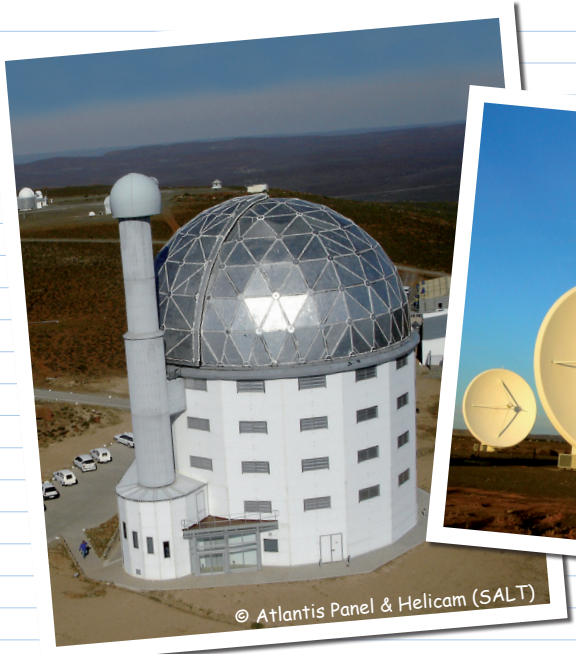
Telescopes in South Africa

Activity Book



What is a telescope?

DEFINITION:
an instrument that makes a distant object appear nearer.

Imagine you are looking through a telescope.

Answer the questions below.

List the objects you see in the night sky.

_____

_____

How many stars did you see?

_____

_____

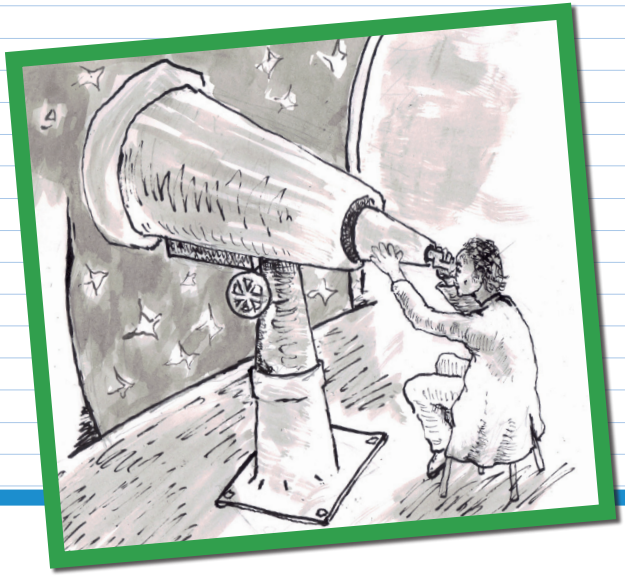
Did you see the moon? What was it's shape and colour?

_____

_____

Decoding

Can you decode the name of the profession?



Decode your answer using the symbols below

a e m n o r s t

_ _ _ _ _ _ _ _ _ _

Astronomy Word Search

M B R X D O P T E Q W X K V A
A N G S I G N A L L J A H S S
T G R T S S T A R M R K C P T
H D A A H A C W A O A I Y C R
E I N U D I I D O N S F B V O
M N X S T I E W N Y P O N T N
A S U P I R O E H G W R I R O
T T O S P G T P T A K R E E M
I D F E W N I O R L E S T C E
C S A R A S L U P A P O S E R
S U N I V E R S E X E H N I J
C A B L E S E F D Y F L I V K
K A R O S I T E N G I N E E R
E R E T U P M O C X L C U R N
S K A K E M E P O C S E L E T

Radio
SKA
Waves
Galaxy
Data
Astronomer
Cables
Computer
Engineer
Karoo
Life
Sun
Meerkat
Signal
Physics
Mathematics
Einstein
Pulsar
Universe
Optical
Telescope
Receiver
Dish
Antenna

What have telescopes taught us?

Stars are born in big clouds of gas and dust in the Universe. Young stars are very hot and make the gas in the clouds glow brightly, which means that we can see these clouds through telescopes.

The planet Uranus is an oddball. Unlike all of the other planets in our Solar System, it spins on its side! This means that if you were on Uranus you wouldn't see day time and night time in a day like you see on Earth, as its spin doesn't affect which parts of the planet see the Sun.

Astronomers have found a planet in another solar system that is blasted with 1000 times more X-ray radiation from its stars than what the Earth gets from the Sun!

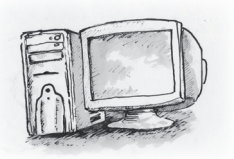
Credit: EUNAWE Space Scoops

Match Mate

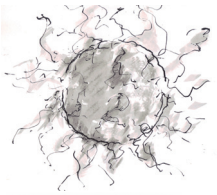
Draw a line matching the word with the picture.

optical telescope

universe

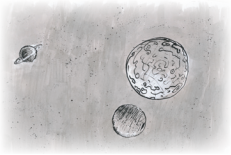


radio telescope

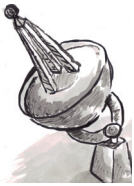


astronomer

computer



sun



Eye and I Experiment

Materials:

Bowl
Cotton bud
Food colouring (3 different colour)
Milk
Dishwashing liquid

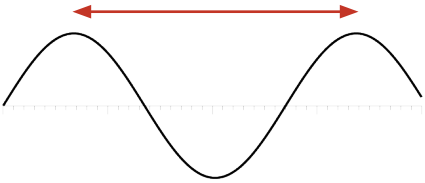
Procedure:

1. Pour a little milk into a bowl.
2. Pour a drop of each food colouring at 3 different locations in the bowl.
3. Dip a cotton bud into dishwashing liquid.
4. Touch the surface of the milk with the cotton bud.
5. Observe what happens.

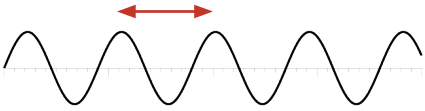
Write down your observations:

Let's measure waves

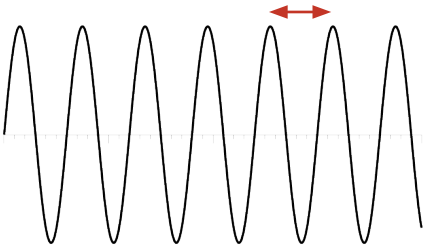
Measure the arrow in centimetres to determine the length between the peaks of the waves.



_____ cm



_____ cm

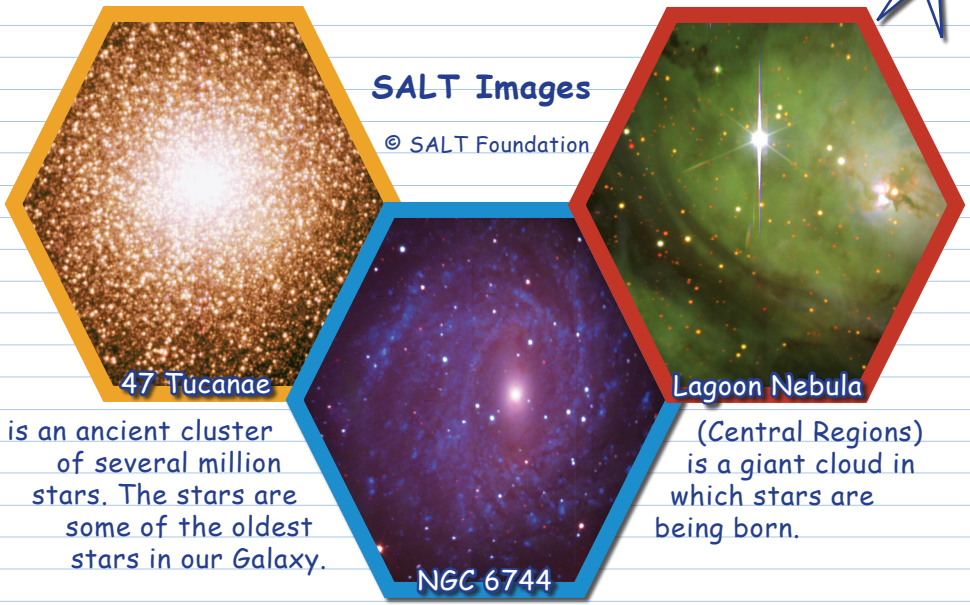


_____ cm

Multiwavelength Images

SALT Images

© SALT Foundation



47 Tucanae is an ancient cluster of several million stars. The stars are some of the oldest stars in our Galaxy.

Lagoon Nebula (Central Regions) is a giant cloud in which stars are being born.

NGC 6744 is a large spiral galaxy located in the constellation of Pavo (which means Peacock).

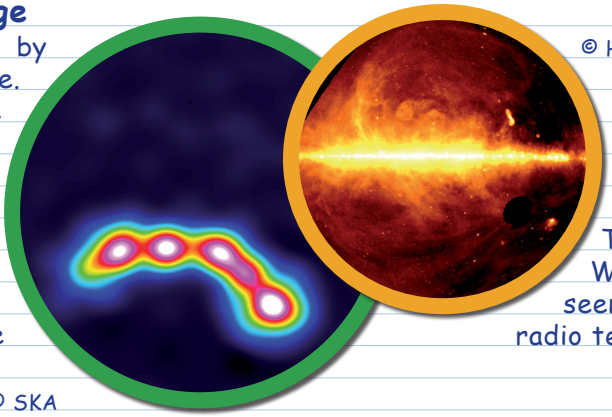
KAT-7 Image

A galaxy as seen by the radio telescope. Scientists use different colors to represent different intensity of emission (White is the brightest and dark blue the faintest).

© SKA

HartRAO Image

© HartRAO



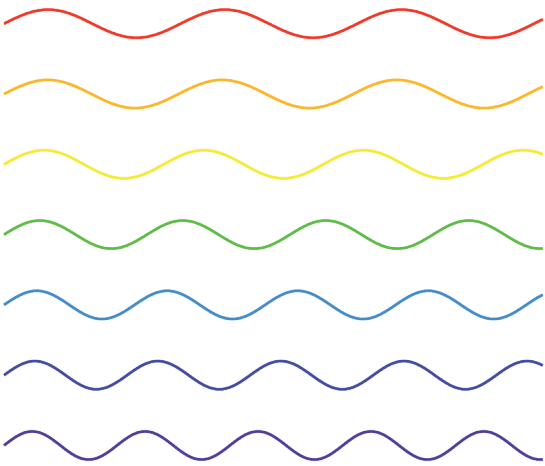
The Milky Way as seen by the radio telescope.

Wavelength and colour

Light is a wave, the distance between one peak in the wave and the next is called the wavelength.

White light is made up of the colours of the rainbow. The different colours of light have different wavelengths.

Label the different colours of the rainbow.

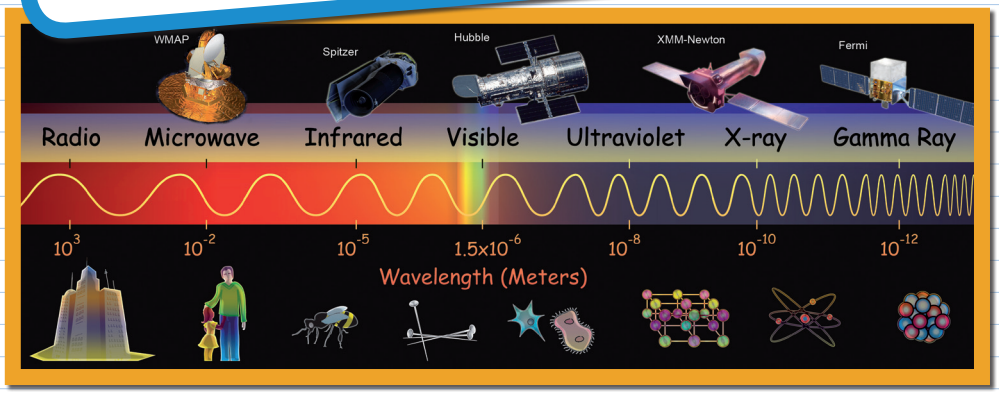


Which colour has the longest wavelength? _____

Which colour has the shortest wavelength? _____

Electromagnetic Spectrum

- Our eyes can detect optical light, however there are other "colours" of light that we cannot see.
- Radio waves have wavelengths that are too long for our eyes to detect.
- X-rays have wavelengths that are too short for our eyes to detect.
- The different colours of light, including ones that we cannot see, is called the **electromagnetic spectrum**.



Are the following sentences about the electromagnetic spectrum true or false? Circle the correct answer.

1. Microwaves can be used to cook food. TRUE/FALSE

2. Ultraviolet waves from the Sun are responsible for sunburn. TRUE/FALSE

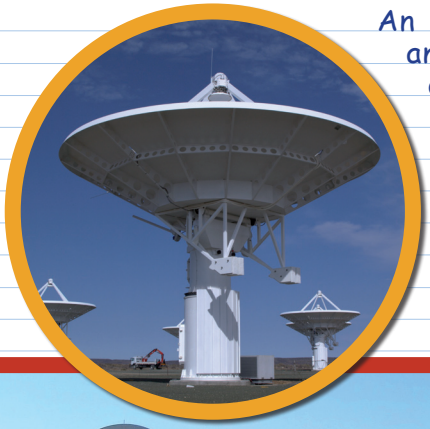
3. X-rays have longer wavelengths than microwaves. TRUE/FALSE

4. Radio waves have the shortest wavelength. TRUE/FALSE

5. Optical light has wavelengths about the same size as germs. TRUE/FALSE

SKA Facts

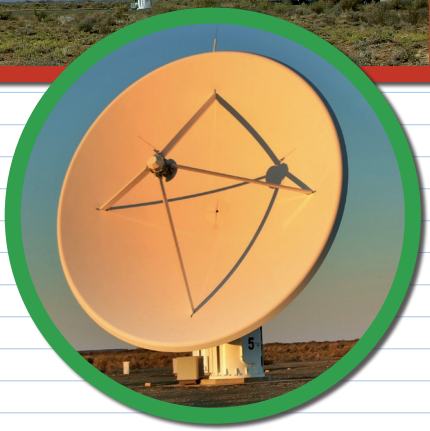
The Square Kilometre Array (SKA) Radio Telescope will be the world's biggest radio telescope in Southern Africa. Thousands of antennas, spread over 3000 kilometres, will work together as one gigantic virtual instrument.



An array is made up of many large antennas that are linked together via optic fibre cables.

The total surface area of the all the antennas together will add up to approximately one square kilometre.

© N. Oozeer (SKA)



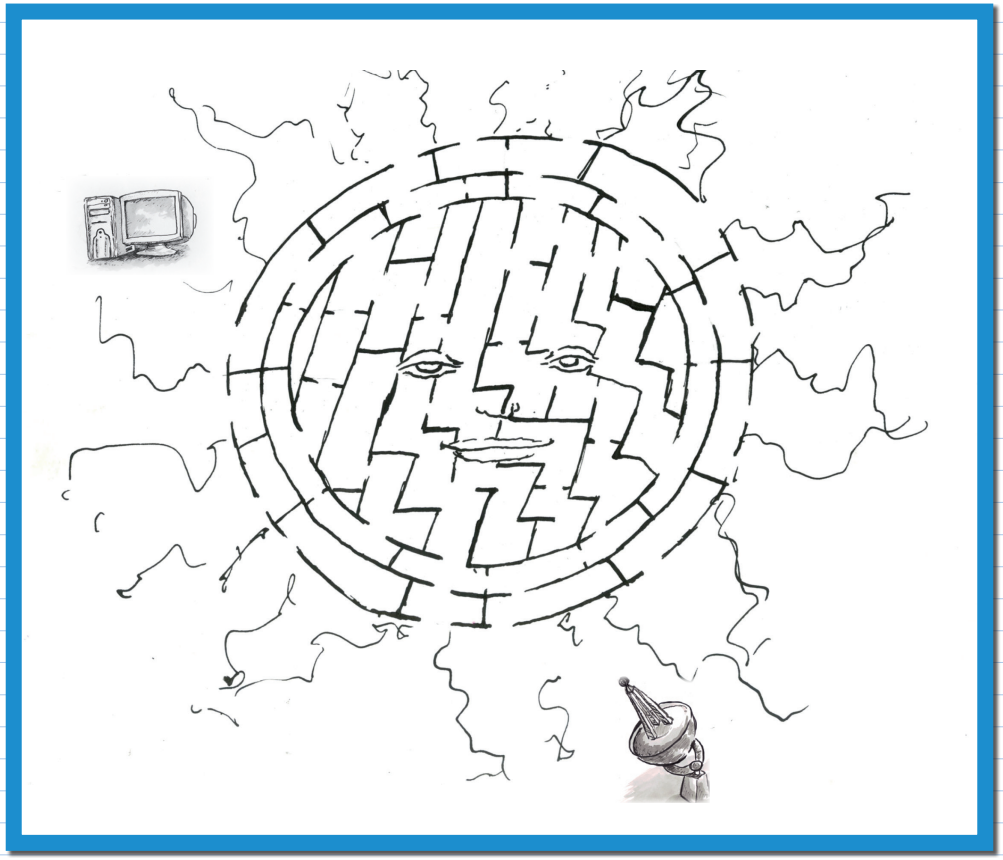
Radio astronomers will use the SKA to discover new aspects of the Universe.

Radio telescopes collect radio waves that reach the Earth from space which are not dangerous.

Just as a radio turns radio waves into music, a radio telescope turns radio waves from space into pictures using computers.

Radio Telescope Maze

Follow the path from the telescope to the computer.



Radio Images

Colour by number. Choose one colour for each digit. What patterns do you see?

0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	4	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SALT Facts

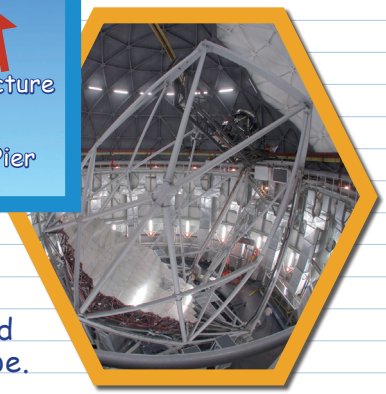
The Southern African Large Telescope (SALT) is the largest single optical telescope in the Southern Hemisphere.

SALT is situated at the observatory at Sutherland in the Karoo because there no large towns close by and the skies are very dark.

© SALT Foundation

SALT's huge mirror is made of 91 individual hexagon-shaped segments. Each mirror segment is 1m wide and weighs 100kg.

Astronomers use the telescope to study planets, stars and galaxies.



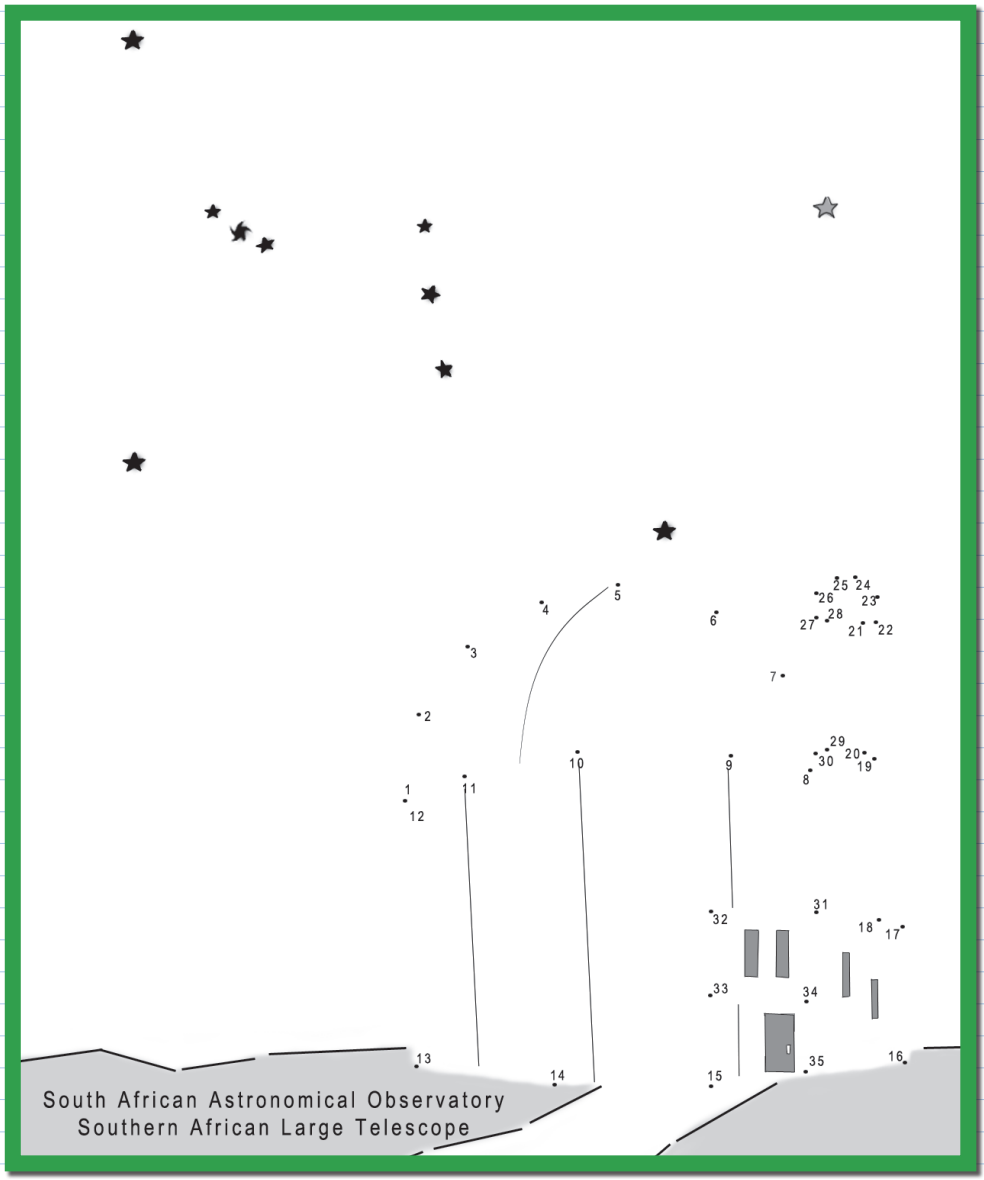
SALT does not have a telescope tube, instead there is a network of metal struts which support the tracker and payload at the top of the telescope.

© L. Crause (SAAO)

As the stars move across the sky at night, the tracker at the top of SALT is used to follow the drifting stars.

Join the dots

Complete the picture by joining the dots.



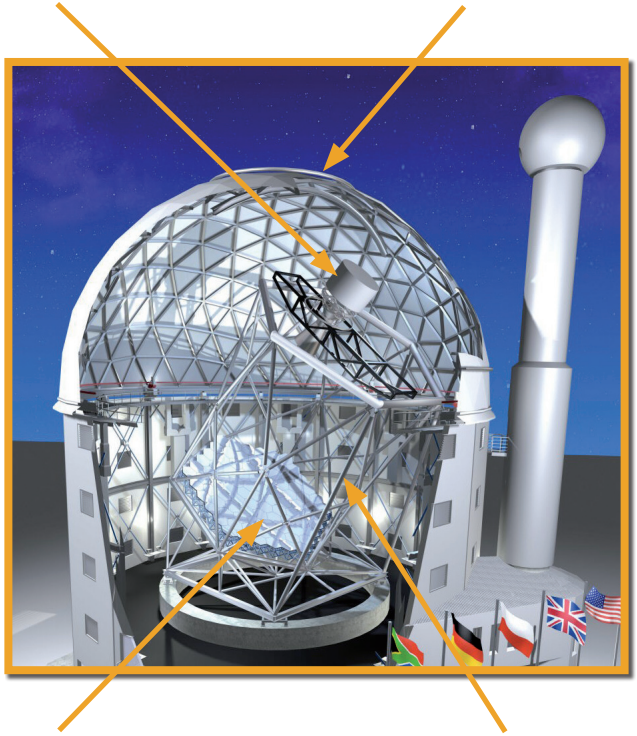
© A. Koeslag (SAAO)

Label the telescope

Use the word bank below.

Word Bank

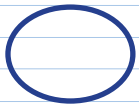
Dome
Payload
Structure
Mirror



SALT Mirrors

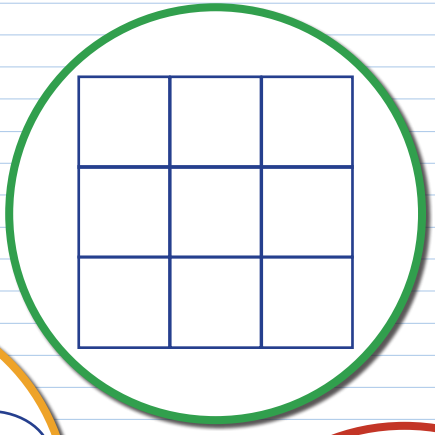
Colour in the circle you think contains the shape of the SALT mirror segments.

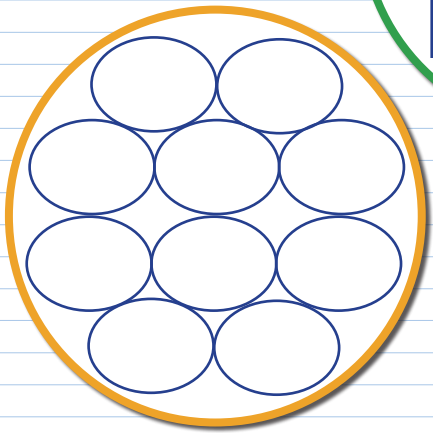
square

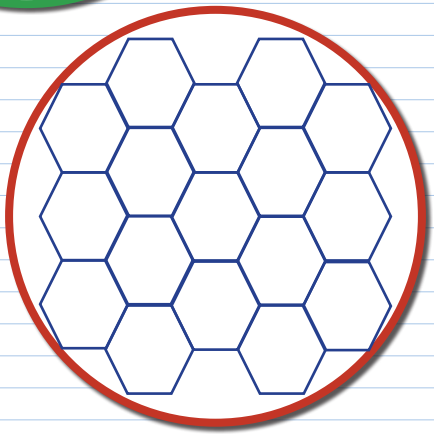


oval

hexagon







What did you learn?

List 3 things you have learnt.

In the year 2030, you became an astronomer.
Draw a picture of the telescope you will be using.

NRF National Research Foundation | SAAO South African Astronomical Observatory | HartRAO Hartebeesthoek Radio Astronomy Observatory

SALT

SKA AFRICA SQUARE KILOMETRE ARRAY