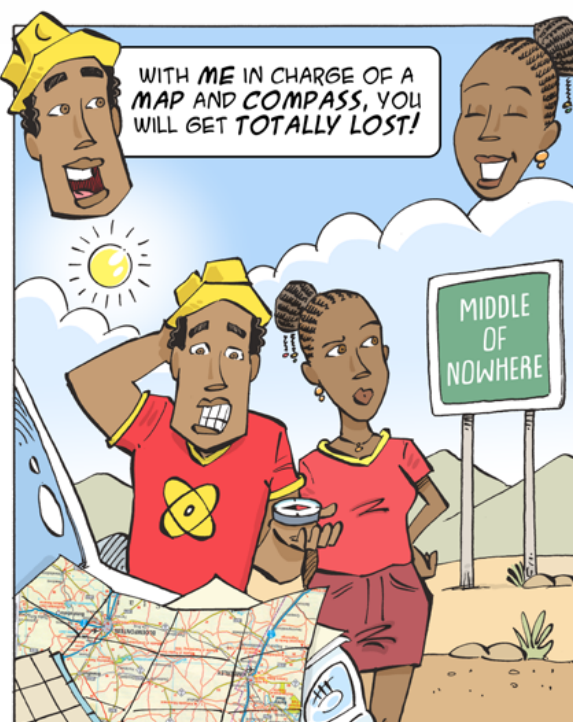
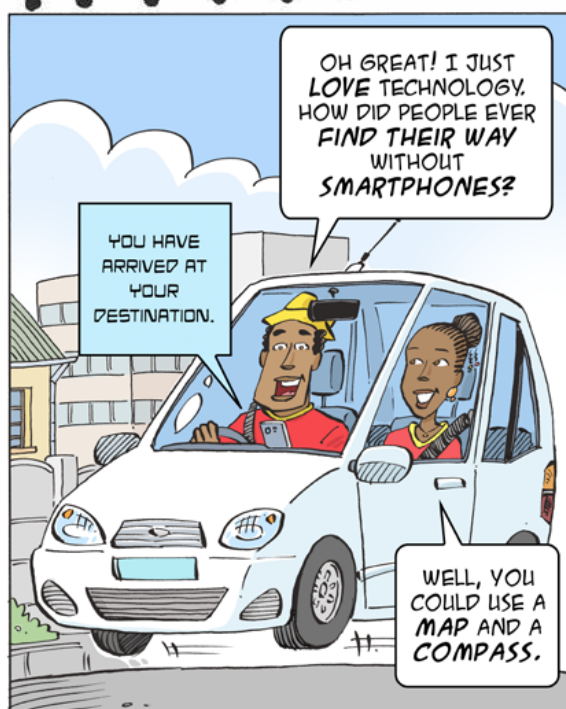


SCIENCE SPAZA

www.sciencespaza.org

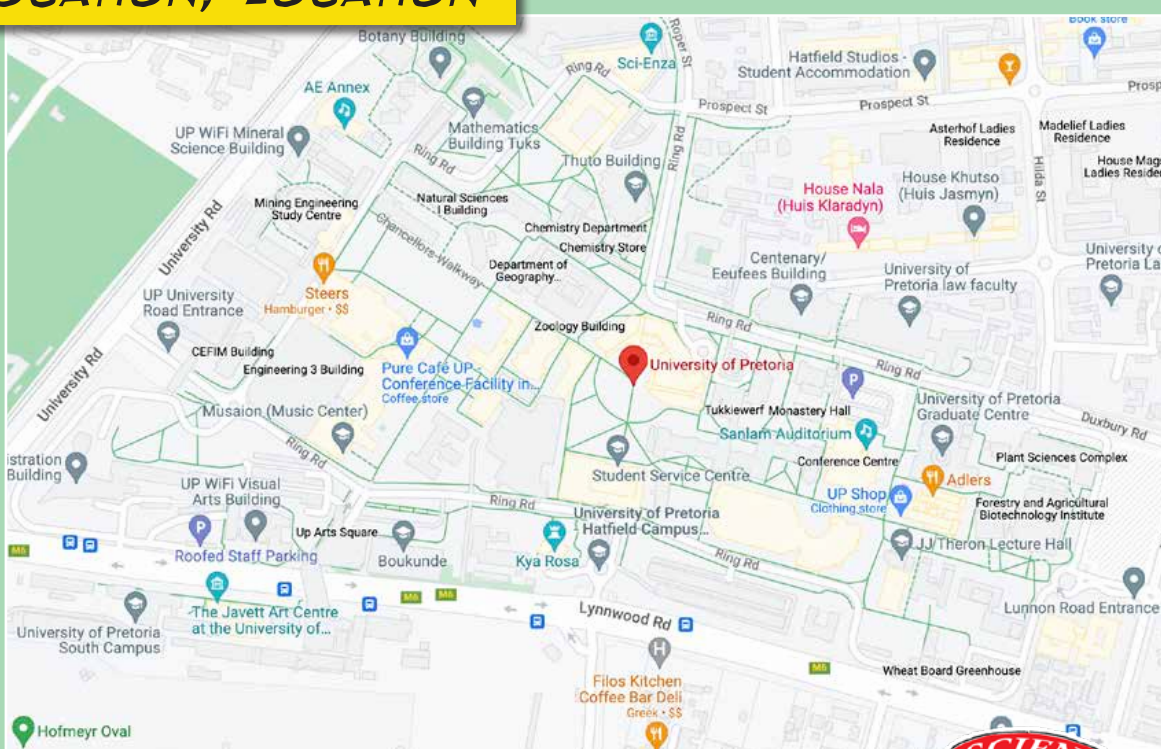


SPATIAL STATISTICS: PUTTING STATISTICS ON THE MAP



LOCATION, LOCATION, LOCATION

Spatial analysis is a type of Statistics that looks at data linked to a point on a map or a specific place. It uses mathematical models to make sense of data along with info from geographical information systems (GIS).



Knowledge is Ncaw!



MAKE A COMPASS

Before smartphones could tell you where to go, people used maps and compasses to find their way.

A compass is an instrument that helps the user to find which way is north.

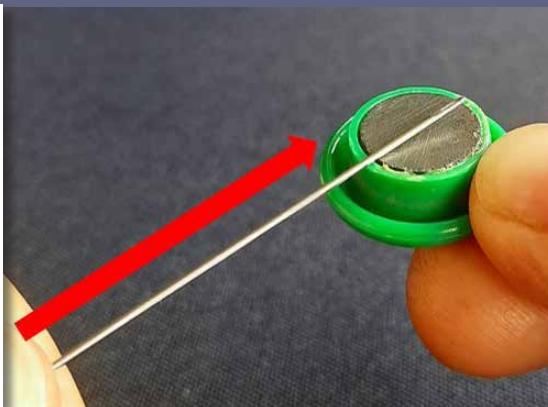


YOU WILL NEED:

- NEEDLE
- MAGNET
- BOTTLE CORK*
- KNIFE (ASK AN ADULT TO HELP)
- BOWL WITH WATER
- *USE A LEAF IF YOU DON'T HAVE A CORK

1

RUB A NEEDLE AT LEAST 50 TIMES WITH A MAGNET IN ONE DIRECTION. TIP: YOU CAN RUN THE NEEDLE ALONG THE MAGNETIC SEAL OF A FRIDGE DOOR IF YOU DON'T HAVE A MAGNET.



2

SLICE THE CORK TO MAKE A 1 TO 2-CM THICK DISK.



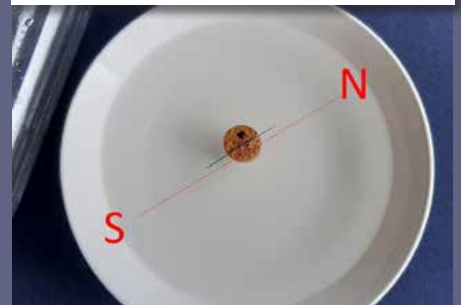
3

BALANCE THE NEEDLE ON THE SMALL CORK DISK. FILL THE BOWL WITH WATER. FLOAT THE CORK OR LEAF WITH THE NEEDLE ON THE WATER.



4

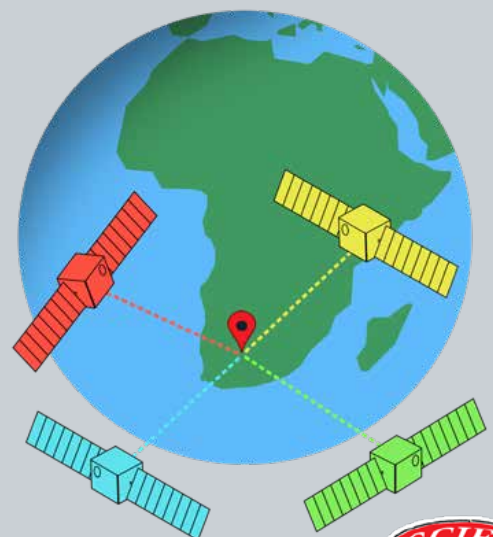
THE NEEDLE WILL POINT IN A NORTH-SOUTH DIRECTION.



WHAT'S HAPPENING HERE?

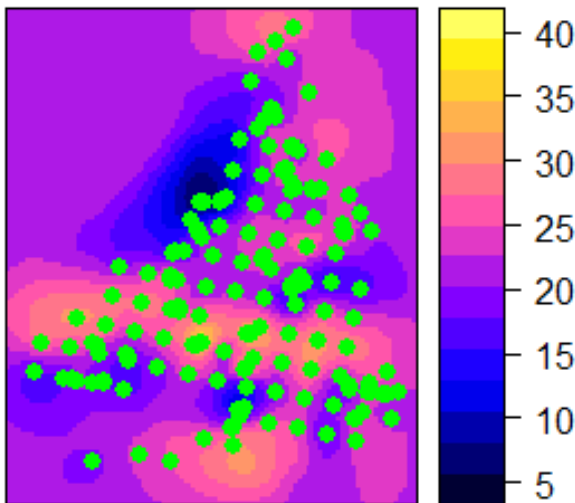
Just like a magnet, our planet creates a magnetic field. Rubbing the needle with a magnet, magnetised it, giving the needle a magnetic field of its own. When the needle can move freely, it will point in a north-south direction due to its interaction with Earth's magnetic field.

Today most navigation depends on satellites circling our planet in precise orbits. These satellites called global positioning satellites, or GPS can pinpoint the users' exact location.



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GOING FOR GOLD WITH SPATIAL STATISTICS



Did you know that Spatial Statistics started right here in South Africa? Prof Danie Krige a South African Statistician and mining engineer invented a statistical model called Kriging.

This model helped to predict where precious mineral resources like gold could be found in Johannesburg in the 1950s and is still used in Statistics today!

Left: Professor Krige's mathematical model is widely used in Statistics. This data plot shows Kriged data.

CAREERS: MEET TWO MATHEMATICAL STATISTICS RESEARCHERS



Renate Thiede discovered her passion for Statistics and Geography in high school. She uses Spatial Statistics, Geography and Artificial Intelligence to map township roads from satellite images to make travelling in Mzansi easier.



René Stander found her passion for Statistics during her BSc Actuarial Science degree at the University of Pretoria. Her current research uses Spatial Statistics to identify crime hot spots. She hopes her research will help to keep South Africans safe.

Spatial Statistics combines knowledge from fields like geography, mathematics, Statistics and data science.

Careers options include:

- Programming
- Data scientist
- Statistician
- Town and city planning and many more!

CURRICULUM LINKS

- **Geography FET**
GIS; map work, Spatial Statistics
- **Mathematics SP**
Data handling: Collect, organise and summarise data
- **Natural Science SP**
Energy and changes: Magnetic Fields
- **Information Technology FET**
Data and information management; Solution development; programming

Knowledge is NCAW!



FIND THE FASTEST ROUTE

SPATIAL ANALYSIS CAN HELP US FIND THE BEST ROUTE TO TRAVEL AND PLAN NEW ROADS.

USE THE MAP TO FIND THE FASTEST WAY TO THE HOSPITAL. TAKE NOTE OF THE SCALE PROVIDED TO SEE HOW LONG EACH ROUTE IS. CONSIDER THE SPEED LIMIT FOR EACH SECTION.

Example: Route A

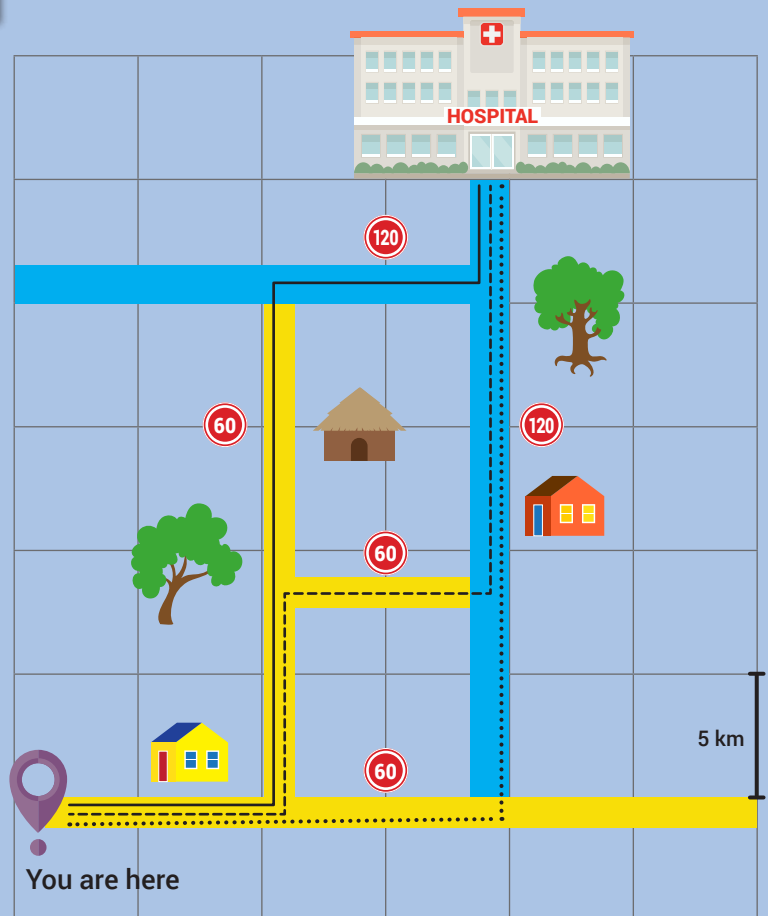
$(35 \text{ km @ } 60 \text{ km/hour}) + (15 \text{ km @ } 120 \text{ km/h}) = 35 \text{ min} + 7,5 \text{ min} = 42 \text{ minutes } 30 \text{ seconds}$

Now calculate the time it takes to use routes B and C:

Route B: _____

Route C: _____

Which route is the fastest? _____



A _____

B _____

C _____



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This worksheet represents a collective effort put together by Renate Thiede, Rene Stander, and their supervisor Prof Inger Fabris-Rotelli, from the Department of Statistics, University of Pretoria. They and other members of their research team specialise in Spatial Statistics, Image Processing, and Remote Sensing. The team is funding by COE-MaSS.

WE WANT YOUR FEEDBACK!

WE WOULD LOVE TO SEE HOW YOU USED THIS WORKSHEET. SEND US A PHOTO OF YOUR COMPASS OR YOUR SCIENCE CLUB IN ACTION! WHATSAPP US AT 076 173 7130



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