

Key Stage 2 Cross-curricular mathematics and numeracy examples

Artistic Impressions

In this task, learners research how self-portraits have been created historically and use this research and their own ideas to create a self-portrait using a digital photograph as a basis for their drawing. When researching, they have opportunities to develop their reading skills. They work with fractions, scale and proportion to work out the sizes of different features of their portrait and use numerical reasoning to explain their decisions.

During this task, learners can participate in pairs, small groups and sometimes as individuals. There will also be aspects of the task that lead to whole-class participation. Due to the diverse nature of the task, it is envisaged that it will take several sessions for learners to explore it fully.

Each section of the task has a number of bulleted suggested questions that can be posed to learners to try and elicit their understanding and reasoning. These can be used either directly by the teacher or can be given to a group or pair of learners to structure their thoughts.

Resources provided by the teacher

- Digital camera.
- Computer access.
- Access to library and/or literature about artists.
- Ruler.
- Pencils.
- Coloured pencils.

What to do

Prior to the task

Ask pairs of learners to take head shot pictures of each other using a digital camera. Ensure that each learner has a print out of a digital photograph of themselves that they are happy with.

During the task

Invite the learners to research the creation of self-portraits by different artists through history. Encourage them to find out, compare and consider the different styles and techniques used by artists at different times.

- How did you find information online? Why did you do it in this way?
- What did you find out about self-portraits and the artists who have created them?
- What have you learned about creating self-portraits?
- How will you use this knowledge and information for your own self-portrait?

Ask the learners to use their digital image as a basis for creating their self-portrait on either A4 or A3 paper. Encourage them to use a ruler to measure different parts of their head and to produce a self-portrait that has their facial features in the same proportions as their digital image. As part of this process learners are likely to use simple fractions, doubling and halving strategies, and simple ratio and proportion. To develop learner's numerical reasoning, encourage them to discuss and explain the methods and techniques they use to create their self-portrait.

- How did you make sure your self-portrait was in proportion to your photograph? Why did you do it in this way?
- Which parts of your head and face did you measure? Why?
- Which parts did you not measure? Why?
- How did you use these measurements when creating your self-portrait? Why did you use them in this way?
- How did you make sure your self-portrait was in the same proportion as your digital image?
- What other methods and techniques did you use? How did you use them? Why did you use them in this way?
- How will you evaluate the methods you used and your result? Why do it like this?

Taken from: Interactive Literacy and Numeracy Framework classroom resources

What makes a good astronaut?

Overview

In this task, learners consider the qualities and skills that an astronaut might need in terms of physical characteristics and personality, as well as the conditions they might have to cope with. Learners may research the qualities and skills of astronauts on known space missions, rank some personal qualities, examine the 'Astronaut selection criteria' and 'Astronaut trump cards'² to support their discussions and explore how different selection criteria could be used. They also use a living graph to explore and predict how astronauts might react to different scenarios during a mission and consider whether such information could be used to justify their selection of crew members.

Resources provided with this task

- Useful web links.
- Helen Sharman fact file.
- Personal qualities cards (including blanks).
- Astronaut selection criteria.
- Astronaut trump cards (including blanks).
- Astronaut trump cards spreadsheet.

Resources provided by the teacher

- Information books.
- Internet access.

What to do

During the task

Thinking about astronauts

Encourage learners to think about and discuss the qualities needed to be an astronaut and what kind of person might become an astronaut. Thinking about and discussing famous or fictional astronauts might help them. Learners could use a mindmap to record their ideas.

- What is an astronaut? How do you know this?
- Which astronauts have you heard of? What do you know about them? How do you know about them?
- Where have you got your ideas about astronauts from? Do you think these ideas are 'facts'? How could you find out?
- What evidence is your information based on? How did you collect it?
- How do you know you can trust this evidence?
- What kind of person do you think a real astronaut needs to be?
- How could you find more evidence about what kind of person an astronaut is?

Astronauts and space missions

Ask learners to search for information about astronauts and their work; they could use some of the resources and web links provided or find some of their own. They could use a range of strategies to help them record their findings.

- Where will you search for information about astronauts and their work? How will you find this information?
- If you use the internet, what search terms will you use? What other search terms could you try?
- When have you used this sort of search before?
- How will you record the information that you find? Why do you think this a good way of recording?

Encourage learners to expand their research to find out about what astronauts do on different kinds of space mission, e.g. carry out repairs to space equipment, conduct scientific experiments or explore. They should consider some of the special conditions (physical and mental) that astronauts are likely to face.

- What are the different kinds of space missions that astronauts might go on? How do you know about these?
- What might an astronaut do on a particular space mission? How do you know this?
- What special skills or knowledge might an astronaut need for a particular mission (e.g. spacewalk to repair a satellite in space or any of the other missions they have discussed previously)? How would you find out?
- What have you found out about the work of astronauts? How does this new information fit with what you already knew?

Devising criteria for becoming an astronaut

Ask learners to use the information they have gathered about real-life astronauts to help them make up their own minds about what criteria makes someone suitable to become an astronaut. They could use a range of techniques to explore and prioritise different qualities, explaining and justifying their decisions. The set of 'Personal qualities cards' provided can be used as support if needed, or teachers may provide blank cards for learners to list their own ideas.

- How did you decide on the criteria for becoming an astronaut?
- What did you decide was the most important criterion? Why have you chosen this?
- What did you decide was the least important criterion? Why have you chosen this?
- What evidence do you have to support your decisions? Where did you get this evidence?

Comparing own criteria with 'Astronaut selection criteria'

Invite learners to study and discuss the 'Astronaut selection criteria' resource and to compare these criteria with their own criteria for becoming an astronaut. Encourage them to use both sets of criteria to generate a job advertisement for an astronaut to go on a space mission.

- Why do you think there is a need for a space agency to have astronaut selection criteria?
- What difficulties do you think a space agency would face in selecting people to become astronauts?
- In what way are the 'Astronaut selection criteria' different to your selection criteria? In what way are they the same?
- Do you think there are other criteria that a space agency should use? Why do you think this?
- What do you notice about the way these criteria are written? Are they written in the same way as yours?
- What are the good and bad points about using numbers or words to write astronaut selection criteria? Why do you think this?
- What will you include in your job advert for an astronaut? Why include these things?
- How will you organise the contents of your advert? Why do it in this way?
- How can you make your job advert appealing? Why would this make it appealing?

Considering different people to be an astronaut

Invite learners to consider some of the candidates on the 'Astronaut trump cards' to see how well each of them meets the criteria in their job advert. They will need to work out that in order to compare the measures they need to convert and calculate lengths and times. Learners may work with the cards or they may find the 'Astronaut trump cards spreadsheet' useful as a basis for comparisons.

- How can you compare the astronauts on the cards with one another?
- What are the difficulties of comparing the different astronauts? How can you get around these difficulties?

- Have you done anything like this before? Where might you do something like this again?

Encourage learners to develop a numerical system to use to decide how well each of the people on the 'Astronaut trump cards' meet the criteria in your job advert. This could be a simple points system that demonstrates lower-level number skills, or a more complex one that combines categories of data. Learners might also like to use minus points (negative numbers) for less desirable attributes and fractions for small variations in points given. It is important that learners are given freedom to design their own system. Encourage learners to justify and describe the number operations and calculations they use.

- How will you develop your points system? Where have you come across a points system like this before?
- How does your points system work?
- How have you used numbers to show what is more important or less important?
- How well does your points system work when you try it out on different astronauts from the trump cards? What adjustments are needed? Why?
- Can you use a blank 'Astronaut trump card' to invent a very high-scoring/low-scoring astronaut, using your points system? How did you do this? What number operations did you use? How did you use them?

What can we learn from astronaut's heart rates?

Invite learners to consider how an astronaut's heart rate can give an indication of how they are reacting to outside events. Ask them to match the stages of a simulated space flight to the living graph which they developed and discuss what it shows.

- What do you know about your heart rate? What might cause your heart rate to speed up or slow down? How do you know this?
- What do you think you need to do with the living graph? Why do you think this? What clues do you have?
- Can you think of a story that the graph might be about? Look at each of the cards and decide where each one fits on the graph. As you decide, tell your group why you think this. Which card or point in the graph did you start with? Why?
- How did you choose the points on the graph where each event took place? Why did you select these? What evidence did you have for choosing the points in the living graph where each event took place? Are there any other possibilities? Why?
- On each point, does your group agree with you? If not, why not? What are the other reasons? How will you decide which card fits best?
- What have you learned from using the living graph? How might you use this learning in other situations?

Ask learners to apply their understanding of living graphs to the 'Heart rate graphs' provided for the fictional astronauts on the 'Astronaut trump cards'. Encourage them to consider how the evidence from the 'Heart rate graphs' affects their views of the astronauts' suitability to be chosen for a space flight.

- What do the 'Heart rate graphs' tell you about different astronauts? How do they tell you this?

- What kind of heart rate pattern makes someone a good astronaut? Why do you think this? Are there any other possibilities? What are they and why are they possible?

Taken from: Interactive Literacy and Numeracy Framework classroom resources

Rationing

Overview

Learners consider their prior knowledge and understanding about rationing during the Second World War before comparing imperial and metric units for money, mass and volume in relation to rationing. They calculate the quantities of basic foods that their own family would receive each week under the rules of rationing and carry out further research to find out about how other foods were dealt with during the Second World War. Learners use recipes to calculate how long it might take to gather the required ingredients for these recipes under the rules of rationing and work out what clothes they would be able to buy for a year under the coupon system used during the war. Finally, learners consider what they have learned about rationing during the Second World War and create a one minute presentation that demonstrates their awareness and understanding of how the amount of food and clothing available to people during the war compares with today and how this might have affected people then and now.

During this task, learners can participate in pairs, small groups and sometimes as individuals. There will also be aspects of the task that lead to whole-class participation. Due to the diverse nature of the task, it is envisaged that it will take several sessions for learners to explore them fully.

Each section of the task has a number of bulleted suggested questions that can be posed to learners to try and elicit their understanding and reasoning. These can be used either directly by the teacher or can be given to a group or pair of learners to structure their thoughts.

Resources provided with this task

- Information sheets 1, 2, 3 and 4.

Resources provided by the teacher

- Computer and internet access.

What to do

During the task

Activating prior knowledge and understanding

Invite the learners to think about and discuss what they know about rationing during the Second World War:

- What do you know about rationing? How do you know these things?
- What types of food might have been rationed? Why?
- What else might have been rationed? Why do you think this?

Ask learners to consider what they know about imperial units of measurement for familiar things like money, length, weight, etc.:

- What units do we use to measure length? How do you know that?
- What units did we use in the past? Why do you think that?
- What other metric units do we use to measure? How do you know about these?
- What imperial units did we use in the past for these things?

Comparing imperial and metric units

Invite pairs of learners to consider Information sheet 1 that compares the imperial and metric units for money, mass and volume. Explain to learners that many metric units are rounded up as they are small measurements and too precise for practical purposes. One ounce is 28.35g but is usually rounded up to 30g or down to 25g so that 4oz is roughly equivalent to 100g. Encourage the learners to discuss these issues and to carry out research to gather more information if necessary. When familiar with both sets of units ask the learners to read Information sheet 2 that shows the typical rations for a week during the Second World War. Encourage them to complete the sheet by recording the metric equivalent for each of the rationed items.

Where possible, encourage the learners to use measuring scales to weigh out the metric quantity of the rationed item so that they can see exactly how much butter, sugar, sweets, milk, etc. a person received in a week:

- What have you learned about imperial and metric units?
- Which units are the easiest to use? Why do you think that?
- Why do you think some of the metric units are rounded up or down?
- How did you work out the metric equivalent of the imperial rations? Why did you do it in this way?
- What do you think about the amounts of food you have weighed out?
- How does this compare to what someone might eat now in a week?

Exploring and understanding food rations

Ask the learners to use the information sheets and what they have learned about rationing to calculate the quantities of basic foods that their own family would receive each week under the rules of rationing. They might also carry out further research to find out about how other foods like fruit, vegetables and bread were dealt with during the Second World War.

Invite the learners to use recipe books or search for online recipes and to calculate how long it might take to gather the required ingredients for these recipes under the rules of rationing:

- How will you calculate the total rations your family would have received each week? Why will you do it in this way?
- How and where will you find information about other foods?
- Who could you ask to find out more? Why would this person know?
- How much sugar/butter is needed to make the cake? What is your weekly ration of sugar/butter?
- How long will it take you to have enough to make the cake? How do you know this?

How were clothes rationed?

Explain to the learners that during the Second World War everyone received a clothing allowance and were given a set amount of coupons which they could use to buy clothes. Ask the learners to look at Information sheet 3 that shows how many coupons were required to buy different articles of clothing for men, women and children. You could give learners the sheet with many of the figures removed and ask them to consider how many coupons might be required to buy the other items and to explain their reasoning – as Information sheet 4. Learners might also be asked to compare the figures and to consider why, for example, shoes cost seven coupons for men and only five for women.

Set learners the challenge of clothing themselves for a year. Ask them to use the information sheet to work out what clothes they would buy to last a year under the system described on the sheet.

They might also be encouraged to make a list of all the clothes they have at home so that they can make a comparison:

- Why do you think clothes were rationed during the war?
- How will you decide what clothes to buy with your coupons? Why do it like this?
- How many clothes were you able to buy with your yearly allowance? Do you think this is enough? Why?
- How does this compare to the clothes you have at home today?

Presenting our ideas and understanding

Ask the learners to consider and share what they have learned about rationing during the Second World War. Invite learners to create a one minute presentation that demonstrates their awareness and understanding of how the amount of food and clothing available to people during the war compares with today and how this might have affected people then and now.

- How do you think rationing affected people during the war? Do you think this was a positive or a negative thing? Why do you think that?
- What do you think about the amount of food and clothing you have available to you now? What are the pros and cons of this?

- Do you think people were healthier then or now? Why do you think that? How could you find out?
- How will you present your ideas in only one minute? Why will you do it in this way?
- How will you ensure you put across your main points in that time?

Taken from: Interactive Literacy and Numeracy Framework, classroom resources