

12. The number of seconds in a year is 3.156×10^7 . This is listed in Appendix D and results from the product

$$(365.25 \text{ day/y})(24 \text{ h/day})(60 \text{ min/h})(60 \text{ s/min}) .$$

- (a) The number of shakes in a second is 10^8 ; therefore, there are indeed more shakes per second than there are seconds per year.
- (b) Denoting the age of the universe as 1 u-day (or 86400 u-sec), then the time during which humans have existed is given by

$$\frac{10^6}{10^{10}} = 10^{-4} \text{ u-day} ,$$

which we may also express as

$$(10^{-4} \text{ u-day}) \left(\frac{86400 \text{ u-sec}}{1 \text{ u-day}} \right) = 8.6 \text{ u-sec} .$$