Future Literacy 100-2

Unit 1. Robot Firefighters

Robot firefighters are used to decrease the injuries that are sustained by human firefighters. This includes life-threatening injuries and deaths. Robots can perform tasks that are too risky and dangerous even for the bravest firefighters. Robot firefighters are designed to perform tasks such as analyzing and locating fires, conducting search and rescue, and monitoring fires. Mobile robot firefighters are usually equipped with firefighting tools such as sensors and cameras. Some robots are drones that can fly around and provide human firefighters with an aerial view of fires that occur in tall buildings or have spread across a wide area. One example of a firefighting robot is THOR (The Tactical Hazardous Operations Robot). THOR is a humanoid robot that uses sensors for navigating. It has succeeded in putting out fires on Navy ships. Scientists hope that more firefighting robots can be developed to help people.

Unit 2. Cleaning Up Space Garbage

The RemoveDEBRIS satellite is a British satellite built by the Surrey Space Centre at the University of Surrey. It was designed to find ways of cleaning up the trash that is floating around in space. On September 16th, 2018, it managed to capture a piece of trash successfully using a large net. It proved that a simple solution like a net could be used to clean up garbage in space. Along with nets, the satellite also has the ability to launch harpoons to spear objects and drag them out of orbit. These different methods are being tested by the satellite to find the best way to clean up trash from space. The added bonus of the use of nets and spears is that they are comparatively low-cost. The satellite is also equipped with special cameras that can help it navigate through a large amount of garbage. According to the U.S. Department of Defense's Space Surveillance Network, there are currently 8000 objects being tracked as they orbit the Earth.

Unit 3. Cars That Drive Themselves

Self-driving cars have become a reality. In 2018, Dubai's Roads and Transport Authority announced that it would test the region's first self-driving taxi. The statement also said that it would aim to turn twenty-five percent of transportation journeys in the emirate into autonomous ones by 2030. The tests ensure that the self-driving taxis meet all the requirements for safety and security. For example, the tests will measure such driving hazards as collisions. All the taxis are capable of driving up to speeds of thirty-five kilometers. As an added precaution, a human driver will be in the car to take control in the case of emergencies. In addition to Dubai's self-driving taxis, the Hyundai Motor Company has also announced that it will be testing a self-driving truck called "Xient truck" in South Korea. It can carry up to forty tons and has reportedly driven around forty kilometers between the cities of Uiwang and Incheon.

Unit 4. Intelligent Machines

Over the past half a century, computers have completely changed our way of life. Our education, work, and leisure time have all become increasingly dependent on the machines we use – desktop and laptop computers, tablets, and smartphones. The first modern computer was proposed by English mathematician Alan Turing in 1936. This machine was built and used during the Second World War to decode secret German communications. After the war, governments and universities continued to invest heavily in computer development. The first computers were huge and predominately used for academic research. Personal computers only became available in the 1970s and were very slow and expensive. Fifty years later, computer devices are cheap, easy to transport, and ever more intelligent. With huge investments in artificial intelligence (A.I.), computers will soon be as smart as humans, which will lead to more large-scale changes in how we live our lives.

Unit 5. Baseball Signs

Baseball hand signals originated from a boy named William Ellsworth Hoy. Born in 1862, he lost his hearing at a young age due to illness. He was sent off to attend the Ohio School for the Deaf where he learned sign language. William also learned to play baseball, which he fell in love with. He and his team played against other schools with non-deaf children. Due to his deafness, William had a disadvantage. He could not hear what the umpires were shouting. He had to ask his coach whether the umpire had shouted a strike or ball. To make the process easier, William asked his third base coach to use hand signals to communicate the umpire's calls. If it was a strike, the coach would raise his right arm. If it was a ball, he would raise his left. The hand signals were so efficient that it quickly spread to all the other players.

Unit 6. Hieroglyphics

The word hieroglyphics is a Greek term that combines the meanings "holy" and "marks." Egyptians believed that there was great power in a name. If a name was remembered, then that individual would survive in the afterlife. For this reason, Egyptian kings and queens had their names written in hieroglyphs in their tombs so that their names would never be forgotten. Each hieroglyph has its own meaning. Some of them represent the actual objects that they resemble. In other cases, they are used to refer to different sounds. For example, the owl symbol stands for the "m" sound, and the mouth symbol usually stands for the "r" sound. Other symbols include the cobra for the "j" sound, a lasso for the "o" sound, and a lion for the "l" sound. If you manage to memorize all the symbols for the English alphabet, you'll be able to spell out your own name just by using hieroglyphs.

Unit 7. How Animals Communicate

Like humans, animals also communicate in different dialects. Studies have shown that the same species of animals in different regions have different dialects. Blue whales, for example, make different patterns of tones and pitches depending on which region they are from. Some animals are even bilingual. Birds that live on the border between different territories typically communicate in a different singing pattern when addressing different bird groups. Animals also participate in cross-species communication. Scientists have discovered that Madagascan spiny-tailed iguanas have well-developed ears so that they can hear the warning calls of the Madagascan paradise flycatcher. Both species have a common predator, the raptor, so iguanas can protect themselves when the flycatcher warns other birds. Sadly, human noise pollution gets in the way of animal communication. As traffic noises have increased over the centuries, animals have suffered. Some birds have tried to adapt by producing songs that are shriller and louder so as to be heard over all the noise pollution.

Unit 8. Barcodes and QR Codes

Barcodes store information using the EAN-13 system where information is contained in a 13-digit number. Each digit from 0 to 9 is represented by a sequence of two bars and two spaces that have different widths of spacing between them. The code is scanned by a laser that can accurately read the spacings of the bars. The thirteenth digit of the code is a check-digit which is used for detecting errors. The last digit is designed to ensure that the sum of all the digits is a multiple of ten. If the scanner reads the code and the check-digit does not add up with all the others to a multiple of ten, then we can assume that there is an error. Nowadays, more companies use QR (Quick Response) codes which use a complex two-dimensional barcode. They can store 4296 characters of data and can include web links, emails, and images.

Unit 9. The Theremin

The theremin was invented by a Russian inventor named Leon Theremin in October, 1920. The theremin is one of the first fully electronic musical instruments and can be played without being touched. The instrument has a control section where two metal antennae are used to sense the positions of the player's hands. The player uses one hand to control the pitch and the other to control the volume by moving their hands around the two metal antennae. The electric signals are then amplified and played through a loudspeaker. The sound of the theremin has been described as "alien" and eerie-sounding. These sounds have been used in film soundtracks such as *Mars Attacks!* and *The Day the Earth Stood Still*. The instrument has also been featured in the BBC Radiophonic Workshop which produced sounds and music for radio and television.

Unit 10. Beat Machines

Commercial drum machines have been available since the 1950s. However, they became more popular with professional musicians in the late 1970s when the Roland CompuRythm CR-78 was released. This was the first programmable rhythm box and enabled musicians to create futuristic beats. The technology behind the beat machines began to develop as the years went on. Early digital models could sample real drums. Later on, beat machines developed into full-fledged sampling and sequencing workstations, which were used by hip-hop and R&B producers. By the 1990s, beat machines took up a lot of space and resembled a large board with an array of different knobs and switches. Recently, smaller and more compact devices have been released. With a diverse range of products that include drum brains, X0X-style Drum Machines, and sampling drum machines, musicians looking to buy a new beat machine have plenty of options to choose from.

Unit 11. Auto-Tune

In the U.S. music industry, Auto-Tune was used behind the scenes to correct the occasional pitch and smooth out imperfections in a studio recording. However, in the summer of 1998, singer Cher's British producers used the software to intentionally modify a part of her vocals into a robotic sound. In Cher's "Believe," the effect is used while she sings the lyrics "I can't break through." Cher's voice sounds very robotic and electronically glitched in the last three words. This was a notable feature of the song, and people were very curious as to how it was done. In the beginning, the producers tried to keep Auto-Tune a secret and falsely claimed in interviews that the song used a different device. However, the secret eventually came out, and the Auto-Tune software has become one of the most influential technologies in popular music.

Unit 12. The Changing Shape of Music

Sharing music online goes back several years before iTunes or Spotify were ever thought of. In 1999, a peer-to-peer music sharing website called Napster gained popularity among American college students. The site allowed users to share MP3 files of songs online. However, the ethical and legal issues surrounding the sharing of music online led to Napster's eventual shutdown in 2001. At the time, approximately 21.4 million users were active on the site. Having witnessed the popularity of Napster, Apple saw a business opportunity and quickly launched the iTunes Store in 2003. Users were able to download music from its online library for the price of 0.99 USD per song. In 2005, Pandora launched its own online services that combined a music library with a recommendation service based on the user's listening history. Pandora had a huge user base of over 200 million users, and its business model eventually went on to influence modern streaming services like Spotify.

Unit 13. Weighing a Planet

Because planets are too large to weigh, the best method of measuring their weight or mass is by figuring out how their gravity affects other bodies. According to Newton's Law of Gravitation, all matter attracts other matter with a gravitational force that is proportional to its mass. This means that the more mass an object has, the more it attracts or pulls other matter towards itself. This is not an easily observable phenomenon on Earth since humans and surrounding objects do not have much mass. With planets, however, the gravitational pull is strong enough that moons are kept in orbit around planets instead of drifting away. It is particularly easy to calculate the mass of planets that have man-made satellites orbiting around them. Since scientists already know how much these satellites weigh, they can use Newton's equations to figure out the mass of the planet that is pulling on the satellite.

Unit 14. The First Scales

Scales have existed as long as merchants have been trading goods. The oldest known weighing scale was discovered in the Indus River near present-day Pakistan. These were actually "balances" and are used like a seesaw. First, an object was placed on one plate while weight-setting stones were placed on the other side until the plates reached the same level. Some technological improvements were made to the balances in the 18th century when a British balance maker named Richard Salter invented the spring scale. The spring scale does not rely on a counterweight and instead measures the tension placed on a spring by an object. Spring scales are cheap to make and are, therefore, still commonly used. However, they are not quite as accurate as the electronic scales that were invented in the 20th century. With the modern focus on fitness and health, electronic scales designed to weigh people can now be found in nearly every home.

Unit 15. Catching Rain

A disdrometer is an instrument used to gauge rainfall. It uses light to measure the drop size distribution and velocity of rain. More sophisticated disdrometers can actually differentiate between rain and hail. Disdrometers are very useful in city environments for a variety of reasons. Traffic control officials use them to determine whether there is too much rain and the roads are too slippery for drivers to use safely. The instrument is also used in airport observation systems. Since the weather has a large impact on the safety of aircraft, airports need a reliable tool to tell whether planes can safely take off in the rain. Of course, disdrometers are also used to study weather patterns and measure rainfall for forecasts. Nowadays, disdrometers have been improved so that they can use microwaves and laser technologies. Some are equipped with video capabilities that can analyze individual raindrops or snowflakes.

Unit 16. Weather Models

The supercomputers that are used by weather scientists are much larger than regular computers used in homes. The computers used by the National Oceanic and Atmospheric Administration (NOAA) in the United States are the size of school buses. Every day, these computers collect information about the weather, such as temperature and air pressure, moisture, wind speed, and water levels. The computers can collect such data from weather balloons, satellites, buoys, radars, sensors on airplanes and ships, and river gauges. The computers can then process 2.8 quadrillion mathematical calculations per second all day long. These calculations are used to make weather prediction models. These models can predict what can happen globally up to sixteen days into the future. The NOAA can use a variety of models to predict things such as global weather patterns, ocean waves, flooding, storm surges, and air quality. In many parts of the world, this information is important for saving lives from potential environmental disasters.