

STARS RESOURCES

Teacher notes

Supermoons and micromoons

ACTIVITY

Understand the difference between micromoons, supermoons and full Moons.

Students will:

- take photographs of a micromoon, a supermoon and a full Moon using a telescope and a smartphone camera adapter.
- complete measurements of the three types of moon.
- identify the difference in apparent sizes of the three types of moon.

This activity is aimed at students in upper primary and lower secondary school.

CURRICULUM LINKS

YEAR 7 SCIENCE – EARTH AND SPACE SCIENCES V.9

Science Understanding

model cyclic changes in the relative positions of the Earth, sun and moon and explain how these cycles cause eclipses and influence predictable phenomena on Earth, including seasons and tides (AC9S7U03)

Science as a Human Endeavour

explain how new evidence or different perspectives can lead to changes in scientific knowledge AC9S7H01

Science Inquiry

select and use equipment to generate and record data with precision, using digital tools as appropriate AC9S7I03

select and construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information AC9S7I04

analyse data and information to describe patterns, trends and relationships and identify anomalies AC9S7I05

analyse methods, conclusions and claims for assumptions, possible sources of error, conflicting evidence and unanswered questions AC9S7I06

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BACKGROUND INFORMATION

The Moon appears to change size as it travels around the Earth on its monthly journey. This journey is not circular, as often drawn in textbooks, but elliptical. This means that its distance away from Earth is constantly changing.

If a full Moon occurs when the Moon is closest to us at 362,600 km away it is called a supermoon.

If a full Moon occurs when the Moon is furthest from us at 405,400 km away it is called a micromoon.

PLANNING AHEAD

1. Read the Astrophotography Teacher Notes regarding planning for the best observing conditions and setting up the equipment.
2. Ensure that observing dates are chosen for all three stages of full Moon. (You can use the Time and Date website <https://www.timeanddate.com/astronomy/moon/micro-moon.html>.)
3. **The Moon's brightness and using a neutral density filter** (included with the Bintel 8" Dobsonian given to schools).

Observing the full Moon: The full Moon is very bright and it shouldn't be observed directly through the eyepiece. Whilst it should not damage your eyes, it will be very uncomfortable for them, you won't really be able to see much and such bright light may even destroy your smartphone's camera. Using the neutral density filter gives an 87% reduction in light. It usually screws in between the eyepiece and the body of the telescope.

4. After photos are taken, students will need to manipulate the photo files using software. Check ahead of time with your IT department to see which software you are able to or allowed to use. Quite often school-provided laptops require administrative permissions to install non-standard software.

5. Give students the task of researching the three types of full Moon. This could include:

- 'What's a Supermoon and Just How Super Is It?', Jet Propulsion Laboratory website, <https://www.jpl.nasa.gov/edu/news/2017/11/15/whats-a-supermoon-and-just-how-super-is-it/> (15 November 2017)
- 'What is a Micromoon?', Time and Date website, <https://www.timeanddate.com/astronomy/moon/micro-moon.html>
- 'Supermoons', Dr Angel R. Lopez-Sanchez's website, <https://angelrls.wordpress.com/2016/11/11/supermoons/> (11 Nov 2016)

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OBSERVATION NIGHTS

1. Set up the telescope, smartphone camera adapter with smartphone attached.
2. Students should take photographs of the three types of full Moon (supermoon, micromoon, 'normal' full moon) with good enough images to make comparisons of the moons' apparent diameters.
3. As with many experiments or measurements, ensure that conditions are the same between photographs. This includes using the same location, telescope, camera and settings wherever possible.
4. If using zoom, make sure the SAME zoom settings are used every time a photograph is taken. One suggestion is to use full zoom, a setting which is easily reproduced.

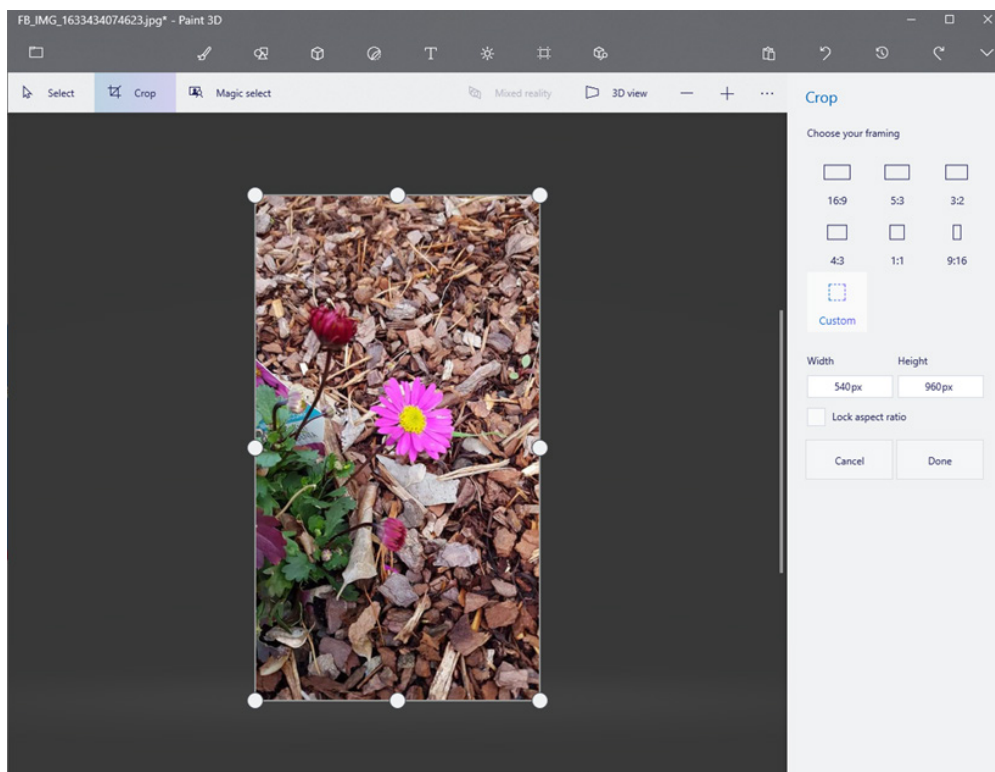
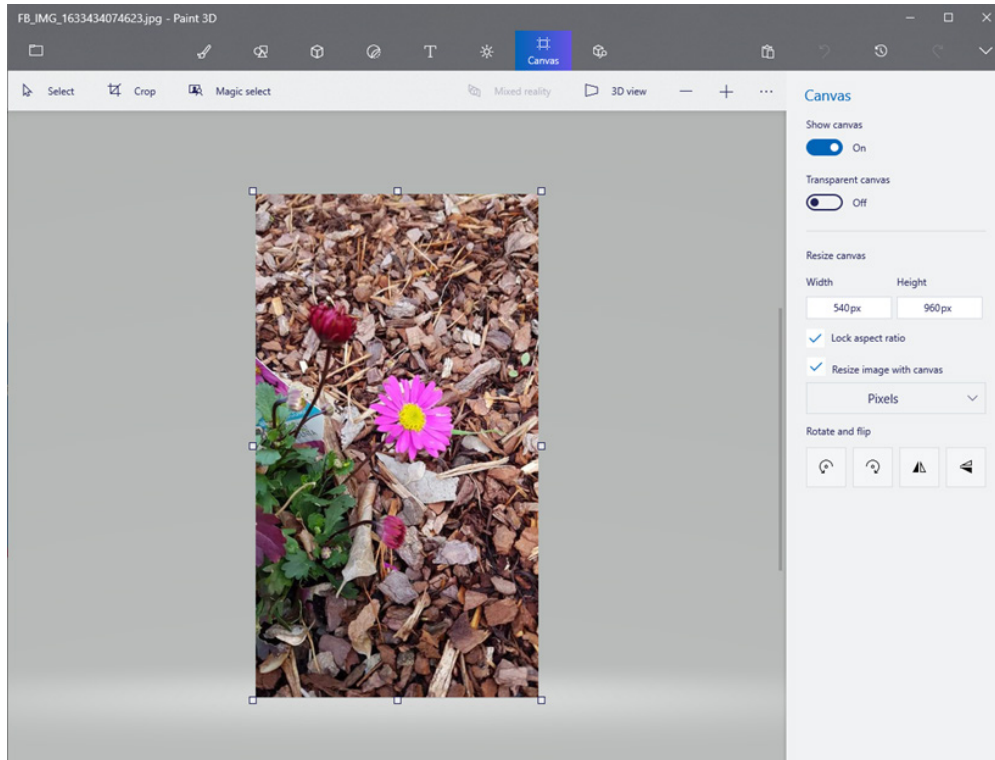
POST-OBSERVATION

1. Students should download the photo files and measure the diameter of each of the Moons by counting how many pixels wide the moons appear in the images. This can be done using software such as:
 - 'Measure Pixels' by Microsoft (<https://apps.microsoft.com/store/detail/measure-pixels/9N6VNCV9LF5K?hl=en-us&gl=us> – free app).
 - GIMP (<https://www.gimp.org> – free, but might require a bit of practice).
 - Windows Paint 3D (<https://apps.microsoft.com/store/detail/paint-3d/9NBLGGH5FV99> – free app). Use the crop tool with px units). See examples below.

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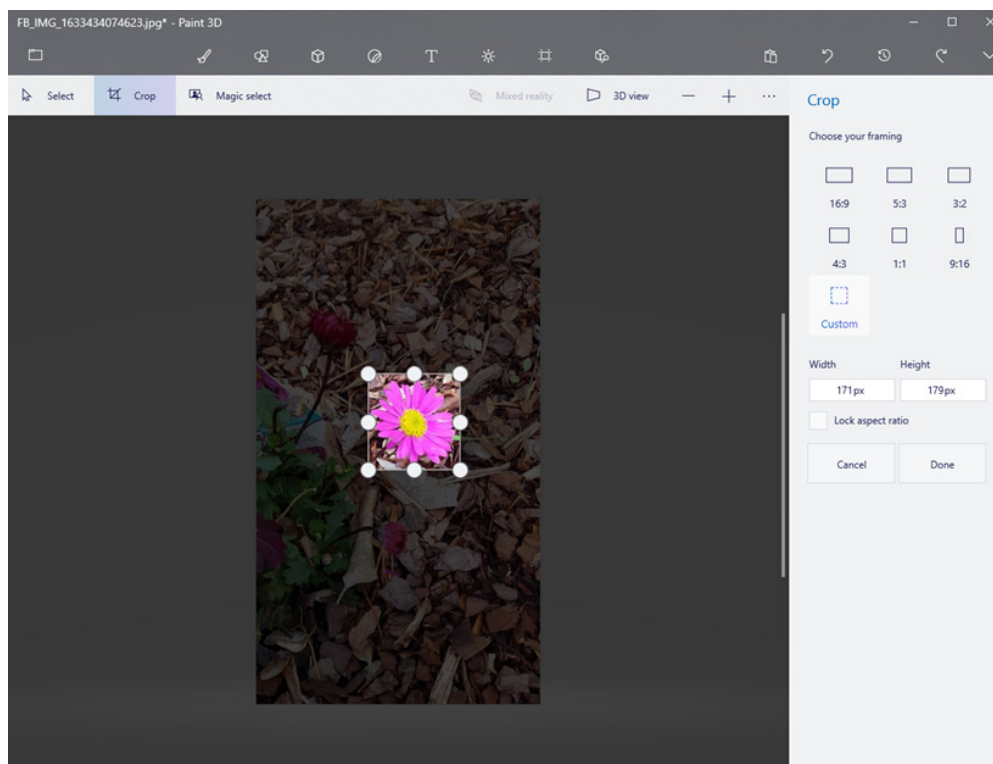
POST-OBSERVATION cont'd



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POST-OBSERVATION cont'd



2. Students can tabulate their data for each of the full Moons.

Type of full Moon	Date	Measured width (pixels)	Distance from Earth (km)
'normal' full Moon			
Supermoon			
Micromoon			

3. Ask students to look up how far away the Moon is for each of these observations, and add this information to the table. They should consider why this affects how big the Moon appears to be.

4. Students then calculate how much larger or smaller the supermoon and micromoon are compared to a 'normal' full Moon.

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POST-OBSERVATION cont'd

$$\frac{\text{diameter of supermoon}}{\text{diameter of full Moon}} \times 100 = ?$$

$$\frac{\text{diameter of micromoon}}{\text{diameter of full Moon}} \times 100 = ?$$

(The results should show that the supermoon is 14% larger in diameter than a micromoon.)

(All websites accessed April 2023)