# Modern physics Excersices Chapter 1-2

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2.1.1 Suppose that the orbit of Earth around the Sun is circular. Calculate its velocity if the mean distance from the Sun is $6.3 \times 10^9$ m.

Answer: $3.0 \times 10^4$ m/s

2.4.1 Calculate how the length contraction affects a meter stick if it moves at the speed 0.8c.

Answer: 0.6 m

2.6.1 The same meter stick has a weight of one kg is moving at a speed of 0.6c. How big is its relativistic mass?

Answer: 1.7 kg

2.7.1 Lasse is driving his fast Porsche against red light (600 nm). When he is stopped at a police control he says that he was driving so fast that the red light looked green (500 nm) since the relativistic Doppler effect must hav played him a joke.
How fast was Lasse driving?

Answer: The speed was c/12 or $0.25 \times 10^8$ m/s

2.8.1 Show that if we divide the electric force and the gravitational force between an electron –positron pair we get $1.2 \times 10^{36}$.

2.8.2 An electron is moving in circular orbit with radius 5.0 cm in a homogeneous magnetic field (B) at a speed of $3 \times 10^6$ m/s. Calculate B.

Answer: $B = 3.4 \times 10^{-4}$ T

2.8.3 Perform the same calculation for a proton.

Answer: B = 0.62 T