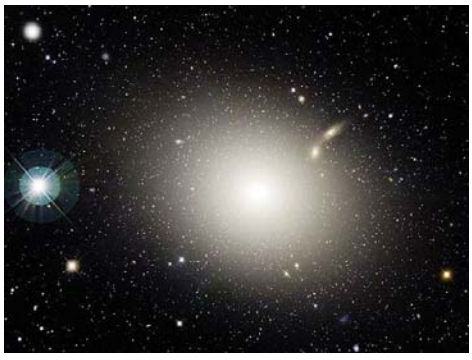
Galaxies to Scale

The Milky Way is a spiral galaxy. There are many other kinds of galaxies, some much larger then the Milky Way, and some much smaller. This exercise lets you create a scale model of the various kinds, and learn a little about working with fractions too!

Problem 1 - The irregular galaxy IC-1613 is twice as large as the elliptical galaxy M-32, but 10 times smaller than the spiral galaxy NGC-4565. How much larger is NGC-4565 than M-32?

Problem 2 - The spiral galaxy Andromeda is three times as large as the elliptical galaxy NGC-5128, and NGC-5128 is 4 times as large as the Large Magellanic Cloud, which is an irregular galaxy. How much larger is the Andromeda galaxy than the Large Magellanic Cloud?



Problem 3 - The Milky Way spiral galaxy is 13 times larger than the irregular galaxy IC-1613. How much larger than NGC-4565 is the Milky Way?

Problem 4 - The elliptical galaxy Leo-1 is 1/4 as large as the elliptical galaxy Messier-32, and the spiral galaxy Messier-33 is 9 times larger than Messier-32. How large is Leo-1 compared to Messier-33?

Problem 5 - The elliptical galaxy NGC-205 is 2/3 as large as the Large Magellanic Cloud. How large is NGC-205 compared to the Andromeda galaxy?

Problem 6 - The irregular galaxy NGC-6822 is 8/5 the diameter of Messier-32, and Messier-32 is 20 times smaller than NGC-4565. How large is NGC-6822 compared to IC-1613?

Problem 7 - Draw a scale model of these galaxies showing their relative sizes and their shapes.

Images: Top: The spiral galaxy Messier 74 taken by the Gemini Observatory; The elliptical galaxy Messier-87 taken at the Canada-France-Hawaii Telescope (**copyright@cfht.hawaii.edu**); The irregular galaxy called the Large MAgellanic Cloud. Photo by **Credit & Copyright:** Yuri Beletsky (ESO) ybialets@eso.org

Answer Key

The galaxies used in this exercise, with the diameter given in light years, and relative to Messier-32:

Name	Type	Diameter	M-32
Large Magellanic Cloud	Irregular	15,000 LY	3
NGC-5128	Elliptical	65,000	13
NGC-4565	Spiral	100,000	20
IC-1613	Irregular	10,000	2
Andromeda	Spiral	200,000	40
NGC-205	Elliptical	10,000	2
Messier-32	Elliptical	5,000	1
Milky Way	Spiral	130,000	26
Messier-33	Spiral	45,000	9
Leo-1	Elliptical	1,000	1/4
NGC-6822	Irregular	8,000	8/5

Problem 1 - IC-1613/M-32 = 2.0 , NGC-4565/IC-1613 = 10 so NGC-4565/M-32 = 10 x 2 = 20 times

Problem 2 - Andromeda/NGC-5128 = 3 and NGC-5128/LMC = 4 so Andromeda/LMC = 3 x 4 =12 times

Problem 3 - MW/IC-1613 = 13 and also NGC-4565/IC-1613 = 10, so Milky Way / NGC-4565 = 13 x 1/10 = 1.3 times.

Problem 4 - Leo-1 / M-32 = 1/4 and M-33 / M-32 = 9, so Leo-1 / M-33 = 1/4 x 1/9 = 1/36 times smaller.

Problem 5 - NGC-205 / LMC = 2/3 and Andromeda/LMC = 12 so NGC-205 / Andromeda = 2/3 x 1/12 = 2/36 as large.

Problem 6 - NGC-6822 / M-32 = 8/5 and M-32 / NGC-4565 = 1/20 and NGC-4565 / IC-1613 = 10 so NGC-6822 / IC-1613 = 8/5 x 1/20 x 10 = 8/5 x 1/2 = 8/10 or 4/5 as large.

Problem 7 - Students can use the ratios in the problems, together with the ones they derived, to create a table that gives the relative sizes for each galaxy. The table at the top gives the 'official' numbers, and the relative sizes in the last column.