Early Astronomy:

* China
  + Earliest known records of supernova explosions (1400 B.C.)
  + Early cave day paintings in China explain the patterns of the sky, and of newly appearing stars
* England
  + Stonehenge (completed around 1500 B.C.), could be a very early astronomical observatory
* Calendar
  + Days of the week are named for the Sun, Moon, and visible planets
* What did ancient civilizations achieve in astronomy?
  + Daily timekeeping
  + Tracking the seasons and calendar (important for agriculture and religious ceremonies)
  + Monitoring lunar cycles
  + Monitoring planets and stars
  + Predicting/recording eclipses
  + Records of supernovae
* Models of ancient astronomy
  + Aristotle: (First Principle) “Heavens must be perfect”:
    - objects moving on perfect spheres or in perfect circles at constant speeds (uniform circular motion)
    - Earth at the center of the universe (geocentric model)
      * Earth – Mercury – Venus – Sun – Mars – Jupiter – Saturn – Uranus
    - c. 400 B.C.
    - The motion of the Earth should result in an observable parallax, which was not seen
    - Argued with the apparent retrograde (westward) motion of planets
      * Mars appears to stop, go back, then go forward again
  + Ptolemy: Most sophisticated geocentric model proposed
    - Planets rotate around Earth, and also around a point (except for the sun)
    - These are called epicycles
    - Explains retrograde motion through epicycles
  + Copernicus realized the solar system was *heliocentric* (centered on the sun)
    - Planets exhibit *apparent retrograde motion* due to their distances from Earth
      * Appear to turn around
      * Retrograde motion of a planet occurs when the Earth passes the planet, making Ptolemy’s epicycles unnecessary
  + The cosmological principle: “There is nothing special about our place in the universe”
    - On one level:
      * Our view from the Earth is not special or unique
      * On a large scale, the universe is the same everywhere
    - On another level:
      * Matter and energy obey the same physical laws everywhere
      * We can learn about distant objects by studying nearby ones
  + Galileo Galilei
    - Introduced the modern view of science: transition from a faith-based “science” to an observation based science
    - First to use telescopes to observe the universe
    - Major discoveries
      * Moons of Jupiter (4 Galilean moons)
      * Rings of Saturn
      * Sun spots (proving that the Sun is not perfect!)
      * Phases of Venus (including “full Venus”), proving that Venus orbits the Sun, not the Earth
    - But, model was no more accurate than Ptolemaic model
  + Kepler
    - Planets orbits are ellipses
    - Each ellipse has two foci
    - The Sun is at one focus of a planet’s elliptical orbit