35:00
1. A spaceship moves away from Earth at 0.6c. The spaceship is 20m long in the Earth's reference frame. How long is the ship in the ship's reference frame?

45:00
2. A spaceship moves away from Earth at 0.8c. The spaceship is 40m long in the Earth's reference frame. How long is the ship in the ship's reference frame?

49:00
3. A spaceship moves away from Earth at 0.6c. The spaceship is 30m long in the ship's reference frame. How long is the ship in the Earth's reference frame?

56:30
4. Sirius is 20 light-years from Earth in the Earth frame. A spaceship travels from Earth to Sirius at 4/5 the speed of light. How far is Sirius from Earth in the ship's frame?

1:02:50
5. Betelgeuse is 30 light-years from Earth in the Earth frame. A spaceship travels from Earth to Betelgeuse at 3/5 the speed of light. How far is Betelgeuse from Earth in the ship's frame?

1:11:00
6. The North Star is 40 light-years from Earth in a spaceship's reference frame. The spaceship travels from Earth to the North Star at 4/5 the speed of light. (a) How far is the North Star from Earth in the Earth's reference frame? (b) The ship is 20m long in the ship's frame. How long is it to an observer on Earth?

1:15:50
7. A spaceship travels to Alpha Centauri at 0.8c. The trip takes 5 years in the Earth's reference frame. How long does the trip take in the ship's reference frame?

1:23:40
8. A spaceship travels to Sirius at 0.6c. The trip takes 40 years in the ship's reference frame. How long does the trip take in the Earth's reference frame?

1:29:00
9. A subatomic particle has a lifespan of 3 minutes. If the particle is moving away from the Earth at 1×10^8 m/s, what is the particle's lifetime as measured by a physicist on the Earth?

2:00:20
1. A spaceship moves a 0.6c relative to the Earth, traveling from Earth to Sirius, a distance of 10^{12} m relative to Earth. How long does the trip take in the earth frame?

2:06:50
2. A spaceship moves at 0.8c.
(a) How long does it take to go the 10^{11} m distance from the Earth to the Sun, according to observers on Earth?
(b) How long does it take to go the 10^{11} m distance from Earth to the Sun according to an alien on the spaceship?
(c) What is the distance between the Earth and the Sun as measured by the alien?