CORONAVIRUS 13/March/2020

This data from the World Health Organisation portrays the growth in the number of confirmed cases of the coronavirus disease. In some countries the pattern appears to be exponential growth. Data is given for the most affected countries and for the two countries in Africa with more than 10 cases.

In one week, new data will be added and it will be possible to see if the trends are continuing.

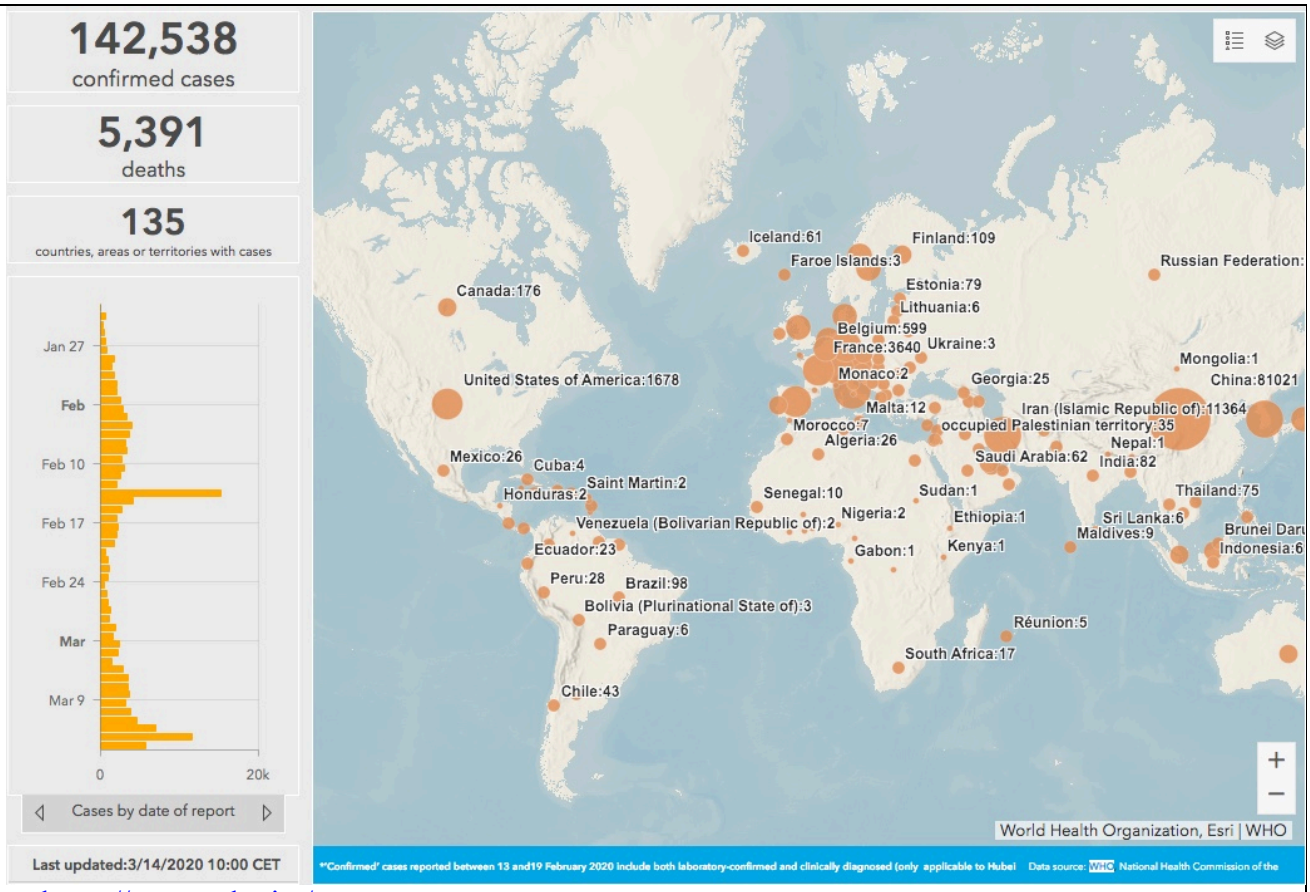
Discuss the data in your group.

1. What can you learn from the data?

The figures shown are based on WHO data **up to and including 13th March 2020.**

Location	How long did it take for the number of **total confirmed cases to double?**	**Total confirmed cases** WHO data. Up to date for 10 AM (CET) on March 13.	**Daily new confirmed cases** WHO data. Up to date for 10 AM (CET) on March 13.
Worldwide	doubled in **26 days**	**132,758 total** March 13	**+7,488 new** March 13
China	doubled in **32 days**	**80,991 total** March 13	**+10 new** March 13
Italy	doubled in **4 days**	**15,113 total** March 13	**+2,651 new** March 13
Iran	doubled in **6 days**	**10,075 total** March 13	**+1,075 new** March 13
South Korea	doubled in **12 days**	**7,979 total** March 13	**+110 new** March 13
Spain	doubled in **3 days**	**2,965 total** March 13	**+825 new** March 13
South Africa	doubled in **2 days**	**17 total** March 13	**+4 new** March 13
Senegal	doubled in **1 day**	**10 total** March 13	**+6 new** March 13

2. What do you notice about the heights of the bars when you compare one country to another? What does this tell you about the scales used in drawing the graphs? Did you notice the different scales when you first saw the graphs, and is this misleading?
3. What do you notice about the data for South Korea?
4. What should **not** be assumed about the actual numbers of cases as opposed to the number of confirmed cases?
5. If the number of cases in Senegal continues to double each day what will the numbers be for the next 10 days?
6. What influences the spread of the disease and why is this different in different countries?
7. The way data has been collected has varied in different countries, some testing a high proportion of the population, others only testing serious cases that need hospitalisation. What difference does this make to what can be learned from the data?
   https://ourworldindata.org/coronavirus



https://www.who.int/

HELP

What can you tell from the shapes of the graphs?
What is different about the numbers of new cases in China and South Korea from the numbers for the other six countries? What can be deduced from this?

NEXT

Look up more information from https://ourworldindata.org/coronavirus and discuss it in your group

NOTES FOR TEACHERS

Why do this activity?

This subject is important and topical and it is a good example of the application of mathematics to a real life issue. It provides a basis for discussion of exponential growth and decay at a simple level. It provides data and graphs that give learners practice in interpretation and analysis and learning how to assess them critically.

Teachers can help learners to discuss at a level suitable to their age and maturity, the trends and comparisons that can be made. It only gives a glimpse of what is involved in mathematical modelling. Learners need to appreciate that predictions are based on limited data, assumptions about the future and estimated probabilities.

Learning objectives

In doing this activity students will have an opportunity to:

- practise analysis and interpretation of data;
- discuss the statistics relating to an important social and public health issue;
- develop their understanding of the value of collecting data and the necessity for careful analysis and interpretation.

Generic competences

In doing this activity students will have an opportunity to:

- **think flexibly**, be creative and innovative and apply knowledge and skills;
- develop the **skill of interpreting visual images** representing situations;
- **evaluate, organise, analyse, and interpret information**;
- **exchange ideas**, criticise, and present information and ideas to others;
- analyze, reason and record ideas effectively.

Suggestions for teaching

You can guide the discussion according to the age of your learners. If the class has access to the internet then more information can be found on the World Health Organisation website.

Introduce the idea of **exponential growth** by discussing the information given about doubling. The time it takes for the number of cases to double will change during the outbreak and it would be wrong to make projections based on the assumption that this stays constant. But it is important to think about the nature of exponential growth.

If during an outbreak the number of cases is in fact doubling, and this doubling time stays constant, then the outbreak is spreading exponentially.

Under exponential growth 500 cases grow to more than 1 million cases after 11 doubling times. And after 10 more doubling times it would be 1 billion cases.

It is important to discuss these issues during the time when they are in the news and causing widespread concern. A series of these AIMING HIGH lesson activities will be published as the pandemic spreads. Perhaps 30 minutes can be set aside each week to talk about the statistics which will help learners to appreciate that even the maths they learn in school has important applications and also help them to develop a better general understanding of social issues and data handling.

There have been 5391 deaths and 142 538 confirmed cases which gives a death rate of 3.8%. The actual death rate is very much lower because there are many cases that have not been confirmed. For example in the UK they are testing only the people who are very sick and need to be admitted to hospital. This might be discussed with the class.

Key questions

- What do you notice about the heights of the bars when you compare the graph for one country to another?
- Why do you think that the graphs for China are different from the other countries?
- Is there still a daily increase in the number of cases in China?

Follow up

This is the first in a series of AH lessons on the coronavirus pandemic.
Unfortunately there is not yet any immunity vaccine for this virus as there is for example against flu.
This lesson activity https://aiminghigh.aimssec.ac.za/years-10-12-epidemic/ introduces the importance of the theory of probability in understanding and preventing epidemics.

Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and up to Secondary 5 in East Africa. New material will be added for Secondary 6. For resources for teaching A level mathematics see https://nrich.maths.org/12339 Note: The mathematics taught in Year 13 (UK) and Secondary 6 (East Africa) is beyond the school curriculum for Grade 12 SA.				
	Lower Primary or Foundation Phase Age 5 to 9	Upper Primary Age 9 to 11	Lower Secondary Age 11 to 14	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6