Teacher's Pack

COLLECTIVE

LOTTERY FUNDED
EDINBURGH WORLD HERITAGE
ALBA | CHRUTHACHAIL

Contents

Collective is a new kind of Observatory, bringing people together around contemporary art and iconic heritage. It is a unique place to bring pupils on a school trip. Along with a changing programme of contemporary art exhibitions, the site offers stunning panoramic views of Edinburgh and is home to a number of historical buildings and artefacts, all of these aspects of Collective easily lend themselves to cross-curricular learning.

This pack is designed to help teachers get more out of a self-directed visit to Collective. Subject areas covered include:

- Expressive Arts
- Literacy and English
- Social Sciences
- Mathematics and Numeracy
- The Sciences

For each subject area you'll find suggested activities to do with your class before you visit, questions to ask and activities you can undertake whilst you're at Collective, and follow-up tasks to do back at school, along with background notes and curriculum references.

Expressive Arts

Close Observational Drawing

"Of all places for a view, this
Calton Hill is perhaps the best"
Robert Louis Stevenson, 1889

The panoramic views, interesting architecture, and historic artefacts of Collective lend themselves to lessons on close observational drawing. The following activities use observation and are inspired by the views, buildings and contemporary art within Collective.

Activity 1a
Map Starting Point '1a'.

Materials
A4 card, A4 paper, pencils, boards to lean on.

Before Your Visit
Give every pupil a sheet of A4 card, roll it and stick it with tape to make a cylindrical tube to be used as a telescope on your visit.

Setting The Scene
It is the year 1776. An optician from Leith called Thomas Short has arrived in Edinburgh with a twelve foot telescope made by his brother. He wants to put the telescope in a building where it can be used by astronomers to view the night sky so they can observe, record and study what is happening in space. Thomas decides to build the City Observatory on Calton Hill, high above the city lights where the sky is darker and with a specially designed domed roof that opens. Today, the class will be observers, but unlike astronomers looking into space, we are going to study the world around us in close detail. Get your pre-made telescopes at the ready!

Look And Discuss

- Can anyone see the words City Observatory carved in stone?
- What does observe mean?
- What does observatory mean? (Close looking, thinking, exploring, discovering, recording)
- Today at Collective we will be seeing old and new buildings. Does anyone know what a gallery is? (A space to display art)
- Moving inside the gates, can you see the Observatory building? Walk around the site path to the left of the entrance. Get in pairs (not too close to other pairs) and face each other, looking over your partner's shoulder.

Pupil A: Looking through your telescope, choose something small within the landscape. Describe it to your partner using lots of detail (colour, shape, size) but without saying what it is. Can they guess?

Pupil B: Looking through your telescope choose something you can see within the Observatory complex. e.g. Part of the Observatory building, a plant, part of the path. Look really hard and describe it to your partner. Can they guess what it is?

Now Pupil A choose something within the complex and Pupil B choose something in the landscape. This can be repeated around the site, inside and outside the buildings. Pupils can see around inside and outside of the Observatory building and the now glazed transit slot can be viewed from the inside and outside of the Transit House along with the two-faced 'Politician's clock'.

Make
After visiting the spaces, everyone can choose something they have observed to create a line drawing in-situ. Use your telescopes to focus into the small area. Spend time looking carefully. Think about how different mark-making techniques can be used to show lots of detail such as textures, shapes and tones. Looking particularly at textures, the class could take rubbings from a variety of stone surfaces using paper and crayons to compare the buildings on site.

Back At School
In small groups, show each other your finished drawings.

Discuss:

- Why did you choose your subject?
- What your drawing shows?
- What you liked about the visit?
- One thing you learned?

See Teacher's Notes on Buildings

Curriculum Reference Points:
EXA 1-03a
EXA 2-04a
LIT 1-09a
LIT 2-09a

Activity 1b
Map Starting Point '1b'

Materials
Pencils, A4 paper, pencils, boards to lean on.

Setting The Scene
It is the year 1787. The artist Robert Baker has just left the spot where we are all standing and has come up with a way to capture a 360-degree view of the city without using modern technology like cameras but through looking and drawing. However, to do this he needs the help of his twelve-year-old son, Henry and all of Henry's classmates - that's you! By sketching out different views of the city and joining them together, we will re-create the very first panorama!

Look And Discuss

- Can anyone see buildings or features they recognise in the landscape?
- What forms and shapes can you see?
- Discussing together, what would be a good area to choose as the basis for the class panorama? For example, from Arthur's Seat to Edinburgh Castle or from Fife on the Firth of Forth to North Berwick.
- How can mark-making change 2D shape into 3D forms? (Using lines and shadows)

Make
Each child can focus on one part of the panorama to sketch. For example, Arthur's Seat, Dynamic Earth or St Andrews House. Simplify and focus on these most significant sites. Each pupil should remember who is to their left or right (or the teacher can note this) so the drawings can be joined together later.

Back At School
Using their sketches as inspiration, the children can make larger charcoal drawings, paintings or collages. These can then be joined together and displayed on a large wall space.

See Teacher's Notes on The Panorama

Curriculum Reference Points:
EXA 1-03a
EXA 2-04a
LIT 1-09a
LIT 2-09a

Social Sciences

Maps and Mapping

From Calton Hill the children have a superb view of Edinburgh and can use this site to see the contrasting and distinct architectural and building styles of the city's historic old and new towns.

Activity 2

Map Starting Point '2'
Download Worksheet 1

Materials

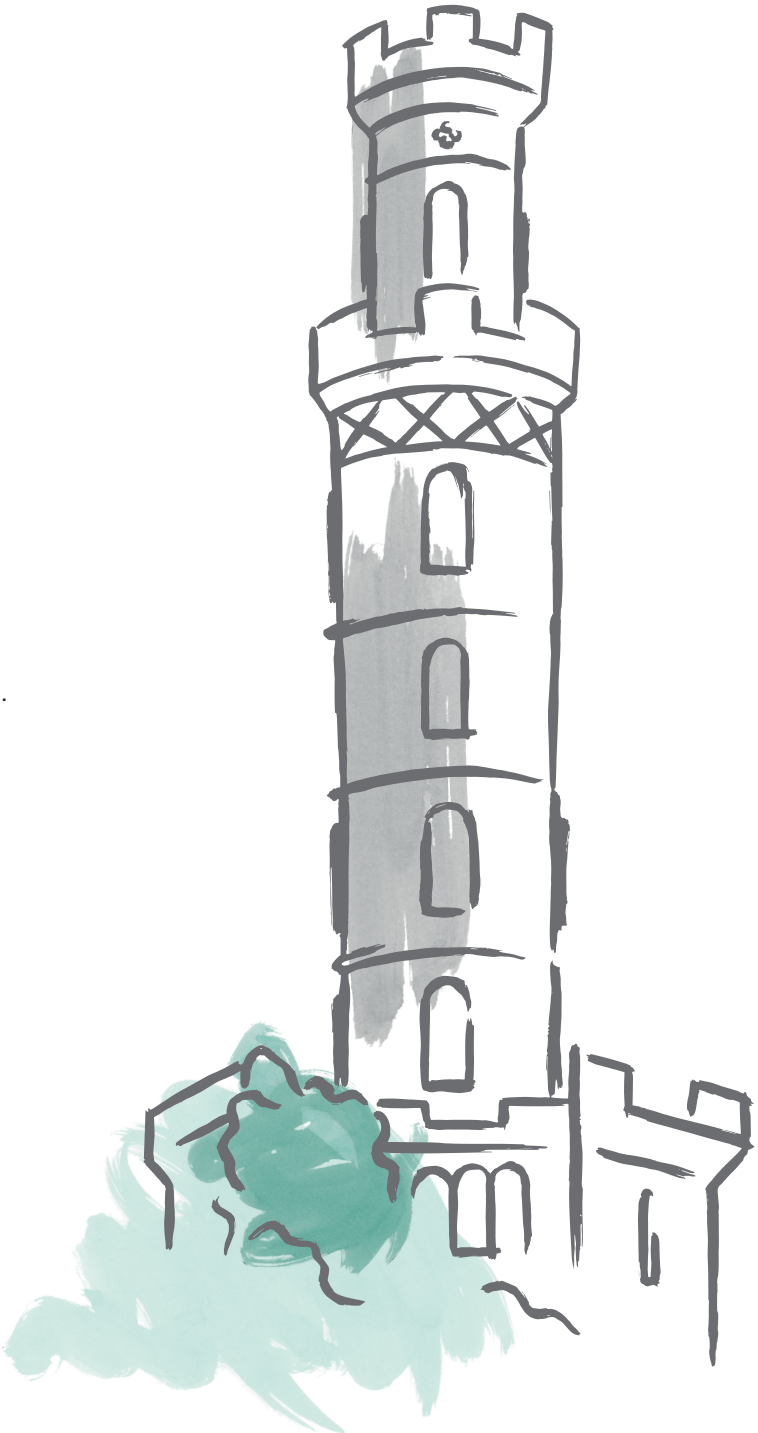
Worksheet 1, pencils, compasses, boards to lean on.

Before Your Visit

It may be beneficial to discuss what a map is, show some examples and use a simple 'key' to identify main landmarks.

Setting The Scene

Looking out over the view, imagine it is the year 1766. The only buildings in Edinburgh run from the Castle down the Royal Mile to Holyrood Palace. No buildings have been built to the right of the castle yet. Only the Old Town stands and although there are some beautiful buildings like Edinburgh Castle and St. Giles' Cathedral, the area is densely populated with high tenements. There is little plumbing, all the waste is thrown out into the streets and runs into the Nor Loch (now Princes Street Gardens) which has become a stinking cesspit. This and the vast number of smoking chimneys gives Edinburgh its nickname Auld Reekie. A competition is held for someone to design a new part of a city to be called the New Town and is won by the twenty-six-year-old, James Craig. Today the class will be town planners, mapping out aspects of the Old and New Towns looking for landmarks in the landscape.



Look And Discuss

- Does anyone recognise any landmarks?
- What are the different shapes of roofs and what buildings might these be? Cathedrals/churches, houses, offices, banks, shops.
- What are the differences (if any) between old and new buildings?
- Can they work out where their school might be?
- What is a map? (A representation of an area of land showing physical features)
- What is a map key? (It gives you information to make the map make sense, using symbols to represent things).

Make

Give each child Worksheet 1 (see resources at the back of this pack) to spot and draw all the landmarks in the key as line drawings or black silhouettes. Edinburgh Castle has been done as an example.

The class can now draw a simple line drawing map of the view starting at the left of their paper with Arthur's Seat and Salisbury Crags.

Working to the right of the paper, filling in the map with sketches of the shapes of some of the biggest buildings and landmarks on their map, using their key to help. Focus on lines, shapes and simplicity at this stage. After this activity, visit the Collective buildings.

Looking at the architecture outside, do the buildings suit the Old or New Town style? Guess where north, south, east and west are then use compasses to determine the answer.

Identify one main landmark in each compass point. Repeat this inside the buildings, trying to remember where the main landmarks were outside.

Back At School

Using their simple maps, children can make a grid map on a larger sheet of paper or card (size A1) using paints, coloured pens or paint to mark out roads, railways and bridges. Pupils can make the main landmarks from their key three dimensional with cardboard; small boxes for Edinburgh Castle or a rolled cardboard cone for St. Giles Cathedral etc. Children can add a compass, a title and key to their maps and older pupils could devise symbols for a new key.

More activities:

See how Edinburgh has changed over the years by looking at old and new maps. Explore the social history of Edinburgh by investigating what life was like in the closely packed high tenements of the Old Town or investigate the development of the much grander and more spacious New Town. When presenting their findings, discuss comparisons and contrasts.

See Teacher's Notes on Maps

Curriculum Reference Points:
SOC 1-07a
SOC 1-14a
SOC 2-14a

Mathematics & Numeracy

Estimating and Measuring

The City Observatory at Collective plays an important part in the history of measurement and can be used as both a stimulus and physical construct for practical lessons in estimation and measurement.

Activity 3

Map Starting Point '3'

Materials

Paper, pencils, boards to lean on, small sand bags, tape measures.

Setting The Scene

It is a dark, clear night more than one-hundred-and-fifty years ago. The first Astronomer Royal, Thomas Henderson, climbs up the steps and goes inside the City Observatory. He sets to work making notes of times and calculations sitting at a large telescope with the roof to open, looking up at the night sky. Henderson was a famous astronomer because he was one of the first people to measure the distance from planet Earth to the nearest star, Alpha Centauri, using what's known as the parallax method. Today, the class are going to be trainee astronomers – making measurements between objects but with distances not so far away as a star! Sadly, Henderson lacked confidence and was beaten by another astronomer to publish his findings, but his mathematical brilliance in calculating vast distances is recognised today. He and the other astronomer didn't fall out about who was first and went on to become good friends going on walking holidays in the Highlands together!

Look And Discuss

- What are observatories built for?
- What are telescopes used for?
- People can gain more understanding about our planet and solar system by looking, measuring, estimating and recording findings. Thinking about Thomas Henderson: How far away do you think the star Alpha Centauri is?

Before revealing the answer, show the pupils what a metre looks like (with pre-prepared strip of paper) Then ask how many metres are in a kilometre? (1000) to give the some sense of scale. Alpha Centauri is 4.396 light years or 41.59 trillion km away. Why do you think this Observatory stopped being used? Discuss light pollution and the need for astronomers to find a darker sky outside of the city.

Make

Before visiting the City Observatory buildings, telescope and transit slot, gather the pupils in a space outdoors. Explain that they are going to guess and then measure distances between two points they can see– like Henderson's measurement between Earth and Alpha Centauri. Without rulers or tape measures, what could they use to measure lengths? Hands, feet, bodies etc. Or they might suggest using other things such as sticks or string.

In pairs, each placing a marker (like small a sand bag or something that will not blow away on the windy hill!) at a distance from their chosen object/building. They must decide what they will use to measure the length (e.g. footsteps). Firstly, write an estimate of how many units of their chosen measurement the length will be, then they must measure the length and record their findings. Ask each pair to repeat this activity for three or four more measurements of varying lengths. Can the children work out the difference between their estimate and the actual measurement? Repeat this activity but this time using tape measures. If they are unfamiliar with measuring, demonstrate how to use them. Ensure understanding that 100cm is the equivalent to 1m. Discuss ways to make sure they get an accurate measurement (make sure they measure from the same point each time, one person anchors the end of the tape/metre rule etc, holds tape in a straight line etc).

As a class, discuss findings: Did they choose the right unit of measurement?

How accurate were their estimations? What's the problem with using things like hands and feet to measure lengths?

For a second level extension, ask the children to measure the unit they used to measure in cm (e.g. measure their foot/hand/stick) and work out the length they measured in cms. Convert centimetres to metres (e.g. 152cm = 1.52m). Older children could estimate and measure the perimeters and area of shapes they find about the site (e.g. the perimeter and area of a paving slab or a stone step section at the side of the Observatory).

Hint: choose regular square sided shapes, avoid curves!

Back At School

Use estimation and measuring skills to carry out practical maths activities around the classroom and school grounds:

Can they measure the playground?

The school hall?

Extend skills for older children by measuring perimeter/area as well as length. Use trundle sticks as an easier way to measure large areas. Talk about units of metric measurement and ask the children to arrange the following units in order of size – mm, cm, m, km. Explain how each unit of measurement compares to another and can be converted e.g. 10mm=1cm, 100cm=1m, 100m=1km.

See Teacher's Notes on Thomas Henderson

Curriculum Reference Points:
MNU 1-11a

The Sciences

Space

The Observatory is at the heart of Collective and a visit is the ideal way to launch or animate a project on space and the solar system. Viewing the building and learning about the telescopes used to view the night sky will inspire and bring learning to life.

Activity 4

Map Starting Point '4'

Download Worksheets 2 and 3

Materials

Worksheet 2 (laminate, colour code and cut-out four sets), beanbags, copies of Worksheet 3.

Setting The Scene

Let's go back in time... it is the year 1724, the council have just bought the hill and made it one of the country's first public parks. There are no buildings here, yet - the New Town doesn't exist and Calton Hill is surrounded by countryside. With no street lights, it is very dark at night making it the perfect place to look at and study the night sky, especially for astronomers. Let's jump fifty-four years into the future when Thomas Short builds the first Observatory to house his telescope. Jump another forty years into the future and the larger City Observatory is founded by William Playfair. Telescopes are installed and slots in the roof mean that astronomers can look through them to track the night skies. Today, we are going to be astronomers to learn about space, specifically about our solar system and the eight planets within it.

Look And Discuss

- What is a 'solar system'?(All the planets that revolve round a sun).
- Can anyone name any of the planets?

In advance photocopy the planets on Worksheet 2, laminate and colour code four sets so four teams can find a complete set of 8 planets. Divide the class into four small groups and give them each a colour team name. A helper/assistant can distribute the planets outside in the walled Collective complex using beanbags to weigh them down if its windy. Each team must then find all eight planets in their colour and use the numbers on the back of each planet to put them in the correct order (one being the planet closest to the sun and eight being furthest away).

The teams could hold their planet cards and stand in the right order. Now give each team the laminated picture of the Sun and ask them to lay it somewhere on the ground. Using Worksheet 3 ask pupils to measure and lay out the planets on the ground in order, starting from the one nearest the Sun. To do this, each group should choose one pupil to be the 'measure'. As in Worksheet 3, the pupil can step-out the distances, making sure they put their heel directly in front of their toe so that it touches. The counts in the table are starting from the Sun each time and not from previous planets. They can either weigh the planets down under a beanbag or each person in the team can stand holding the pictures to represent distances.

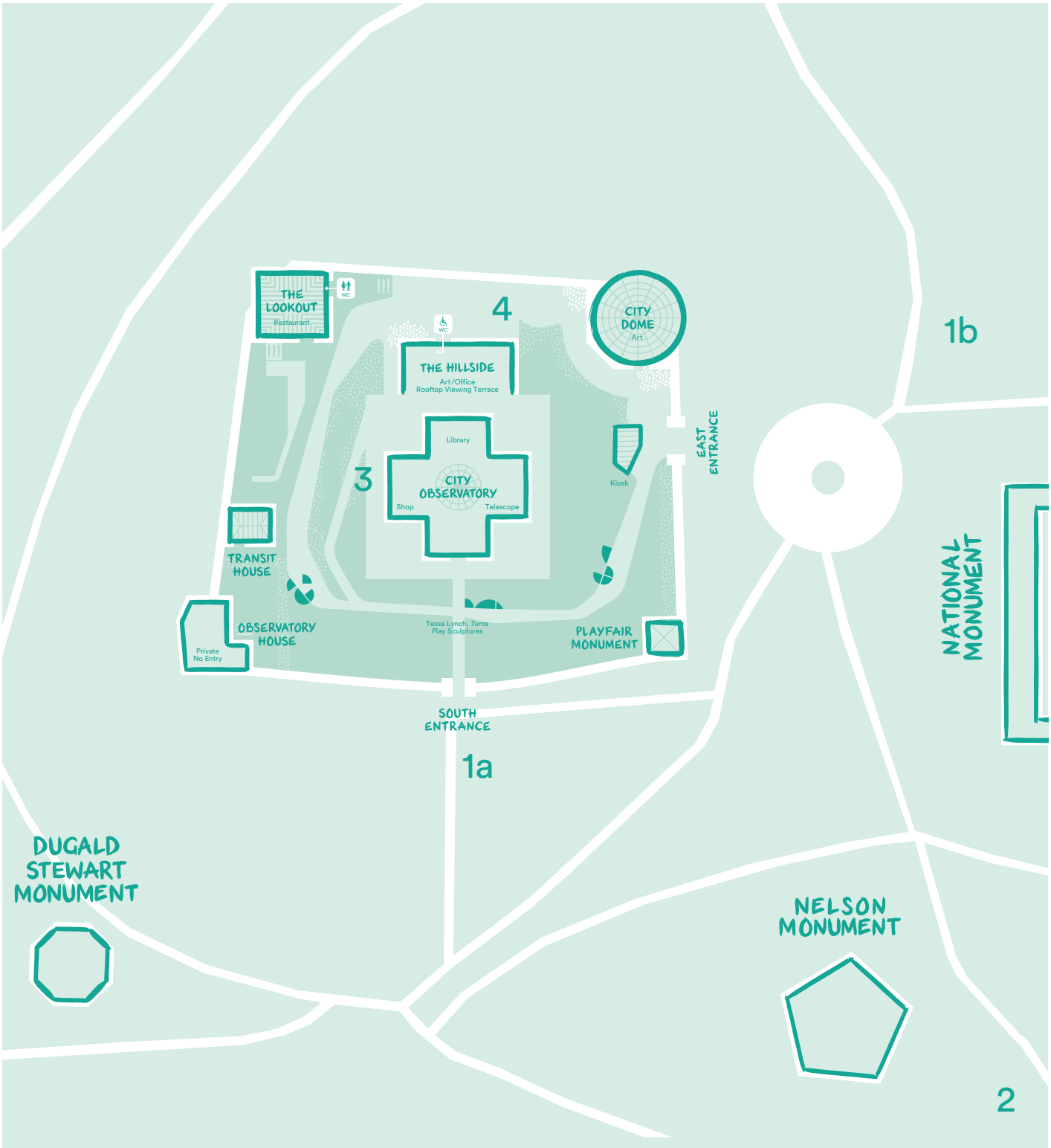
Remind the children that the planetary orbits are ellipses and so they would never all line up in a straight line like this from the Sun and that the activity just gives an idea of the scale of the distances. Gather the pupils around one of the solar system models, near the Sun. A child can "play" Mercury and run in a circle around the Sun. This would be Mercury's orbit. Another pupil could then "play" Earth, and also run around, taking longer. This exemplifies the principle of orbits and the different times that each planet takes to make its journeys. Make sure the class visits the City Observatory and the City Dome, looking at the telescopes and the specially designed roofs that opened.

Back At School

To recap ordering the planets, learn the mnemonic 'My Very Educated Mother Just Served Us Noodles'. Pupils can create their own mnemonics.

Use papier maché to make planets, decorating them with marbling techniques and bubble painting, and hang them in the classroom using a similar measuring system as on Worksheet 3 but substitute feet for something smaller like a pen or a hand.

Map


THE LOOKOUT
Restaurant
WC
WC
4
CITY DOME
Art
1b
THE HILLSIDE
Art/Office
Rooftop Viewing Terrace
Library
CITY OBSERVATORY
Shop
Telescope
3
Kiosk
EAST ENTRANCE
TRANSIT HOUSE
OBSERVATORY HOUSE
Private
No Entry
Tessa Lynch, *Turns*
Play Sculptures
PLAYFAIR MONUMENT
NATIONAL MONUMENT
SOUTH ENTRANCE
1a
DUGALD STEWART MONUMENT
NELSON MONUMENT
2

Teacher's Notes

Calton Hill is a part of an extinct volcano system and one of the seven principle hills of Edinburgh. In 1724 the town council bought the space creating one of the country's first public parks. Calton Hill is a mixture of the planned and the unplanned, of controlled spaces and wild nature. From Collective you can see one of the most stunning panoramic views of Edinburgh and spot many of the important buildings and landscapes of the city.

The Panorama was coined by the artist Robert Barker in 1787 by joining together the Greek words 'pano' (all) and 'horama' (view). To create his first panorama on Calton Hill, Barker enlisted the help of his twelve-year-old son, Henry, to help sketch out a 360-degree view of Edinburgh from the Observatory House. He turned the sketches into a semi-circular watercolour view large enough to fill a small debating chamber. The drawing includes depictions of: Calton Hill, Arthur's Seat, the Royal Mile, the burgeoning New Town and Leith Docks. The panorama from Calton Hill was toured round the country, where people would pay to see it. There is now a copy of Barker's panorama held in the collection of the University of Edinburgh and City of Edinburgh Council.

Maps Cartography is the name for map making. From cave paintings to ancient maps of Babylon, Greece, and Asia, through the Age of Exploration, and on into the 21st century, people have created and used maps as essential tools to help them define, explain, and navigate their way through the world. Maps began as two-dimensional drawings but can also adopt three-dimensional shapes (globes, models) and be stored in purely numerical forms. One of the oldest surviving maps of Edinburgh is from 1532, drawn as a bird's eye view, is by the cartographer Paulo Forlani and can be found in the collection of the National Library of Scotland.

The City Observatory is at the heart of Collective. Designed by William Henry Playfair in 1818 for the Astronomical Institution of Edinburgh, it is in Classical Greek style, with six fluted Doric columns to the porticos facing north, south, east and west; the four cardinal points of the compass. The building houses a shop showcasing the work of contemporary artists' and makers', a library, and two major telescopes, both of which have slots in the roof structure above them, which allow the telescopes to track the night skies. The central dome, a lead-covered timber framework, is mounted on a circular track that allows the whole structure to revolve.

William Henry Playfair, who designed the Observatory, was a leading architect of the early 19th century. His cross-shaped building is a prominent Edinburgh landmark, visible from many parts of the city. Completed in 1822, Playfair specified exceptionally high quality, fine grained sandstone for the Observatory, cut into regular blocks. The stonemasons polished some stone blocks perfectly smooth, while others are decorated with shallow grooved tooling.

On the outside wall on the west wing, there is a carved stone plaque commemorating Thomas Henderson, the first Astronomer Royal and the first person to measure the distance to the star Alpha Centauri. Other notable buildings Playfair designed in Edinburgh include: Surgeons Hall, St Stephen's Church, the Playfair Library at the University of Edinburgh and with C R Cockerel the unfinished National Monument opposite Collective on Calton Hill.

The Transit House is a small unassuming stone building with a slated roof. Unusually, the roof has transit slot openings from ridge to eaves, which allowed a transit telescope mounted on a stone slab– for stability– to follow a star as it moved, or transited, across the night sky. The Astronomical Institution of Edinburgh, formed in 1811 by a group of men for their own study and amusement, established the Transit House and equipped it with scientific instruments.

As well as telescope, the Transit House contained a clock. Accurate time was important for many industries, particularly the mariners based in Leith, so a special window allowed the public to see a clock face from the outside while another face inside was set using astronomical observations. This two-faced clock, still seen in the window today, became known as the Politician's Clock. The Transit House is now a learning space for visiting schools and groups.

The City Dome is the largest remaining dome at Collective, it forms the north east corner of the site. The imposing copper-roofed Classical dome was designed by Robert Morham for the Public Works Office in 1895. It was built to house a telescope too large for Playfair's Observatory, its lens measured twenty-two inches across. The main entrance to the City Dome echoes the Classical porticos of Playfair's Observatory, with a small sundial above the six panelled doors. The City Dome was re-purposed as a space for displaying contemporary art in 2014, and now hosts a changing programme of exhibitions and events.

The Playfair Memorial on the south-east corner of the site, like a miniature Greek Classical building, was designed by William Henry Playfair, and dedicated to his Uncle, John Playfair, the first President of the Astronomical Society, which originally founded the Observatory. The Latin inscription to John Playfair (1748-1819), Professor of Mathematics and Natural Philosophy at the University of Edinburgh, commemorates one of the most important figures of Edinburgh's Enlightenment. It has been suggested that the monument symbolises John Playfair's role as the cornerstone of the development of the Observatory. Constructed in 1825, the monument became enclosed by the walls in 1828.

Thomas James Alan Henderson (28 December 1798 – 23 November 1844) was Scotland's first Astronomer Royal and is commemorated in the memorial on the southern wall of the Observatory, featuring a moon and stars. Despite his visual impairment, Henderson made over sixty thousand observations of star positions.
His scientific legacy incudes accurately measuring the distance from the Earth to the star Alpha Centauri using the parallax method. This first measurement was hugely significant, setting a scale for understanding the vastness of the universe, though at the time Henderson didn't trust his equipment and failed to publish his findings. Only after German astronomer Friedrich Bessal used the same method successfully and was credited as the first to measure the distance to a star did Henderson revisit his data and discover his original findings had been correct. He died in Edinburgh on 23 November 1844 and is buried in Greyfriars Kirkyard.

Further reading and resources.

www.ewht.org.uk/visit/highlights-of-the-world-heritage-site/calton-hill

www.edinburghguide.com/parks/caltonhill

www.bbc.co.uk/history/british/civil_war_revolution/scotland_edinburgh_01.shtml

www.collective-edinburgh.art

www.oldmapsonline.org/en/Edinburgh

www.theplanetstoday.com/the_planets.html

www.solarsystem.nasa.gov/planets/solarsystem/indepth

Worksheet 1

Estimating and Measuring

Edinburgh Castle ☐

Arthur's Seat ☐

St Mary's Cathedral ☐

St Andrew's House ☐

Dynamic Earth ☐

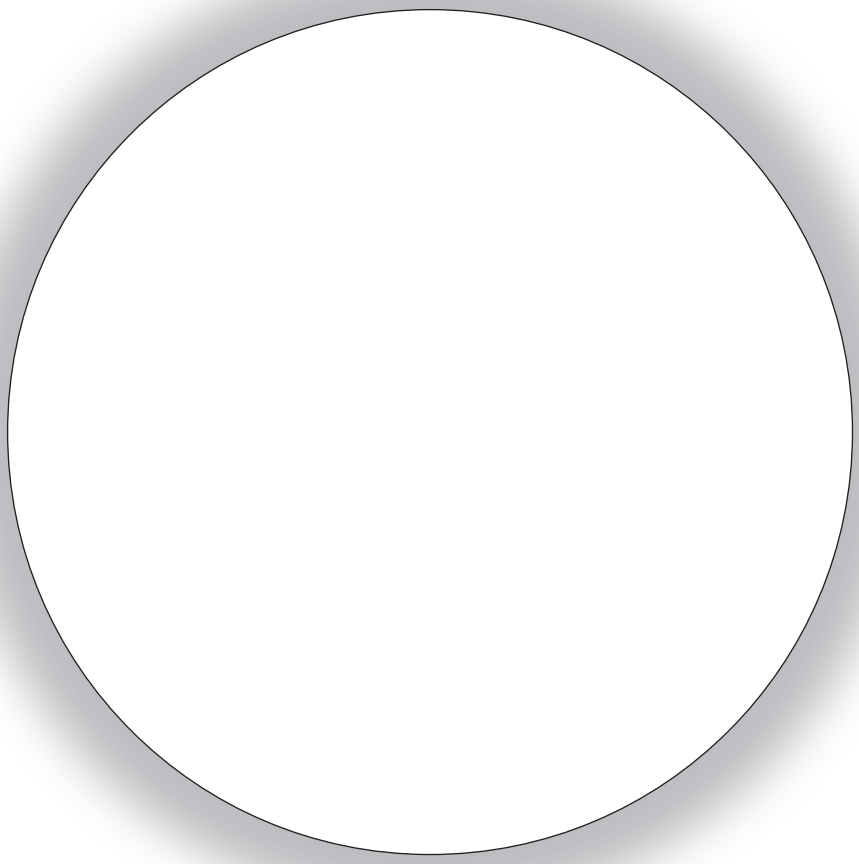
Palace of Holyrood ☐

Scottish Parliament ☐

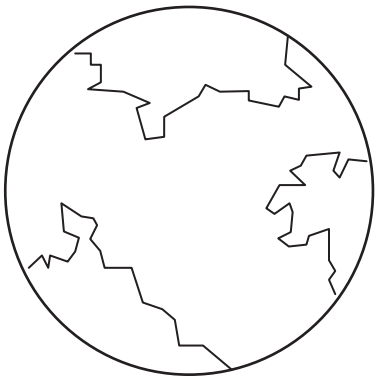
Balmoral Hotel Clocktower ☐

North Bridge ☐

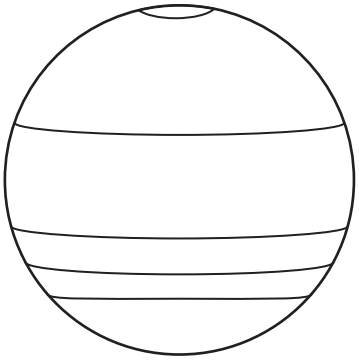
Worksheet 2



The Sun

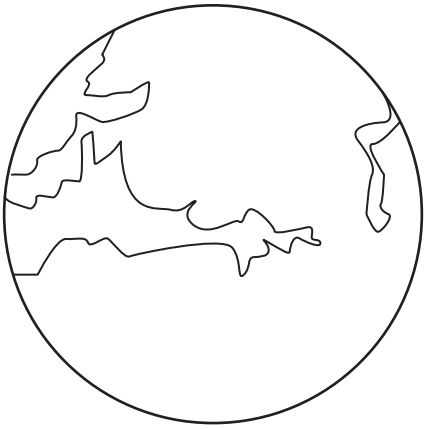


Mercury

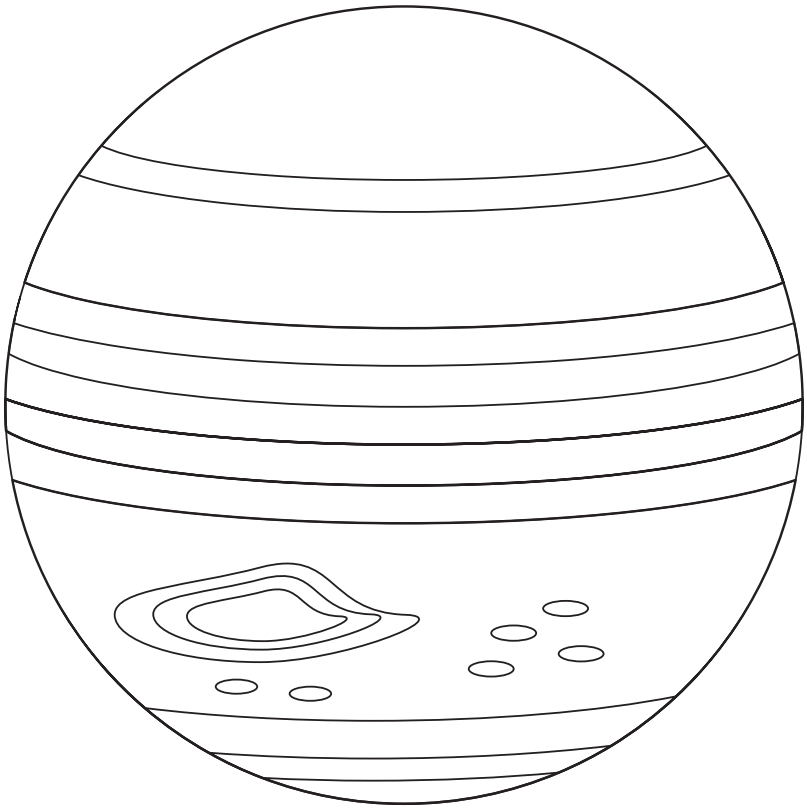


Venus

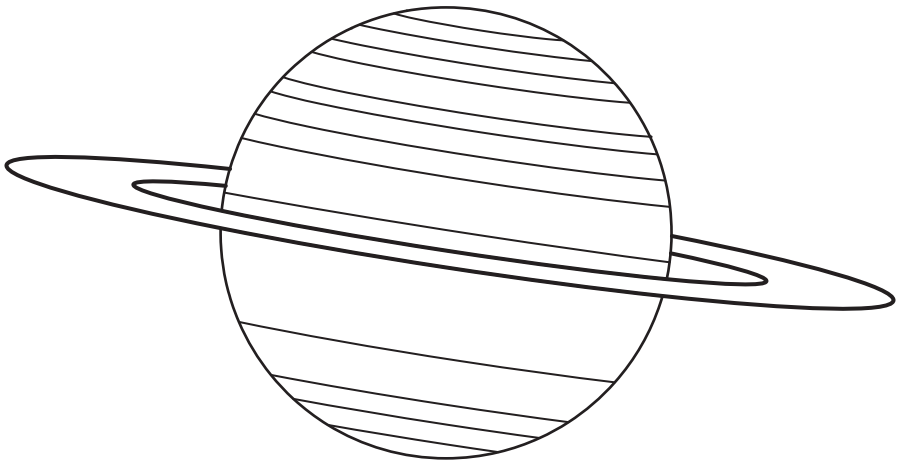
Earth



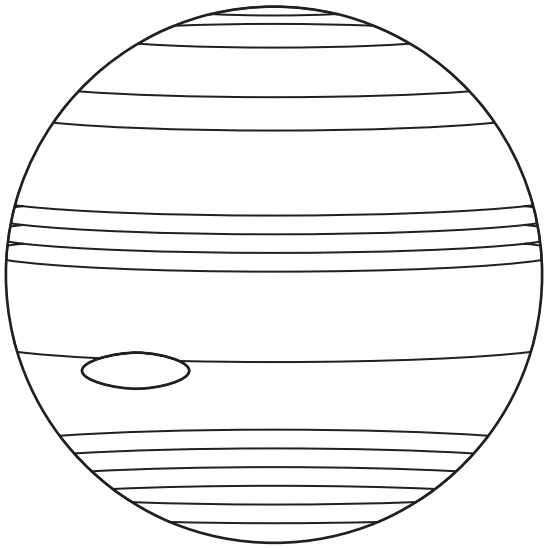
Mars



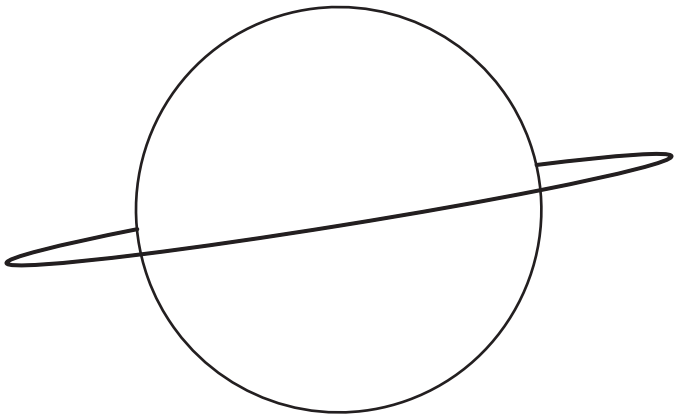
Jupiter



Saturn



Uranus



Neptune

Planet	Actual distance from Sun.	Pupil shoe (from heel to toe, one in front of the other) from the sun in averages
Mercury	57,910,000 km	1
Venus	108,200,000 km	2
Earth	149,600,000 km	3
Mars	227,940,000 km	4
Jupiter	778,330,000 km	13
Saturn	1,429,400,000 km	24
Uranus	2,870,990,000 km	49
Neptune	4,504,000,000 km	76