



2013 is the International Year of the Mathematics of Planet Earth.

Our planet is the setting for dynamic processes of all sorts, including the geophysical processes in the mantle, the continents and the oceans, the atmospheric processes that determine our weather and climates, the biological processes involving living species and their interactions, and the human processes of finance, agriculture, water, transportation and energy.

Whether findings are directly from the mathematical sciences or from branches of chemistry, physics or biology, the chances are that some form of mathematics is used.

There are four international themes for the year:

- A PLANET TO DISCOVER
- A PLANET SUPPORTING LIFE
- A PLANET ORGANISED BY HUMANS
- A PLANET AT RISK

Let's get excited and proud of our mathematicians and scientists!

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www.scholastic.co.nz/toolkit
to access supporting resources.

A Planet at Risk

Epidemics

An epidemic is the outbreak of disease that affects a much greater number of people than is usual for an area, or a disease that spreads to regions where it is not usually present. A disease that tends to be restricted to a particular region (endemic disease) can become epidemic if non-immune persons are present in large numbers (as in times of war), if the infectious agent is more virulent than usual, or if distribution of the disease is more easily effected.

Epidemics may also be caused by new disease agents in a human population, such as the Ebola virus. A disease is said to be sporadic when only a few cases occur here and there in a given region. Epidemic disease is controlled by various measures, depending on whether transmission is through respiratory droplets, contaminated food and water, insects, or other means.

What Is the Difference Between a Pandemic and an Epidemic?

An epidemic occurs when a disease affects a greater number of people than is usual for a region, or one that spreads to areas not usually associated with the disease.

An epidemic occurring over a wide geographical area (eg worldwide) is called a pandemic. Examples include the influenza pandemic of 1918 or the AIDS pandemic that began in the 1980s.

What Is a Disease?

A disease is an ailment that affects the whole body or part of it. There are hundreds of known diseases. Different diseases have different causes and symptoms and require different treatments. Many diseases are caused by germs. Diseases caused by germs are called infectious diseases (AIDS, smallpox, colds, measles).

Other diseases are caused by malfunctions in the body (for example, cancer). These are non-infectious diseases. The following table lists some causes and examples of infectious and non-infectious diseases.

INFECTIOUS		NON-INFECTIOUS
Bacteria	Virus	Dietary deficiencies
tuberculosis	warts	scurvy, beri-beri, rickets
diphtheria	AIDS	Pollution
bronchitis	hepatitis A	respiratory diseases
whooping cough	measles	Obesity
scarlet fever	cold sores	heart disease, stroke
colds	rabies	Body malfunctioning
laryngitis	mumps	cancer

Infectious Diseases

The two types of germs that cause infectious diseases are bacteria and viruses. Bacteria and viruses are everywhere. They enter the body in various ways—through the air, through bodily fluids or through contaminated food, water or utensils.

Bacteria

Bacteria are small organisms. They reproduce by dividing in half. Each half grows and divides again. A bacterium can take from twenty minutes to fifteen hours to reproduce itself. Bacteria like warm, moist environments such as the lung or the ear. When bacteria grow, they produce poisons that enter the bloodstream and cause sickness. Antibiotics can be taken to destroy bacteria.

Viruses

Millions of people suffer from viruses every year. Viruses include polio, measles, chickenpox and the common cold. Viruses have been called humankind's deadliest enemy. Viruses are smaller than bacteria and grow only inside living cells. They grow too big for their host cells and destroy them. Viruses produce poisons which lead to sickness. Antibiotics don't affect viruses.

Non-Infectious Diseases

Diseases that are not infectious are called incommunicable diseases or non-infectious diseases. These diseases are often caused by the malfunction of some part of the body. Incommunicable diseases can also be caused by dietary deficiencies, pollution, drug addiction and obesity.

Body Defences against Disease

Saliva, stomach acids and tears kill many germs and our skin stops many from entering the body. The body's greatest defence against germs is blood. Blood contains white cells. These are larger than bacteria and different white cells have different functions. Some white cells specialise in seeking out bacteria, swallowing them and destroying them.

Antibiotics

The name 'antibiotic' comes from 'antibiosis'. This means the use of substances made by one living thing to kill another living thing. Antibiotics kill bacteria by either breaking down the walls of the bacteria cells, interfering with the bacteria's reproduction, or mixing up the genetic blueprints of the bacteria. Penicillin is an antibiotic.

Antibiotics need to be used sparingly. Overuse of antibiotics can lead to bacteria becoming resistant to them. Scientists have needed to develop increasingly stronger antibiotics because of bacterial resistance.

Plagues and Epidemics in History

The nursery rhyme 'Ring a Ring of Roses' dates from the Middle Ages when the bubonic plague swept through Europe. It was called the Black Death and it was spread by rat fleas. 'A ring of roses' referred to the red rash that sometimes formed on the skin. An early symptom of the disease was sneezing, hence 'atishoo atishoo, we all fall down' (and die). 'A pocket full of posies' referred to the posy of flowers and/or herbs used to cover the stench of dead bodies and to keep away the plague.

The bubonic plague killed a quarter of the population of Europe in the fifteenth century. It is the most infectious disease known to humankind.

When Europeans colonised regions such as the Americas and Australia, they brought with them many diseases that the indigenous people had no immunity to. Many died as a result. During the sixteenth century, for example, introduced European diseases reduced the population of New Spain from more than thirty million to less than three million.

The influenza epidemic of 1918-19 killed more than twenty million people worldwide. This was more than twice the total number of people killed in World War 1.

Bird flu, also known as Avian Influenza, has become a cause for concern over the last decade. In the form of H5N1, it is highly contagious among birds and can spread to other animals and even humans. When it does pass from birds to humans, it is usually fatal. Currently, bird flu cannot be transmitted from humans to humans, though there is evidence to suggest that it would only require the disease to mutate in a single host for it to become a potential world-wide epidemic.

Top Ten Epidemics

1. The Bubonic Plague—The Black Death
2. The Plague of Justinian
3. The 1918-19 Influenza Pandemic
4. The Third Plague Pandemic
5. The 1916 Polio Epidemic
6. The First Cholera Pandemic
7. The Plague of Athens
8. India's Smallpox Epidemic
9. Memphis Yellow Fever
10. SARS

Activities

- Download the *Top 10 Epidemics Research Task* blackline master from the Teacher Toolkit. Ask students to use the list of top ten epidemics and complete the table from information they have found through their research. Once they have completed the table they can then map these epidemics onto a world map template.

- Now that the students know more about diseases and what causes them, challenge them to complete the *Disease Research Matrix* available to download from the Teacher Toolkit. Students choose five diseases to investigate, looking specifically at the cause, symptoms, availability of a vaccine, treatment and prognosis.

- To reinforce terminology introduced during this research, students can attempt the *Diseases Word Search*, available for download from the Teacher Toolkit. Once students have completed the task they can then create their own word search or crossword using other terms from their research tasks.

- Have students pretend they are scientists called on by the World Health Organization (WHO) to discuss the ongoing research of Avian Influenza. Should scientists be allowed to create a deadly bird flu virus to study how it spreads? There are two sides to the argument. It has the potential to cause a human pandemic if it lands in the wrong hands; however, it could provide vital knowledge that would reduce the risk of contamination. Opposing teams could report to the WHO and debate the topic.

Resources available in the 2013 School Essentials catalogue

- *Double-sided X-Y Axis Dry-Erase Mats (10)*, page 169
- *Graphing Flip Chart*, page 169
- *Human Body Factory*, page 190
- *Inside-Out Lenticular Human Body Poster*, page 190
- *Eco Forensic Lab*, page 200
- *Thermometers*, page 200
- *Power of Science pH Paper*, page 215
- *Bio Lab*, page 216
- *Primary Science Jumbo Magnifiers*, page 216
- *Early Science Explorers Set*, page 216
- *Primary Science Jumbo Eyedroppers*, page 216
- *Lab Grabs Safety Goggles*, page 216
- *Micro-Pro 48-Piece Microscope Set*, page 217
- *Jumbo Test Tubes with Stand*, page 218
- *Primary Science Set*, page 218

Free Teacher Toolkit Resources available at www.scholastic.co.nz/toolkit

- *Newspaper Article* blackline master
- *Map of the World* blackline master
- *Top 10 Epidemics Research Task* blackline master
- *Diseases Word Search* blackline master
- *Disease Research Matrix* blackline master