ventures out on a spacewalk.



INNOVATION AND INDIA

SINGH AKASH,
STUDENT

"Look at all this traffic". "There's so much pollution". "Why can't people keep the roads clean?" How many times have you uttered these lines in the last week? While we were complaining, a handful of young Indians were busy creating innovative solutions to improve our daily lives. Here's a list of Indians under the age of 21, who have been silently working to ease our troubles with their inventions this year:

- **1) 'Goggles for the Blind':** Anang Tadar, a Class XI student from Arunachal Pradesh, has developed a pair of glasses to help the visually impaired navigate "hands-free". Tadar's goggles, referred to as G4B, use echolocation technology - which mimics the way bats sense their surroundings - to alert visually-impaired wearers to objects within 2 metres of its field view.
- **2) Bee Saver Bot:** Twelve-year-old Kavya Vignesh hopes to save bees from going extinct. The Delhi girl and her team built a bee saver bot, nicknamed 'Lightning McQueen', on the Lego Mindstorms EV3 robotics kit. The young inventors, who call themselves Supercalifragilisticexpialidocious, was India's youngest ever team to qualify for the First Lego League - European Open championship in Aarhus in May. The team won second place in the European Robotics Competition
- **3) World's Smallest Satellite:** Rifath Sharook, an 18-year-old from Karur in Tamil Nadu, scripted history in June after NASA sent a 3D-printed satellite he helped build into space. The 'KalamSat', named after APJ Abdul Kalam, is the world's smallest satellite - with a weight of 64grams.
- **4) Energy-efficient Car:** In March this year, a team of 15 girl students from Indira Gandhi Delhi Technical University for Women won honours at the Shell Eco-Marathon in Singapore for their creation, of an energy-efficient vehicle. Touted to be the only all-woman team from Asia, 'Team Panthera,' comprising 15 engineers aged between 18-21, won the Perseverance and Spirit of the Event Award for Iris 2.0 - a three-wheeled vehicle with a mileage of 300kmpl.
- **5) Skin Patch to Detect Silent Heart Attacks:** Akash Manoj, a Class X student from Tamil Nadu, has developed a skin patch that can detect 'silent heart attacks'. His skin patch, that can be attached to the ear or the wrist, will release a 'positive' electrical impulse, which will attract the negatively charged protein released by the heart to signal a heart attack
- **6) 3-D Printed Sanitary Napkin Dispenser:** Three Class XII students of Mumbai's Cathedral and John Connon School built and set up a 3D printed sanitary napkin dispenser for their school in April this year. The three innovators, Devika Malhotra, Malini Dasgupta, and Aditi Arya, built a 3D printed dispenser, which uses a coil and light sensor to release sanitary napkins,



INDIA GOES ELECTRIC WITH BATTERY-SWAPPING RICKSHAWS

MANSI LAKHANI

PANKAJ KUMAR DRIVES his autorickshaw up to a charging station in a covered parking lot in Gurugram, a satellite city of New Delhi. He flips open a lid on the side of the box that was the driver's seat. One at a time, he pulls out the two batteries powering the small vehicle, each about a foot high, five inches wide, and weighing 26 pounds. Kumar taps his key fob on the station, a large black box a bit shorter and wider than a vending machine. A locker pops open, revealing a fully charged battery. He pops it in, then repeats the action for the second battery. After just a few minutes of downtime, Kumar and his electric ride are back on the road, fully charged and looking for the next fare.

Globally, transportation accounts for 15 percent of greenhouse gas emissions, and electric vehicles are a big part of the solution. In the US and Europe, governments have worked to push people into electric cars. But in India, where fewer than four million cars are sold annually, two wheelers, autorickshaws (called tuk-tuks in other Asian countries), and buses remain the dominant modes of transportation.

If this sounds familiar, it's because battery swapping has been tried before, most notably by Better Place. In the late 2000s, the Israeli company had raised more than \$800 million and convinced Renault to make a car model using swappable batteries. But the idea never caught on, and Better Place went bankrupt in 2013. Maini dismisses the comparison, saying his business model is different. For one, the Israeli firm was focused only on cars and had tied up with one client (Renault) to sell its products. For another, its charging stations were expensive to install, and at least some were miles from the highway. SUN, Maini says, can work with any manufacturer. It can install its autorickshaw swapping stations, like the one Kumar uses for his vehicle, in crowded neighborhoods. SUN will fit its bus changing stations into 20-foot containers, using a robotic system to swap out the 1,430-pound battery in less than three minutes.

The autorickshaw side of the business, indeed, has a more positive example to follow than Better Place. Since launching its battery swappable scooters in Taiwan in 2015, Gogoro has expanded to Japan, France, and Germany. Its riders now swap some 86,000 batteries a day.

Maini is convinced the market will support swappable batteries, and is in the process of signing new clients, including food and package delivery companies whose drivers are out and about on two-wheelers all day long. If those drivers are like Kumar, Maini shouldn't have a problem. "The other one takes too much time to charge," Kumar says. "This is quick and I can get back to work and get back to earning money." And keep the air cleaner while doing it.

