Ark Pioneer learning at Home

Core Curriculum

Science

Work to be completed

- ☐ Day 1- Knowledge organiser-based revision
- ☐ Day 2- Gravity questions
- ☐ Day 3- Knowledge organiser-based revision
- ☐ Day 4- Seasons question
- ☐ Day 5- News article plus questions

Resources / links to help with work:

- ☐ https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zr3xh39
- ☐ https://www.bbc.co.uk/bitesize/topics/z8c9q6f
- ☐ https://www.youtube.com/watch?v=gTqdZ0GmDcI
- ☐ https://www.youtube.com/watch?v=-n_cXcOe6xk
- ☐ https://www.youtube.com/watch?v=cxrLRbkOwKs

How will this work be checked?

Each week you will be given 'red pen work' to carry out corrections on the learning that you are doing at home. Please make sure this work is done and that you correct all work in your exercise book.

You must also complete the weekly quiz for your core curriculum subjects online and the link to those is on our school website in the 'quizzes' drop-down option from 'Home Learning'.

How much time should I be studying and what happens if I don't finish all my work?

For core curriculum subjects you are expected to do 30min each day as a minimum. Those subjects are English language, English literature, Maths, Science, History and Geography. These subjects all have a weekly quiz and will be checked in on by your form teacher when they call each week.

All other subjects are 'Extended Curriculum' and they should be done after you have finished the Core Curriculum tasks for the day. You should plan to do work in different subjects each day. We recommend that pupils do one hour per week in each of the 'extended curriculum' subjects.

We recognise that it is not possible for all pupils to complete all work given the exceptional circumstance. Please speak with your form tutor about the work if it is becoming unmanageable.

Gravity

1. Gravity can also be called gravitational force.
2. Gravitational forces act on and between *all* objects.
3. Gravity is a non-contact force.
4. Non-contact forces have a force field that weakens with distance.
5. The gravitational field strength decreases with distance.
6. The gravitational field strength increases with mass.

Weight and mass

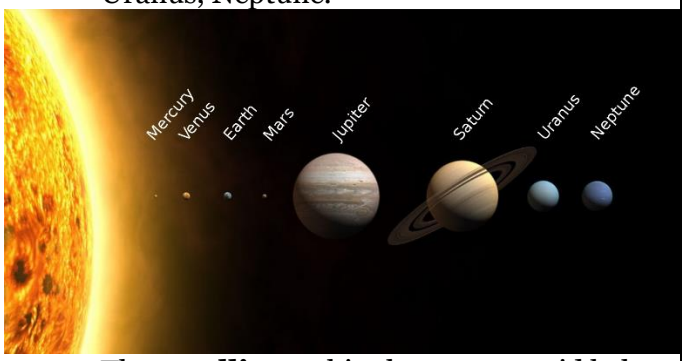
7. **Mass** is the amount of mater contained in an object.
8. The unit of mass is kilograms, kg.
9. Mass stays the same everywhere.
10. **Weight** is the force of gravity acting on a mass.
11. The unit of weight is Newtons, N.
12. $Weight\ (N) = mass\ (kg) x\ gravitiational\ field\ strength(\frac{N}{kg})$

Space and Gravity

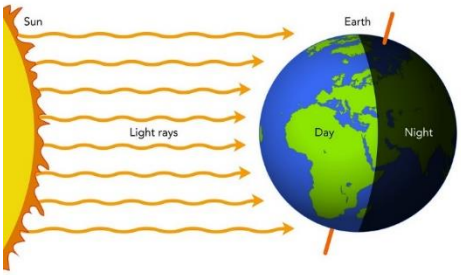
13. Gravity is the force that holds objects in **orbit**.
14. An orbit is the curved path of an object in space around another object in space.
15. There are many billions of **galaxies** in the universe.
16. Our solar system is a tiny part of one galaxy.

Solar System

17. Our solar system contains lots of objects including the sun, planets, satellites, asteroid belts and comets.
18. The **sun** is the star at the centre of our solar system.
19. The **planets** orbit the sun.
20. The planets are in the order: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.



21. The **satellites** orbit planets, asteroid belts and comets.
22. A natural satellite is the moon which orbits the Earth.
23. Artificial satellites include those that orbit the Earth for communication.
24. It takes the Earth 365 days to orbit the sun once. This is a year.
25. Planets rotate on their axis which produces day and night.
26. The Earth rotates once every 24 hours.
27. The seasons are caused because the Earth rotated on an axis of 23.5°.



28. An **eclipse** is caused when an object in space obscures the light from another object in space.
29. A solar eclipse happens when light from the sun is blocked from reaching parts of Earth. This happens when the moon comes between the sun and the Earth.
30. A lunar eclipse happens when light from the Sun is blocked from reaching the moon by the Earth.

Day One

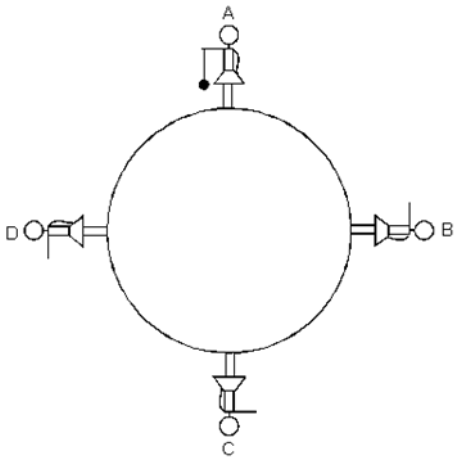
Test yourself on the week's questions by:

1. Study the knowledge organiser for your set topic.
2. Write the answer to each question in Copy column (you can do this in your workbook).
3. Check your answers using the knowledge organiser. Tick if correct, and add any missing information in red pen.
4. Cover the answers in Copy column and answer the question from memory in the Cover, Check column.
5. Uncover the answers and mark the Cover, Check column with a red pen. Tick if correct, and add any missing information.

	Question	Copy, Cover	Check
	1. What is gravity?		
	2. Is gravity a contact or non-contact force?		
	3. What happens to the gravitational field strength as distance increases?		
	4. What happens to gravitational field strength as mass of the object increases?		
	5. What is mass? What unit is mass measured in?		
	6. What is weight? What unit is weight measured in?		
	7. What is the equation used to calculate an object's weight?		
	8. Calculate the weight of a 5kg object when g=10N/kg		
	9. Calculate the weight of a 8.4kg object when g=9.8N/kg		

<u>Day Two-</u> Gravity, Mass and Weight Questions

Q1. Lisa drew a picture of herself standing at four different positions on the Earth,

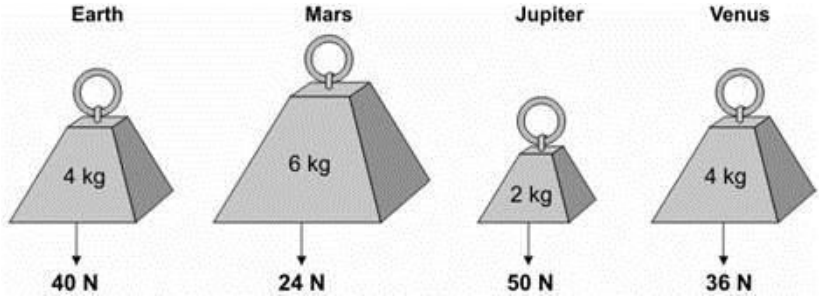


not to scale

(a) (i) Draw an arrow at **each** of the four positions to show the direction of the force of gravity on Lisa.

(ii) The drawing at position A shows Lisa holding a ball on a string.
Draw the ball and string in positions B, C and D.

Q2. The drawings show the mass and weight of four objects on different planets.



(a) On which of the four planets is the object with the largest mass?

.....

(b) How can you tell, from the drawings, that gravity is greater on Earth than on Venus?

.....

.....

(c) Gravity is less on the Moon than on the Earth.

Complete the sentences below to compare the weight and mass of an astronaut on the Moon and on the Earth.

The **weight** of an astronaut on the Moon is ..... the **weight** of an astronaut on the Earth.

The **mass** of an astronaut on the Moon is ..... the **mass** of the astronaut on the Earth.

Day Three

Test yourself on the week's questions by:

6. Study the knowledge organiser for your set topic.
7. Write the answer to each question in Copy column (you can do this in your workbook).
8. Check your answers using the knowledge organiser. Tick if correct, and add any missing information in red pen.
9. Cover the answers in Copy column and answer the question from memory in the Cover, Check column.
10. Uncover the answers and mark the Cover, Check column with a red pen. Tick if correct, and add any missing information.

	Question	Copy, Cover	Check
	1. What is the name of the star in our solar system?		
	2. What is the name of the galaxy our solar system is located in?		
	3. Name the planets in our solar system in order.		
	4. What force keeps objects in orbit?		
	5. What is a satellite?		

	6. What is the name of the Earth's natural satellite?		
	7. Give an example of an artificial satellite.		
	Question	**Copy, Cover**	**Check**
	8. What is a year?		
	9. How long is a year on Earth?		
	10. What is a day?		
	11. How long is a day on Earth?		
	12. Why does Earth experience seasons?		
	13. To what degree is the Earth tilted on its axis?		

	14. What is a Solar Eclipse?		
	15. What is a Lunar Eclipse?		

Day Four (answers available for these question at the back of the booklet if you are really stuck after using BBC Bitesize and YouTube videos to help you.)

https://www.youtube.com/watch?v=gTqdZ0GmDcI

A teacher uses a spotlight and a globe to show why days are longer in summer and shorter in winter.

Questions

1. What makes the globe a good model for the Earth?
2. How can the spotlight and globe show days are longer in summer?
3. What needs to be changed to show how days are shorter in winter?
4. How is this change *similar* to what really happens?
   How is it *different*?

Day Five – Read the news article and answer the questions at the end.

Before working on spacecraft, this engineer overcame self-doubt

Tiera Fletcher has gone on to help design vehicles for travel to the moon and Mars

Tiera Fletcher has dreamed of working on spacecraft since her childhood. On the path to achieving this goal, Fletcher struggled with self-confidence. Now she travels to speak to students about how they can overcome that hurdle.

Like many kids, Tiera Fletcher wanted to be many different things when she was young. At times she wanted to be a mathematician, an inventor, a scientist and an architect. But when she was 11, she figured it out. She wanted to build rockets and airplanes. And since then, she has been reaching for the stars — or at least thinking about how to travel closer to them.

Today, she's a structural engineer in San Antonio, Texas, at Boeing. That's an aerospace company that makes airplanes and space vehicles. Fletcher has helped design vehicles that may someday shuttle people to the moon or Mars.

Explainer: What is a mentor?

Long before Fletcher became a rocket scientist, she was a shy and timid kid. Though she consistently excelled in school, she was plagued by low self-confidence. She just didn't believe in herself. But teachers and mentors helped her come out of her shell. That included her middle-school science teacher, who saw her potential and encouraged her to speak up. It also included her high school engineering teacher, who inspired Fletcher when she grew up to reach out to kids.

Fletcher wants kids to realize that believing in themselves is an important part of reaching their goals. In this interview, she shares her experiences and advice with *Science News for Students*.

What inspired you to pursue your career?

When I was young, I had a passion for drawing and for building. If I were to draw a house, I would actually want to build it. I'd use materials like balsa wood and glue and stickers.


Tiera Fletcher is an engineer at Boeing. She decided she wanted work on vehicles for space travel at the age of 11. That was after taking part in a school program all about aerospace engineering.

I also had a passion for mathematics that started quite early. My mom is an accountant. That's someone who helps people or businesses keep track of money. She taught me about the fundamentals of mathematics. I'd use math to help her with couponing. We would go to the grocery store. She would have me calculate the total amount that the groceries cost. I'd subtract out the coupons, add in the tax — all in my head. So that's how I'd practice math. My mom understood that since I didn't complain about it, I must have a love for math. She just nurtured that love.

I decided to become an aerospace engineer at the age of 11. There was a program at my elementary school that taught the foundations of aerospace engineering. They provided flight simulators. They taught us about the forces objects experience as they fly through the air. They showed us how to make a really cool glider. They made aerospace super fun and interesting. That's when I learned that I could be an engineer and focus on these very cool vehicles for space travel.

How did you get where you are today?

Ever since age 11, I remained focused on becoming an aerospace engineer. I even picked my activities and summer programs in middle school based on that goal. It also helped me to select my high school. I went to Wheeler High School in Marietta, Ga. They had a program that specialized in science, math and technology. It was out of my school district, so I rode the bus for an hour every morning from my home in Mableton, Ga. But I knew that it was the school for me and my goal. So I made it happen and so did my parents.

Five tips for finding a great mentor

Wheeler offered an aerospace-engineering course and other engineering courses. Then, for college, I attended the Massachusetts Institute of Technology (MIT) in Cambridge. That was because they were number one in aerospace engineering. That just fit my goal. They've graduated so many astronauts and even have astronauts as professors. I knew that I had to go there.

Along the way, my biggest hurdle was truly believing in myself. It's something that we all go through at some point in our lives. And it's a battle that I fought up until I attended MIT. Even though I was excelling, I always thought that I didn't have the capabilities to fulfill my dreams. I finally started to believe in myself my sophomore year in college. It was shortly after I accepted an internship with the Boeing Company. I was halfway through this really hard course for aerospace engineers at MIT. I realized I was able to do this work. And I looked in the mirror and said, "I believe in you."

While I was focusing on school, I was also trying to become a well-rounded individual. So for kids who are seeking to excel in school, it's also important to become the person that you want to be. That could mean getting involved in the community and helping others. For me, it was tutoring and mentoring and working for Habitat for Humanity for a bit. (Habitat for Humanity builds homes for people in need.)

In addition to your goals, you have to find other passions. I love to dance and play music. In college, I actually choreographed for an African dance team. It was exhilarating and so much fun. As far as instruments, I started with the piano at around the age of five or six. I later learned to play the xylophone, the violin and the saxophone.

How do you get your best ideas?

One way that I get my best ideas is silence. I just sit there and think about a topic. I think about how I can implement whatever the goal is or different avenues. Just by having that realm of silence and the room to think, that's when the ideas appear. I write them down, probably in a notepad or in my phone. And I'm able to expand on those ideas later. I try and just write out whatever I'm thinking as quickly as possible before the idea slips away. I do this very frequently, almost every day.

What's one of your biggest successes?

One of my greatest successes is marrying my best friend and becoming a mother. It's something I've dreamed of. But after it happens, you can't exactly calculate how things are going to turn out. You want to keep your little ones safe. But all sorts of different factors play a role. Another great success would be achieving my dream, which I had for more than a decade, of becoming an aerospace engineer. Lastly, another success would be getting to the point of believing in myself.

What's one of your biggest failures, and how did you get past that?

I failed my first exam in my freshman year of college. During the first semester of your freshman year, MIT has what's called a "pass-no record" system. All you have to do is make a passing grade. If you get anything else, it's like you never took the class. So I was taking this course in my first semester and I received such a low grade. I think I got maybe 25 percent on this exam.

I just thought that I just couldn't do it. I was ready to pack my things and head back to Georgia. I didn't think that I would be able to succeed. But I took that moment of failure and figured out how to grow from it. I reached out to the professors, to the teaching assistants, to my peers who were thriving in the course. And I put my best foot forward.

What do you do in your spare time?

I travel a lot for outreach. I dedicate a lot of my spare time to reaching out to students of all ages. I want to let them know that they have the power to achieve their dreams. I try to give them advice so they can get to that point of confidence. I don't want them to have to struggle for as long as I did. I also spend time with my family and friends. And then I try and get some dance numbers in there when I can. That's usually just in the comfort of my home.

What piece of advice do you wish you had been given when you were younger?

Allow failures to be learning lessons. Just because you fail, it's not a stopping point. It's a time for you to reorganize your approach and your thoughts. You can still reach whatever goal it is that you're trying to reach.

Power Words

academic: Relating to school, classes or things taught by teachers in formal institutes of learning (such as a college).

aerospace: A research field devoted to the study of Earth's atmosphere and the space beyond or to aircraft that travel in the atmosphere and space.

balsa: Trees of the *Ochroma* genus that grow in the tropical Americas. Their wood is extremely lightweight, easy to cut and buoyant. That's why it's often used to make rafts, model airplanes and other projects that may require light weight and the ability for someone to sculpt parts easily.

engineer: A person who uses science to solve problems. As a verb, to engineer means to design a device, material or process that will solve some problem or unmet need. (v.) To perform these tasks, or the name for a person who performs such tasks.

internship: A training program where students learn advanced professional skills by working alongside experts. People who participate in these training programs are called interns. Some intern in medicine, others in the sciences, journalism or business.

simulator: A device that attempts to mimic the form or function of something. A flight simulator, helps airline pilots practice flying from the safety of a cockpit on the ground. Computers display what the pilot would see on the dials and out of the windows in reaction to each action he or she takes.

STEM: An acronym (abbreviation made using the first letters of a term) for science, technology, engineering and math.

structural engineer: An individual who uses science to determine the strength or vulnerabilities of a building, bridge or other structure.

Questions

1) How does Tiera Fletcher demonstrate our school values in this interview?

2) How do you think Tiera's advice could be useful for you and your own career aspirations?

3) Write a paragraph that shows off your improving literacy by using at least 4 of the Power Words listed above.

4) Write down 3 interview questions you would like to ask someone in your family about their career/successes in life. Organise a time to interview them (it could be someone in your house or over zoom/facetime). Send what you learnt from doing the interview to your form tutor to be included in the shout outs

Day 4 Answers

1. The globe is spherical, it spins and is tilted (at 23.5°).
2. When tilted towards the lamp, more than half of the top part of the globe is lit up. Spinning at a steady speed shows places in this part of the globe are lit up for longer than they are in shadow.
3. The globe needs to be tilted away from the lamp. It should be kept at the same angle and moved to the opposite side of the lamp. (The lamp may need to be turned round.) The force of the Sun on the Earth keeps it in orbit, but cannot change the tilt of the Earth. This means that to tilt away from the Sun the Earth must move around the Sun.
4. The Earth stays tilted at the same angle as it orbits the Sun so its tilt towards the Sun changes over a year. It takes six months for the Earth to move half way around the Sun. The globe should be almost two miles from the lamp to match the true scale of the Sun and Earth system, and the lamp should be a 2.73m ball of plasma and hot gas that radiates in all directions.