Random problems with R

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```
> sample(x = 1:100, size = 1)
[1] 67
>
```

The simplest command in R…

right?

Multiply-and-floor method

to generate a random integer on $\{1, ..., m\}$

start with $X \sim U[0, 1)$and define $Y \equiv 1 + \lfloor mX \rfloor$

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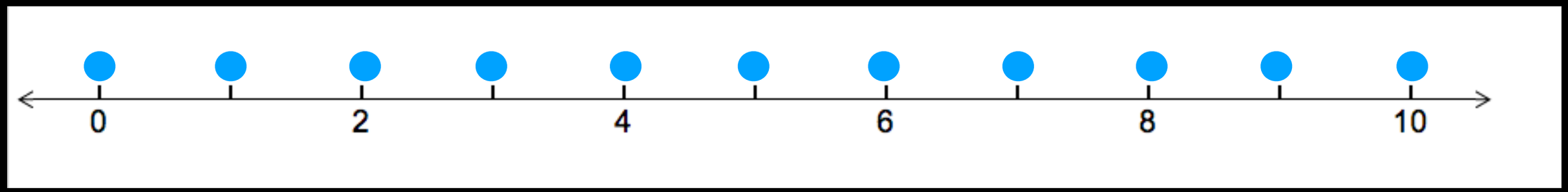
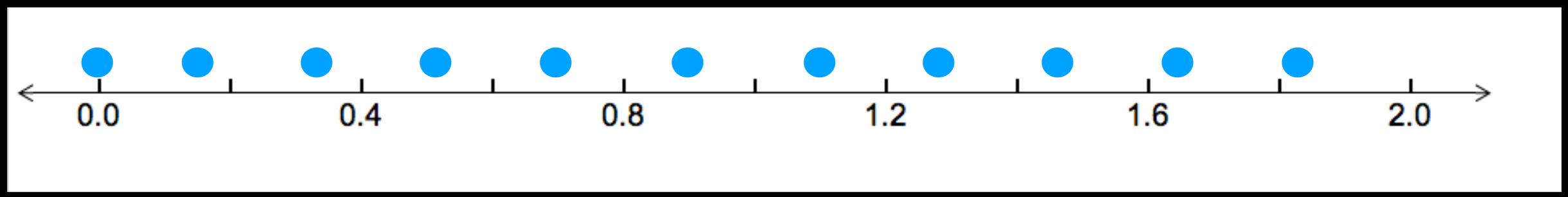
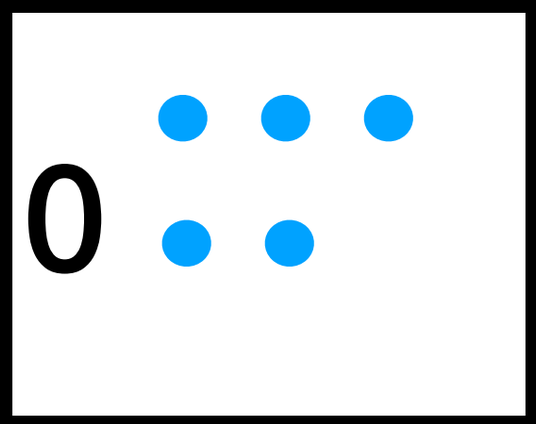
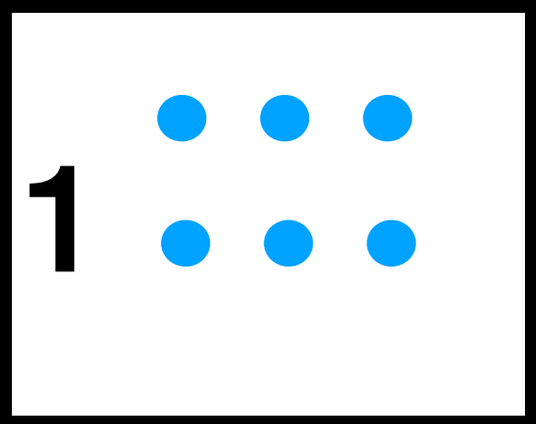
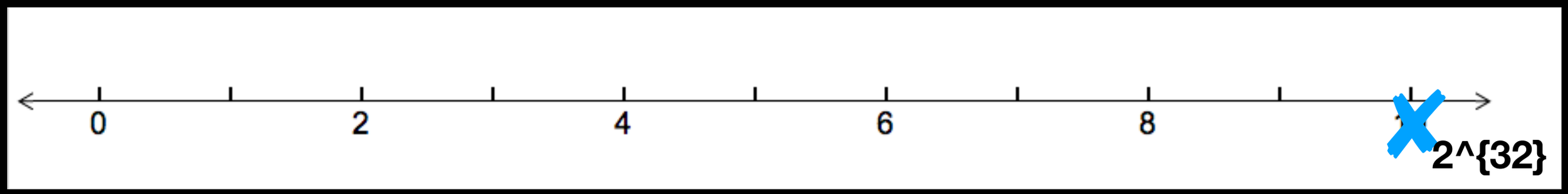








What R does is even more complicated.



Theorem

The sampling probabilities for {1,...,m} are LEAST uniform when m is just below 2^{31}

Some numbers are nearly twice as likely to be selected as others.

Evens and odds

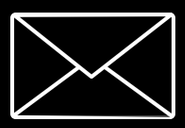
```
> m <- (2/5)*2^32
> m > 2^31
[1] FALSE
> x <- sample(m, 1000000, replace = TRUE)
> table(x %% 2)

     0      1
399827 600173
```

https://stat.ethz.ch/pipermail/r-devel/2018-September/076827.html

Should you worry?

https://arxiv.org/pdf/1809.06520.pdf

Thanks!



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