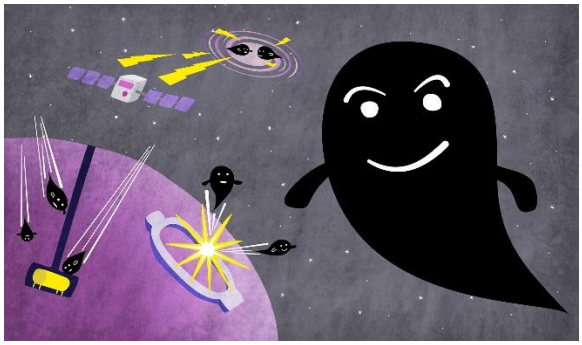
Fermilab

How much of our universe is dark?

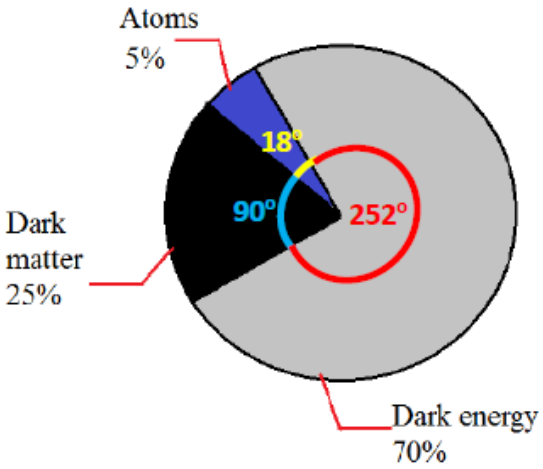
Particle astrophysicists use powerful telescopes to study galaxies. They make measurements, observe galaxy movements, and find patterns in galaxies' behavior. Their measurements show that, besides the ordinary matter, there must be some unknown dark matter and dark energy to explain how galaxies move. In fact, they think only five percent of our universe is made of ordinary matter and the rest is dark matter and dark energy.



Materials: Art paper, protractor, drawing compass
Activity: Draw a 10" diameter circle and cut it out. The central angle of a circle is 360°.

Calculate 5%, 25% and 70% of 360 °.
0.05 x 360 ° = 18°
0.25 x 360 ° = 90°
0.70 x 360 ° = 252°

Use the protractor and divide the circle into three parts as shown in the diagram below. Color each part in different colors. Label the smallest part as "Atoms" (visible matter), the middle part as "Dark Matter," and the largest part as "Dark Energy." You just made a pie chart for our mostly dark universe.



Questions to ask: How do scientists know that dark matter and dark energy exist? What part of our universe is made of ordinary matter (atoms)? What part of our universe is made of dark matter and dark energy?

Useful links:
https://ed.fnal.gov/lsc_exhibits/list.html
https://www.liveworksheets.com/id/uy41889bp