CALIFORNIA ACADEMY OF SCIENCES

Scale of Asteroids and Comets

We know that planets are big, but what about asteroids, comets, or even dwarf planets? Scientists often make comparisons to known objects to better understand what they are studying. Compare well-known asteroids and comets to the size of parks, cities, and even US states to get a better sense of scale.

Materials

Map of Golden Gate Park (A) (page 3)
Map of San Francisco (B) (page 4)
Map of Western United States (C&D) (page 5)
Images of space rocks - Objects A, B, C & D (page 6)

Directions

1. **Print** all three maps and four images of space rocks and **cut** around the black edges of the image squares.
2. **Think**: How do you usually measure the size of things? With a ruler or measuring tape? How would you measure big things in space? Scientists often make comparisons to known objects—we're going to use maps to help us compare the size of space rocks to areas of land.
3. **Observe** Map A (page 3); this is a map of Golden Gate Park in San Francisco, CA, which is about 3 miles long and half a mile wide. You might recognize some familiar-sized features, like a baseball field or city blocks.
4. **Place** Object A onto Map A.
    a. **Compare** Object A to the size of Golden Gate Park. How big is Object A? How many baseball fields would you need to cover the length of Object A? Can you think of anything else this size?

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5. **Observe** Map B (page 4); this is a map of the city of San Francisco, CA, which is about seven miles wide and seven miles long. Can you find Golden Gate Park? What other features can you see that you might know the size of?

6. **Place** Object B onto Map B.

    a. **Compare** Object B to the size of San Francisco. How big is Object B? How many Golden Gate Parks would you need to cover the length of Object B?

7. **Observe** Map C&D (page 5); this is a map of the western United States. Can you find the state of Arizona, California, or Texas? What other States can you identify?

8. **Place** Object C onto Map C&D.

    a. **Compare** Object C to the size of the Western US. Does it fit in California, Arizona, or Texas? Can you think of anything else that big?

9. **Place** Object D onto Map C&D.

    a. **Compare** Object D to the size of the Western US. Does it fit in California, Arizona, or Texas? Can you think of anything else that big?

10. **Think**: Scientists use the size of an object to help identify what type thing it is. Thinking about the size of the objects A, B, C, C, and D compared to their respective maps. Given that information, what type of object do you think each one is based on the definitions below?

    a. **Meteoroid:** a solid natural object of a size roughly between 30 micrometers and 1 meter that is moving in, or coming from, interplanetary space.

    b. **Asteroid:** a small, rocky object that orbits the Sun. Although asteroids orbit the Sun like planets, they are much smaller than planets and dwarf planets, but larger than meteoroids.

    c. **Dwarf Planet:** a natural, celestial object that orbits the Sun, has enough mass to be round or nearly round, has not cleared the neighborhood around its orbit (meaning there are other objects that share its orbital path), and is not a moon.