

IN BRIEF

Working Out the World is a story about a young boy who wanted to find out more about the universe around him! This pack is inspired by Stephen Hawking's works and is full of cool facts about the cosmos.



1. LITERACY LESSON IDEAS

- If you come across a word that you don't know, just turn to the **Glossary** to find out what it means. Looking things up like this is great for building your vocabulary.
- There are lots of different ways to learn things – and this is the focus of this month's **Class Discussion Sheet**. How did Stephen find out things in the story – and how do you prefer to discover new facts?
- Discover different kinds of words on the **Reading Comprehension Sheet!** Can you find the *simile* and the *intensifier*, as well as work out the opposite of a certain word?
- Stephen Hawking is famous for writing a book called *A Brief History of Time* – but the timeline of his own story has been mixed up on the **Story Sequencing Sheet!** You have read his tale, so you should be able to work out the correct order to put the events in. Label the first one with a '1', the second one with a '2', and so on.
- Now it's your turn to tell Stephen's story, on the **Storyboard** page! Write in what happened to him underneath the illustrations.
- Stephen Hawking was a very interesting person who liked to do things his own way! After you have read his story in this month's issue, see if you can answer all the questions about him on the **Character Sheet: Stephen** page, What do you think it would be like to have him as a classmate?

Continued on page 2...

2. SCIENCE LESSON IDEAS

- You will learn a lot of cool things about Stephen Hawking's later life on the **A Brief History of Stephen** page. He accomplished a lot, despite the health challenges he faced!
- Astronomers know a lot about the planets that are closest to us because they are easy to spot with telescopes or the naked eye. (We have even sent space probes to look at them close-up!) Check out amazing facts about planet Earth and its seven closest neighbours on the **Solar System Fact File** sheet.
- Now, use your knowledge to correctly label the worlds listed on the **Name and Colour in the Planets!** page. If you find this a bit tricky, why not re-read the **Solar System Fact File** again? Don't forget to colour in the planets, too!
- Which one of the planets in the Solar System is the coolest? Write about the one you like best on the **My Favourite World** page, giving the reasons why you think it is amazing...
- You have found out about some real planets – so why not imagine your own world as well? Fill out the **Welcome to my Planet!** sheet to describe what it is like. You can take inspiration from a real planet but give it your own unique twist!
- Stephen Hawking came up with ground-breaking theories about one of the most fascinating phenomena in the universe! The **What is a Black Hole?** sheet will introduce you to these strange objects and the things that make them so special...
- There are all kinds of amazing things in space! On the **Name These Cosmic Objects!** page, try to match the words with the definitions. If you can't work some of them out, why not look them up?
- Would you like to discover more about the universe? Then you might like to become an astronomer, who studies the cosmos using advanced telescopes and other devices. The **What Do Astronomers Do?** sheet has everything you need to know about these scientists and the tools they use.
- If you want to try being an astronomer, the **Make a Telescope!** sheet will tell you how to make your own device for looking at the stars!

Continued on page 3...

3. ART LESSON IDEA

- You have learned a lot about space and the things in it in this pack. Now, colour in the telescope on the **Starry Night!** page – and fill in the sky above it with things you might see if you looked into space!

4. MENTAL HEALTH AND WELLBEING

- Stephen Hawking's parents encouraged their kids to learn more about the world around them and nurtured their curiosity. Here are some tips about how to stimulate children's minds and open them up to the wonders of the universe...
 - ▷ Encourage them in their interests! Kids are naturally curious.
 - ▷ Provide experiences rather than things! Going to a museum or a park can be so much better than just getting a new toy.
 - ▷ Questions are great learning tools! Ask kids questions about what they think, see and experience. Encourage them to ask questions, too!
 - ▷ Don't be afraid to break routines! New and surprising experiences can be very stimulating for young minds.

For more information and ideas, you might like to look at this link below, co-authored by Bianca Solorzano, M.Ed: Infant Development & Montessori Consultant:

<https://www.wikihow.com/Encourage-a-Child%27s-Natural-Curiosity-Through-Science>

STORYTIME GLOSSARY

Look up any new words in this handy reference section!

The Quest for Home! (Page 6)

- ▷ **Disaster** – an unfortunate event
- ▷ **Menacing** – scary-looking
- ▷ **Plonked** – put down in a firm way
- ▷ **Plummeting** – falling
- ▷ **Toasted** – burned
- ▷ **Trotted** – ran slowly
- ▷ **Hollered** – yelled
- ▷ **Outwitted** – tricked or fooled
- ▷ **Armoured** – wearing armour
- ▷ **Bolt** – blast
- ▷ **Chuckle** – little laugh

Savoury Dreams (Page 12)

- ▷ **Contest** – competition
- ▷ **Smirked** – smiled smugly
- ▷ **Pantry** – a room for storing food
- ▷ **Pecking** – poking with its beak
- ▷ **Slimy** – slippery and feeling like slime

Working Out the World (Page 14)

- ▷ **Gear** – wheel with little teeth on the edge
- ▷ **Exasperated** – irritated
- ▷ **Pestering** – asking in an annoying way
- ▷ **Locomotive** – powered railway vehicle
- ▷ **Adult supervision** – adults watching them
- ▷ **Soaked up** – took in
- ▷ **Telepathy** – mind-to-mind communication
- ▷ **Complex** – complicated
- ▷ **Grimaced** – made a pained expression
- ▷ **Cosmology** – the study of the universe

The Elfin Knight (Page 20)

- ▷ **Tumbledown** – falling apart
- ▷ **Snuggled** – made herself comfortable
- ▷ **Cloak** – piece of cloth hung from shoulders
- ▷ **Whisps** – thin little bits
- ▷ **Haunts** – wanders around on
- ▷ **Pang** – sudden feeling
- ▷ **Procession** – a parade
- ▷ **Courtiers** – nobles, advisors and servants
- ▷ **Bitterly** – with wind blowing
- ▷ **Windswept** – exposed to the wind
- ▷ **Merrily** – in a happy way
- ▷ **Writhed** – squirmed

Hercules and the Waggoner (Page 28)

- ▷ **Harvesting** – gathering crops
- ▷ **Supervise** – watch and say what to do
- ▷ **Chaff** – bits of straw
- ▷ **Droppings** – bits of poo
- ▷ **Hissed** – made a sound like ‘hiss’
- ▷ **Harnessed** – attached
- ▷ **Wagon** – big cart for carrying heavy things
- ▷ **Ditch** – trench at side of road
- ▷ **Shoving** – pushing

The Lion with Red Eyes (Page 31)

- ▷ **Fertile** – good for growing things
- ▷ **Plentiful** – in great amounts
- ▷ **Livelihoods** – things they need to live
- ▷ **Elder** – oldest and wisest person
- ▷ **Protectors** – things that protect

Continued on page 2...

STORYTIME GLOSSARY

- ▷ **Blazing** – burning brightly
- ▷ **Hollow** – with nothing inside it
- ▷ **Fend for himself** – look after himself
- ▷ **Scaly** – with scales on
- ▷ **Smouldering** – burning slightly
- ▷ **Triumph** – victory

The Boy With the Long Name

(Page 35)

- ▷ **Province** – area of a country
- ▷ **Impressive** – grand and awesome
- ▷ **Chapatis** – savoury pancakes
- ▷ **Mentioned** – written about
- ▷ **Slippery** – hard to hold on to
- ▷ **Familiar** – well known

Old Qanah's Gift (Page 40)

- ▷ **Bravery** – courage
- ▷ **Outcroppings** – rocks that stick up out of the ground
- ▷ **Adventurer** – traveller
- ▷ **Patterns** – repeated designs
- ▷ **Dyes** – substances used to colour things
- ▷ **Vibrant** – brightly coloured
- ▷ **Scarlet** – red
- ▷ **Dizzying** – amazing
- ▷ **Chuckled** – laughed quietly
- ▷ **Flowing** – moving
- ▷ **Flint-maker** – person who chips tools out of stones called flints
- ▷ **Blossomed** – opened up

FUN FACT! Scientists think that the universe began with a huge explosion called the 'Big Bang'!



CLASS DISCUSSION SHEET

LET'S TALK ABOUT... **Finding out about things!** Stephen was a very curious boy who loved discovering things about the world. Let's think about what it means to be curious!

1. One method for discovering things is through observation – this means watching things carefully and taking notes. What did Stephen learn about through observation?

2. You can also learn through experimentation or practical experience. What did Stephen try to discover through experimentation?

3. Can you think of another way of learning about things? What is it?

4. How do *you* prefer to find out about things? Do you like reading books, watching videos, observing the world or doing experiments?

WHAT ARE YOU INTERESTED IN?

Stephen Hawking was interested in the universe and how it worked. What are YOU interested in learning more about? Write down three things and what you could do to find out more about each of them.

1. I am interested in _____ and could find out more by:

2. I am interested in _____ and could find out more by:

3. I am interested in _____ and could find out more by:

READING COMPREHENSION SHEET

See if you can find the *simile* and an *intensifier* and work out what the opposite of *never* is in this extract from Stephen's tale.

“

..The lad was extremely curious and soaked up knowledge like a sponge, but he found school boring and didn't try very hard. Most of the other kids thought he was odd!

“He never finishes his homework!” said one. “Also, his handwriting is really messy!”

”

1. In the first sentence is an *intensifier*, which is a word that strengthens the meaning of the word that follows it. What is it?

2. A *simile* is a figure of speech that describes something as being like something else. What is the *simile* in the first sentence?

3. In the last sentence, the word *never* is used. Can you think of a word that means the opposite of *never*?

INTENSE EXPERIENCE!

See if you can write six sentences, each containing one of these these intensifiers...

Very Amazingly
Really Extremely
Particularly Totally

NAME _____ CLASS _____

STORY SEQUENCING SHEET

Are you as smart as Stephen? Test your intelligence by putting the events of his childhood in the right order by numbering them!

Stephen loved going to the Science Museum in London. He would spend hours looking at the steam engines and astronomy exhibits.

He and his friends built their own computing machine, which they called the Logical Uniselecto Computer Engine (LUCE).

Stephen was a very curious boy and liked discovering things on his own. He once took his dad's clock apart to see what made it tick!

He became fascinated with the idea of how the universe worked – but how could he figure out the patterns in it?

When it was time for Stephen to leave school, his father asked him if he wanted to study medicine – but the boy wasn't keen!

In 1942, a boy named Stephen was born in Oxford. His parents were very smart and loved teaching their kids new things!

Then, he read an article in a newspaper about a new machine that could solve complicated equations quickly, it was called a *computer*!

Stephen made friends with boys who shared his interests. They would have big discussions and play complicated board games.

Instead, he said he wanted to study physics at university, and maybe even find out how the world worked!

The boy was also a big fan of trains. He watched them at the nearby station and pestered his father for a toy train set.

Although he was very smart, the lad didn't try hard at school. Some kids thought he was odd – but others believed he was brilliant!

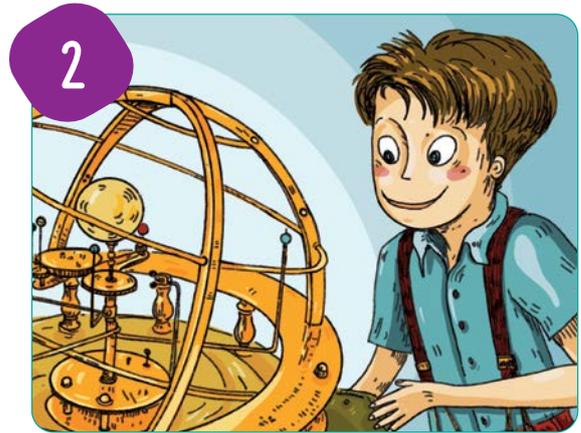
NAME _____

CLASS _____

STORYBOARD

Retell the story of young Stephen on this page by writing about what happened to him under each picture!









NAME _____

CLASS _____

CHARACTER SHEET: STEPHEN



You have read this month’s story about Stephen – but can you answer these questions about him?

What words did Stephen’s fellow pupils use to describe him?

Who were the four other people in his family?

What book do you think he would have enjoyed reading?

List some of the things that Stephen was curious about!

What did he like to do for fun?

Can you think of one thing he DIDN’T like?

A BRIEF HISTORY OF STEPHEN

Stephen Hawking is very famous – but here are ten things that you might *not* know about him! See if you can discover a fun fact of your own, too...

When Stephen was growing up, **dinnertimes were often silent** – because all the members of the family were reading books while they ate!

Stephen was sporty, too! When he was at Oxford, he was the **'cox' of a rowing team** and steered the boat!

He guest-starred as himself in some of his favourite **programmes**, including The Simpsons and Star Trek: The Next Generation.

He drove his **wheelchair** very fast – and sometimes ran over people's toes!

A movie about his life was made in 2014. It was called **The Theory of Everything**.

When Stephen lost the ability to speak, he communicated using a **computerised voice device** controlled by a muscle in his cheek.

He wrote a series of six kids' books with his daughter. The first one was called **George's Secret Key to the Universe!**

He thought that **aliens** probably did exist, but that we shouldn't try to contact them.

When he was 21, he found out he had **Lou Gherig's Disease**. He was told by doctors that he had only 2 years to live. However, he lived for 55 more years!

Stephen dreamed of going into space, and in 2007 he went on an **aeroplane** that allowed him to experience 'zero gravity', like in space.

My fact about Stephen Hawking is...

SOLAR SYSTEM FACT FILE

Here is your amazing guide to the wonderful worlds of the Solar System. Imagine what it would be like to visit them!

MERCURY

It is baking on one side and freezing on the other!

How big? A third the size of Earth

How hot? Between 427 °C and -173 °C!

Atmosphere: Almost none!

Fun Fact: One day on Mercury lasts for two Mercurian years!



VENUS

A planet where it rains acid!

How big? Slightly smaller than the Earth

How hot? It is the hottest planet! The average temperature is 464°C

Atmosphere: Thick carbon dioxide

Fun Fact: Because of the way it spins, the Sun rises in the west and sets in the east!



EARTH

It has a rocky surface but is mostly covered with water!

How big? 12,742 km in diameter

How hot? Pleasant, average 15°C

Atmosphere: A mixture of nitrogen, oxygen and carbon dioxide!

Fun Fact: It is the only place in the Solar System that is known to support life!



MARS

A dry, rocky planet with a reddish surface!

How big? Half the size of Earth

How hot? Chilly – average -65 °C

Atmosphere: Thin carbon dioxide

Fun Fact: Mars is home to Olympus Mons, a volcano that is the tallest known mountain in the Solar System!



JUPITER

A huge planet made up almost entirely of gas!

How big? Could fit 1300 Earths inside!

How hot? Very cold, -110 °C on average

Atmosphere: Hydrogen and helium

Fun Fact: The red spot on Jupiter is a huge storm, big enough to swallow 3 Earths!



SATURN

A yellowish gas giant surrounded by rings!

How big? 700 Earths

How hot? Really cold, average -140 °C

Atmosphere: Hydrogen and helium gas

Fun Fact: Saturn spins very fast – its day is only 10 hours and 41 minutes long.



URANUS:

A blue-green planet made up of gas, with a core of rock and ice!

How big? 63 Earths would fit in it

How hot? Cold – average -195°C

Atmosphere: Hydrogen and helium, with some methane and ammonia

Fun Fact: Uranus is the only planet whose axis is parallel with the Sun.



NEPTUNE

An icy planet with a core of water, ammonia and methane!

How big? 57 Earths

How hot? It's the coldest planet, with an average temperature of -200°C

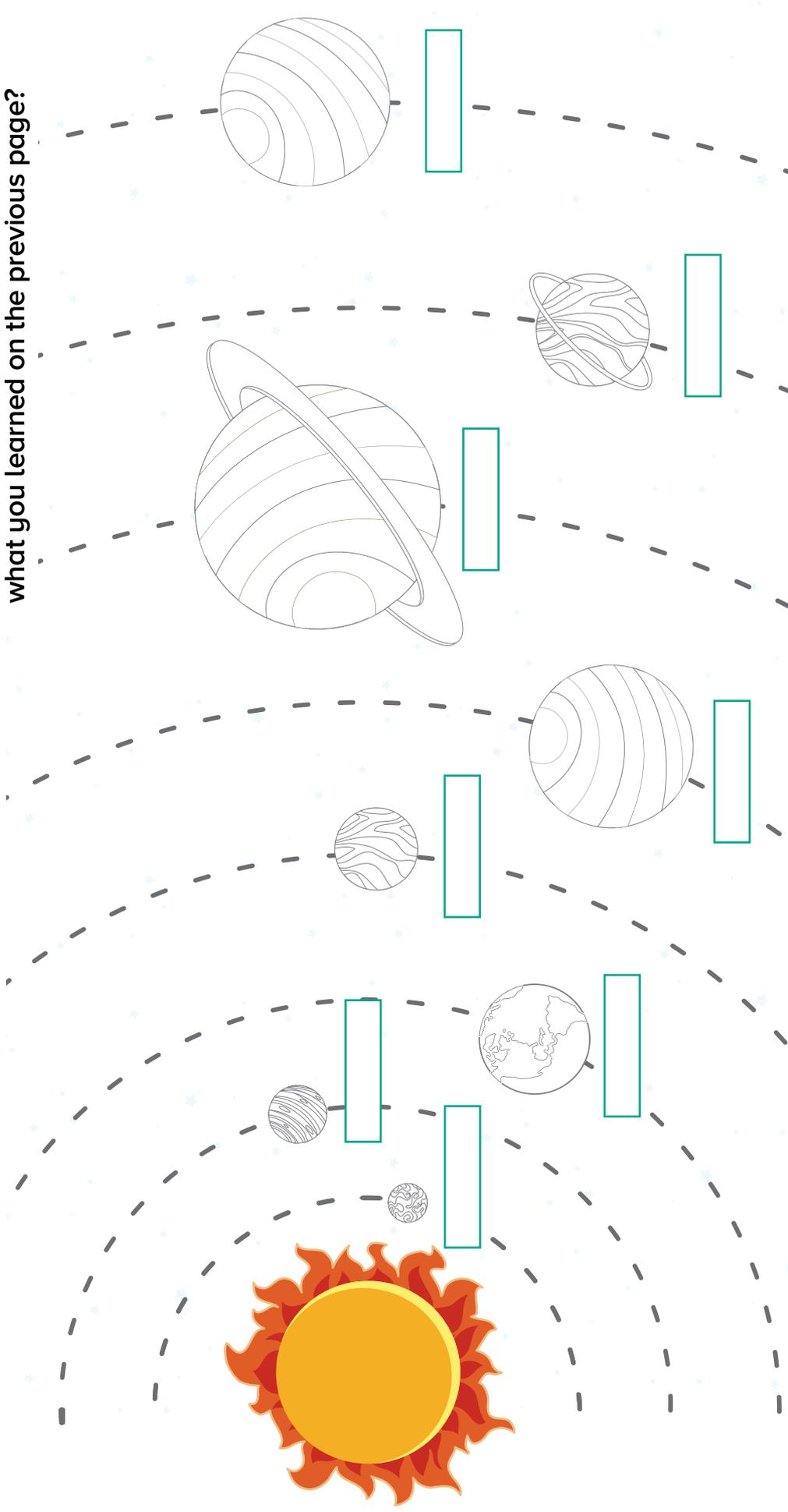
Atmosphere: Hydrogen, helium and methane

Fun Fact: It's the furthest planet from the Sun!



NAME AND COLOUR IN THE PLANETS!

Below is the Solar System – but the planets' names are missing! Can you label them, using what you learned on the previous page?

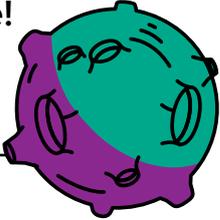
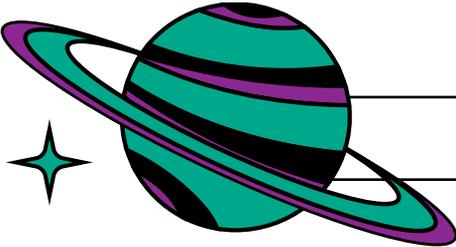


NAME _____

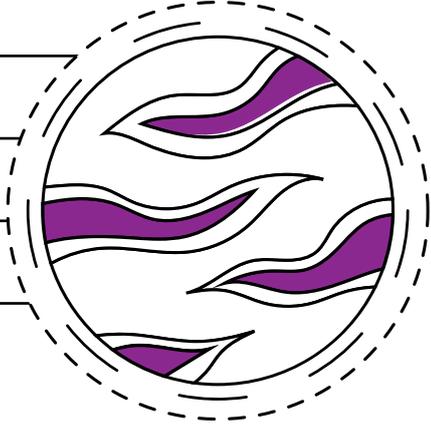
CLASS _____

MY FAVOURITE WORLD

You have read all about the planets of the Solar System on the **Solar System Fact File** sheet! But which one would you like to visit? Write about why you would want to go there and what you would see!



Handwriting practice lines consisting of ten horizontal lines. The first line is connected to the Saturn illustration on the left and the cratered planet illustration on the right. The remaining lines are blank for writing.

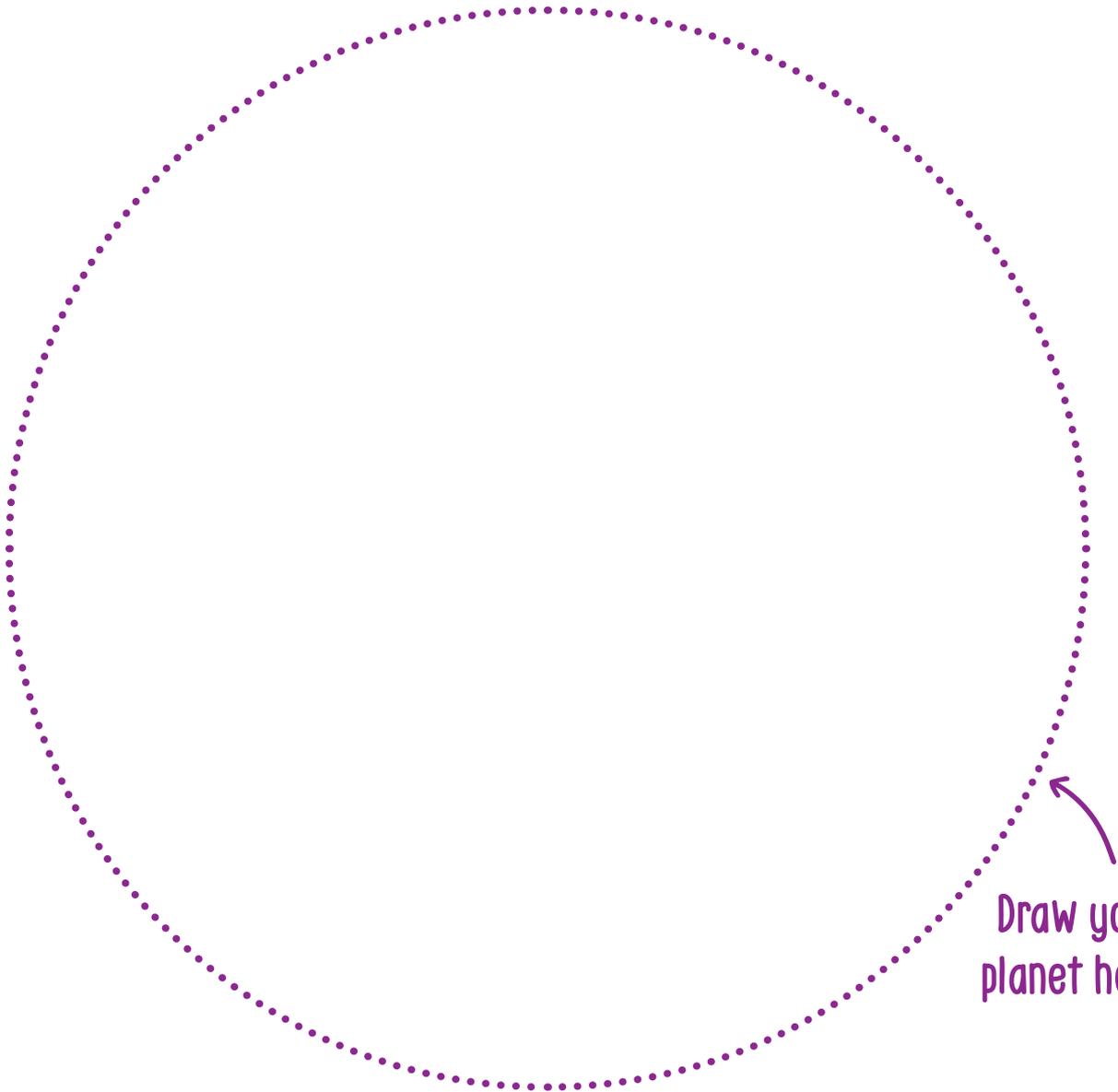


NAME _____

CLASS _____

WELCOME TO MY PLANET!

You have read about the planets nearest us, but what would your ideal planet be like? Answer the questions below to create your own world!



Draw your planet here!

My planet's name is _____

It is: **A.** rocky **B.** a gas planet
C. covered with liquid? _____

How hot is it? _____

What is in the atmosphere? _____

Write down three amazing facts about your new planet!

1. _____

2. _____

3. _____

NAME _____

CLASS _____

WHAT IS A BLACK HOLE?

Stephen Hawking studied black holes and came up with theories about them – but what ARE they? To find out, read this sheet!



A black hole is an area in space where gravity is so strong that nothing can escape it – not even light!

Because black holes suck in light, we can't actually see them! Astronomers can only find black holes by looking at the effect they have on the universe around them.

A black hole is created when a massive star burns out and collapses in on itself!

Astronomers now believe that very big black holes – called 'supermassive black holes' – are at the centre of galaxies.

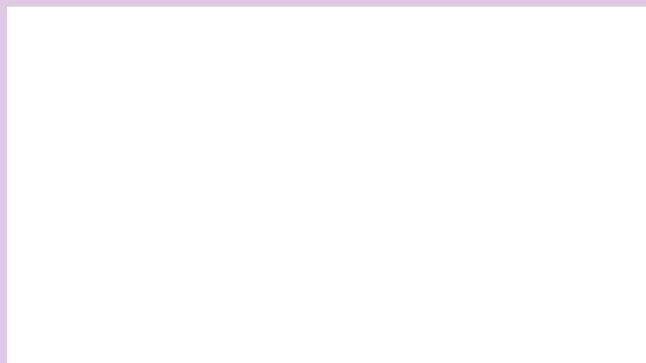
The more things the black hole pulls in, the bigger and more powerful it gets!

A black hole isn't really a 'hole' at all. At its core are the remains of a star, several kilometres across.

DID YOU KNOW? Stephen Hawking came up with a theory that radiation is released at the edge of a black hole. This was named 'Hawking radiation'.

WHAT WOULD YOU PUT IN A BLACK HOLE?

Once something goes into a black hole, it is never seen again! Draw the thing that YOU would want to put in a black hole!



NAME _____

CLASS _____

NAME THESE COSMIC OBJECTS!

Below are 10 things that can be found in space – can you match them up with their definitions?

- A. **STAR** B. **BLACK HOLE** C. **THE SUN**
 D. **GALAXY** E. **ASTEROID** F. **COMET**
 G. **METEORITE** H. **SOLAR SYSTEM**
 I. **CONSTELLATION** J. **PLANET**

1. The star at the centre of Earth’s Solar System.

2. An asteroid that enters Earth’s atmosphere and hits the ground.

3. A chunk of frozen gas and rock that lets out a ‘tail’ of gas when it gets close to a star.

4. Our Sun and all of the planets and other objects that orbit around it.

5. A massive group of stars.

6. A group of stars in distinctive positions that astronomers have named.

7. A huge object made up of hydrogen gas that gives off enormous amounts of heat and light.

8. A large object that orbits a star.

9. Metallic or rocky object in the Solar System.

10. An area of intense gravity that even light cannot escape from.

Answers: A, 7, B, 10, C, 1, D, 5, E, 9, F, 3, G, 2, H, 4, I, 6, J, 8.

NAME _____

CLASS _____

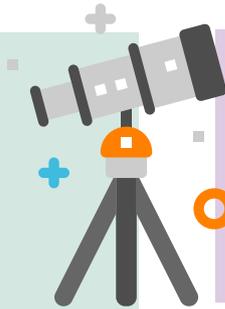
WHAT DO ASTRONOMERS DO?

They observe the universe around us! They then use the information they get to come up with theories about how the universe works.

HERE ARE SOME TOOLS THEY USE!

TELESCOPES

Early astronomers learned a lot about space by looking through telescopes and recording what they saw. Astronomers still do this – but modern telescopes are often huge and controlled by computers!



SPECTROGRAPHS

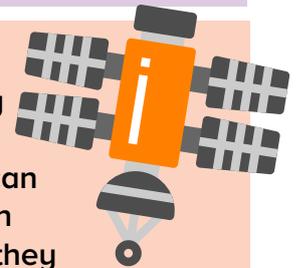
These amazing devices are used to analyse light received from telescopes. They can tell how hot things are, what they are made of, and how fast they are moving!

RADIO TELESCOPES

They are used to pick up the radio waves emitted by distant galaxies and other objects in space. Many things in space give off radio waves – though if aliens are sending out radio signals, the radio telescopes might pick them up too.

SATELLITES

Many satellites are actually space telescopes that peer far into the universe. They can see things more clearly than Earth-based ones because they don't have to look through our planet's atmosphere.



TICK THE TASKS ASTRONOMERS MIGHT DO!

- A. Write in-depth articles called papers about their research
- B. Run for president
- C. Go to conferences and discuss new ideas
- D. Write monthly horoscopes
- E. Read materials from other researchers to keep on learning

- F. Take selfies on the Moon
- G. Teach astronomy
- H. Go on space missions
- I. Do experiments in a lab
- J. Design, fix and operate telescopes and other tools
- K. Analyse data from observations to develop new theories

Answers: Astronomers might do A, C, E, G, H (possibly), I, J and K.

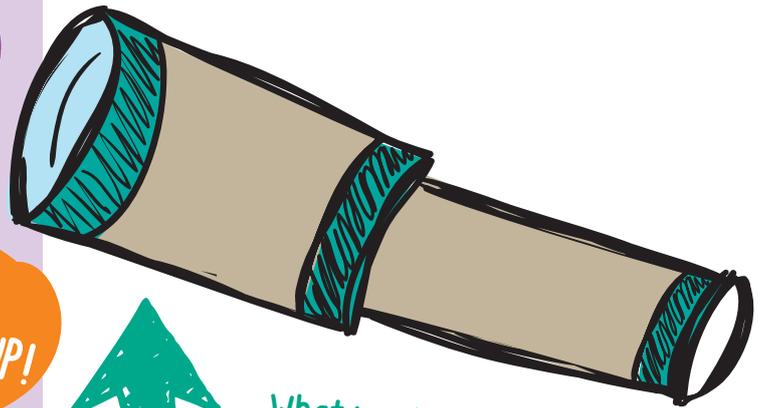
MAKE A TELESCOPE!

Telescopes are important tools for astronomers and cosmologists like Stephen Hawking. Follow these instructions to make a simple telescope to play with!

WHAT YOU WILL NEED

- ⚙️ The lenses from a pair of old reading glasses (ask an adult to carefully remove them for you!)
- ⚙️ A cardboard tube
- ⚙️ A sheet of cardboard
- ⚙️ Scissors
- ⚙️ Sticky tape

ASK A
GROWN-UP!



What would you like to see through your telescope? Use it to stimulate your imagination too!

HOW TO MAKE IT

- 1** First, wrap the cardboard around the tube to make another, slightly bigger tube. Cut off the excess cardboard and tape the cardboard into a tube shape. The smaller tube should be able to slide in and out of the larger one.
- 2** Use tape to stick a glasses lens to one end of the smaller tube, making sure that you only put tape on the edge of the lens. The convex (bulging-out) part of the lens should face out of the tube.
- 3** Stick the other lens onto the end of the larger tube you just made. Again, make sure the convex side is pointing outwards.
- 4** Now look down the tube. Can you see clearly through it? If you can't, try moving the inner tube backwards and forwards until the thing you are looking at is in focus!
- 5** What do you notice about what you see through your telescope? Read the explanation below to understand how these amazing devices work!



EXPLANATION: When light goes through the lenses in a telescope, it creates an image that is upside down. Advanced telescopes include a mirror that flips the picture the right way up!



STARRY NIGHT!

Colour in the telescope below – and then fill in the sky above it with the wonderful things you might see if you stare into space!

