Exercise 1 - Done

1. Magnitudes can be used as a substitute for distances because magnitudes increase as distance increases.

Exercise 2 - Done
Exercise 3 - Done
Exercise 4 - Done
Exercise 5 - Done
Exercise 6 - Done
Exercise 7 - Done
Exercise 8 - Done

2. Using magnitudes and sizes doesn't necessarily give the same for the distance values.

3. A cluster is a group, so relative to us, they would all be at the same distance because they are part of the cluster, which is a set distance from us.

Exercise 9 - Done

4. You could use how bright the town is versus the city as the city would be much brighter, or use the types of buildings in the town versus the city to differentiate the two. Also, one is much more likely to have trees and the other is much more likely to have buses and a lot of cars moving around.

Exercise 10 - Done

5. Depending on how well an astronomer's results might work with different datasets, it could tell that astronomer that one approach works better than another.

Exercise 11 - Done
Exercise 12 - Done
Exercise 13 - Done
Exercise 14 - Done

6. There is a big problem if the redshift there is interpreted as a Doppler shift because that would mean that the radial velocity of the quasar is greater than the speed of light, which is impossible because nothing can travel faster than the speed of light. However, if it was interpreted as the cosmological stretching of space, there would not be a problem.

Exercise 15 - Done
Exercise 16 - Done
Exercise 17 - Done
Exercise 18 - Done

Exercise 19 - Done

7. Galaxies that are farther away have a larger redshift, meaning that they are moving away faster. Therefore, the universe must be expanding at an increasing rate.