1. **Computing error for the use of Patriot Missiles in Saudi Arabia**

The computer software in the Gulf War Patriot Missile system used a single precision 23 bit mantissa instead of the modern double precision IEEE 52 bits. One part of the software computed time in seconds by multiplying the number of tenths of a second since system boot by the decimal value 1/10 expressed as a floating point number. The binary representation of decimal 1/10 is 0.0001100110011001100110011 because it stores 23 bits after the first one.

   a. Compute the approximate value of “1/10” in the patriot system by using the corresponding sum of powers of two in R (or some other language using full double precision). (Hint: Use code like `formatC(2/3, digits=16)` to show as many decimal digits as possible when viewing your result.)

   b. Compute the approximate error

   c. Using a count of tenths of seconds since reboot corresponding to 100 hours, compute the approximate Patriot error in the number of seconds since reboot.

   d. Using a nominal Scud missile speed of 1700 meters per second, compute the approximate targeting error in meters.

2. **Ariane rocket failure**

The first Ariane 5 rocket failed 40 seconds after liftoff at a cost of $500 million. The cause was found to be conversion of the measured horizontal velocity from a 64 bit floating point value to a 16 bit signed integer. If the velocity is measured in cm/second and reaches 34165.23487 cm/s, what is the percent relative error due to the conversion? (This is a trick question!)

3. **Write a function in R** that takes the result of a `glm(, family="binomial")` function call, the name of a quantitative covariate, the range of the covariate to plot, and optionally, the name of a two-level categorical covariate (with 0/1 indicator, rather than factor, coding), and makes a prediction plot with “probability of success” on the y-axis. When the optional indicator is included, make separate prediction curves for the two levels and include a legend. You can assume no interactions. Although generally not a good idea, for this exercise, set all unmentioned x variables used in the model to zero. Label your plot nicely. Format and document your code nicely.

   The function prototype should be:

   ```r
   logisticPred = function(glmRslt, x1, x1Range=c(0,1), x2=NULL) {}
   ```

   You can test your function with LRtest.dat.