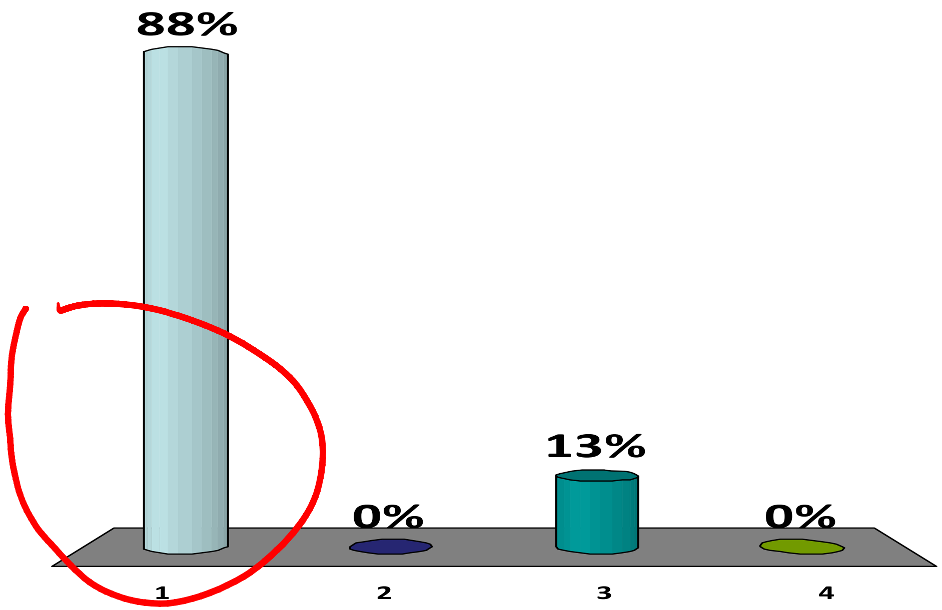
The sequence X_n is iid with common CDF $F(\ \ )$. Is it stationary ?

1. Yes
2. No
3. It depends on the variance of the distribution with CDF $F()$
4. I don't know



The sequence X_n is a random walk, i.e. $X_n = Z_1 + \cdots + Z_n$ where Z_n is an iid sequence.

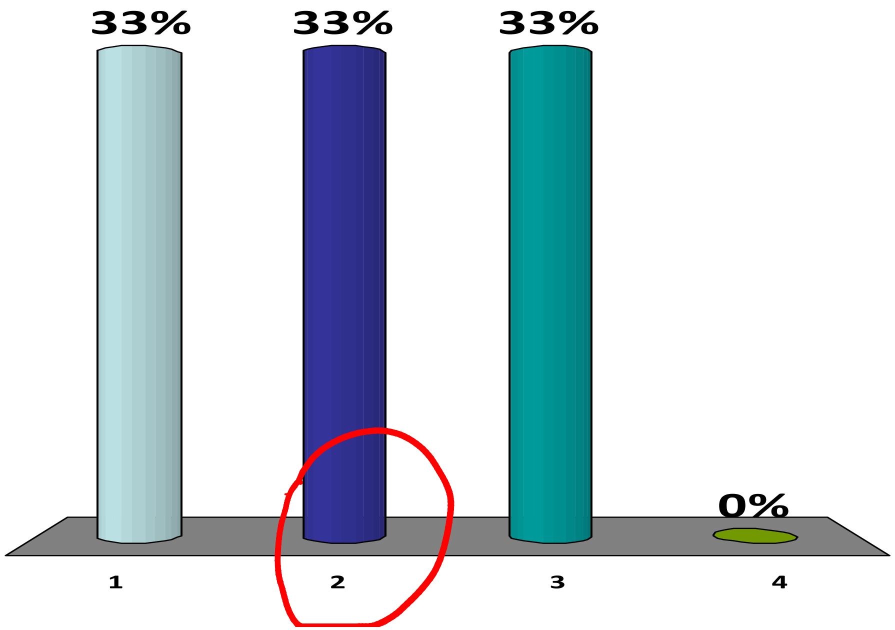
Is the sequence X_n stationary ?

$X_1 \quad X_2 \quad X_3 \quad X_4$

1. Yes
2. No
3. It depends whether Z_n is 0 mean
4. I don't know

$\mathrm{var}\, X_n =$

va



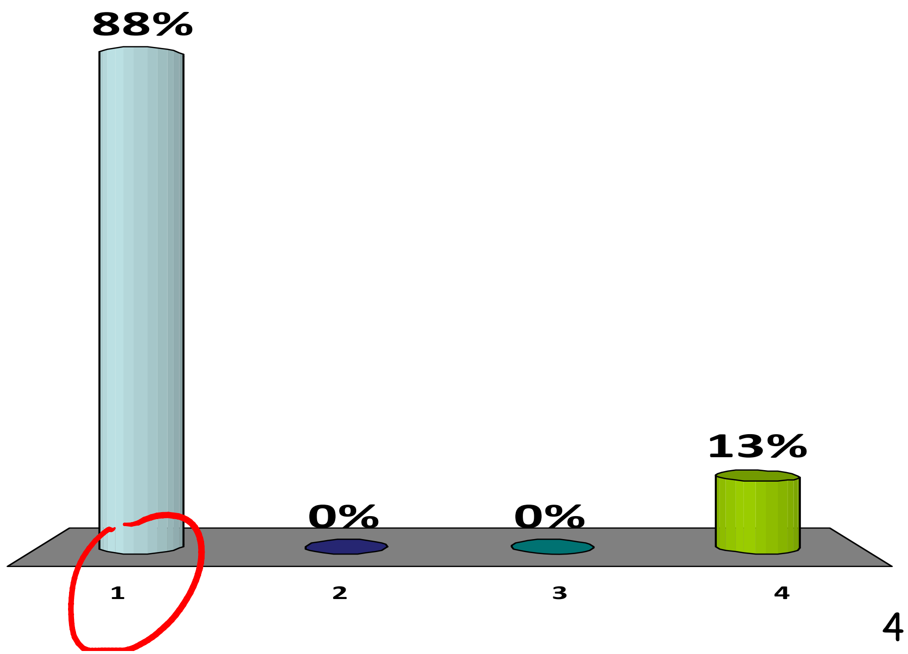
The sequence X_n is iid with ~~common~~ CDF ~~$F($ $)$. Is it~~ ~~stationary~~ ?

$X_1 \sim F(\ )$

$X_{n+1} = X_n$ with proba p

$X_{n+1} \sim F(\ )$ with proba $(1-p)$

1. Yes
2. No
3. It depends on the variance of the distribution with CDF $F()$
4. I don't know

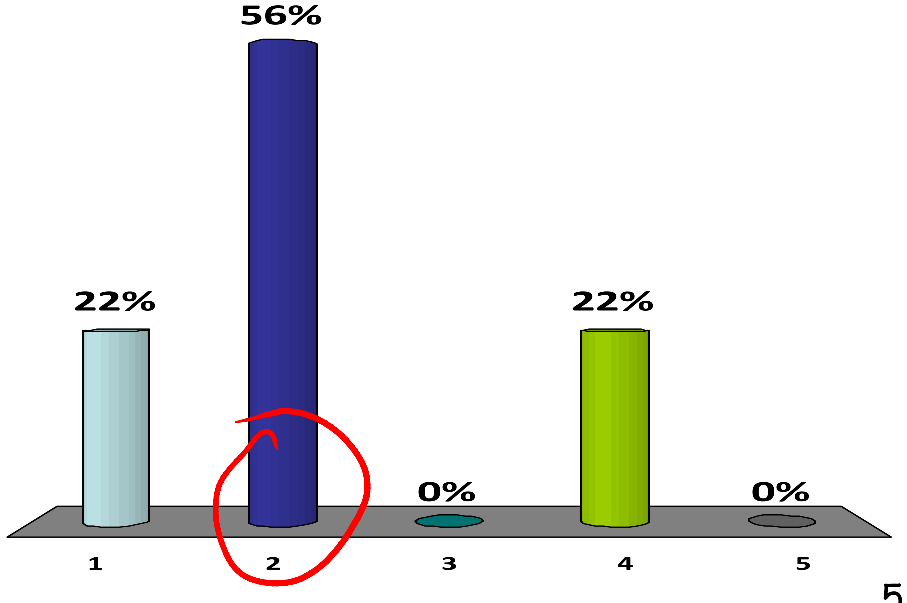


We simulate a single server queue and measure the mean queue length and the mean response time.

Which of these two statistics are time based statistics ?

1. None
2. Mean queue length
3. Mean response time
4. Both
5. I don't know

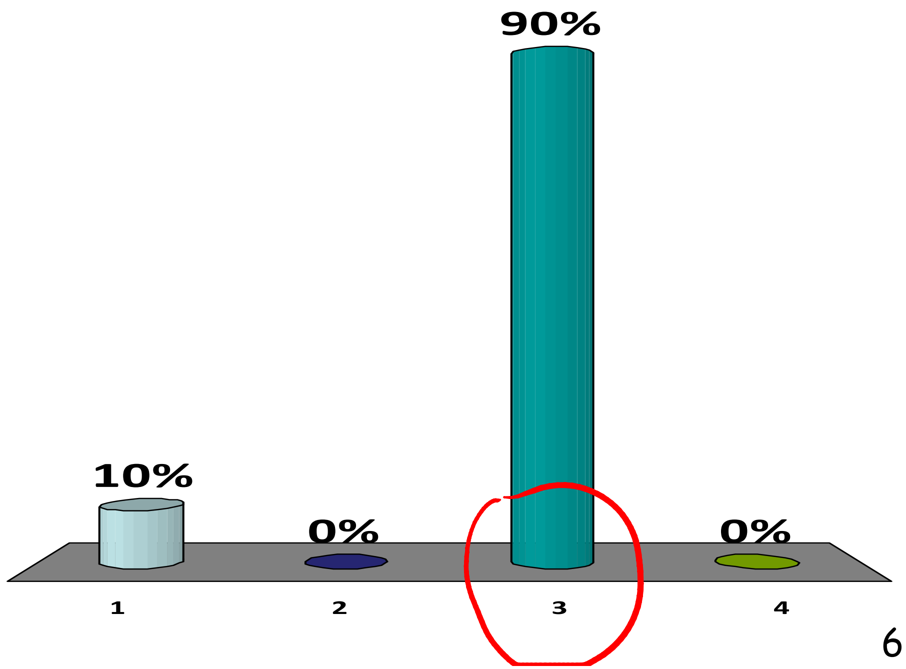
$$\bar{Q} = \frac{1}{T}\int_0^T Q(t)\,dt$$



We simulate a single server queue.

Is this a asymptotic stationary simulation ?

1. Yes
2. No
3. It depends on the parameters of the system
4. I don't know

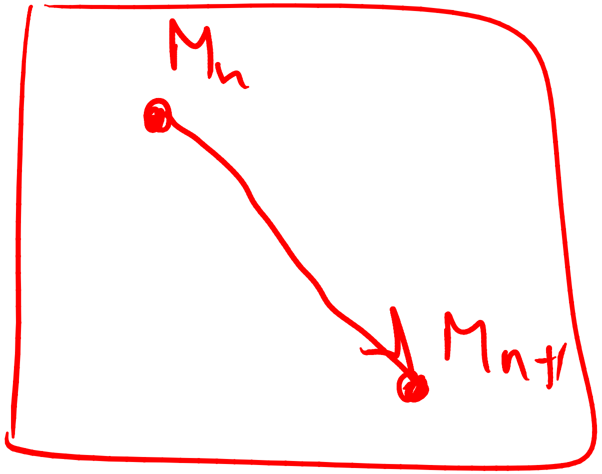


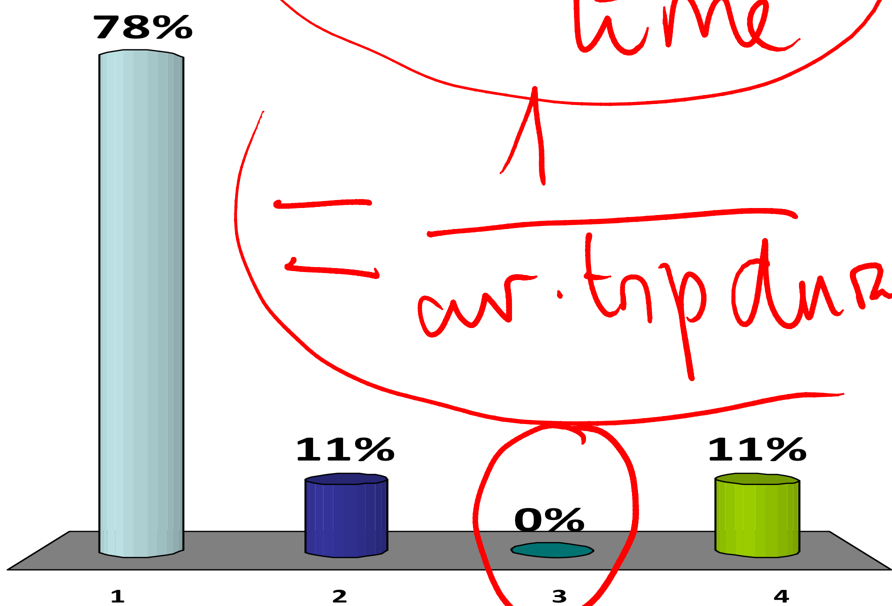
We simulate a random waypoint mobility model.

Is this a stationary simulation ?

1. Yes
2. No
3. It depends on the parameters of the system
4. I don't know

$$\lambda = \frac{\#\text{trips}}{\text{time}} = \frac{1}{\text{avr. trip durat'n}}$$



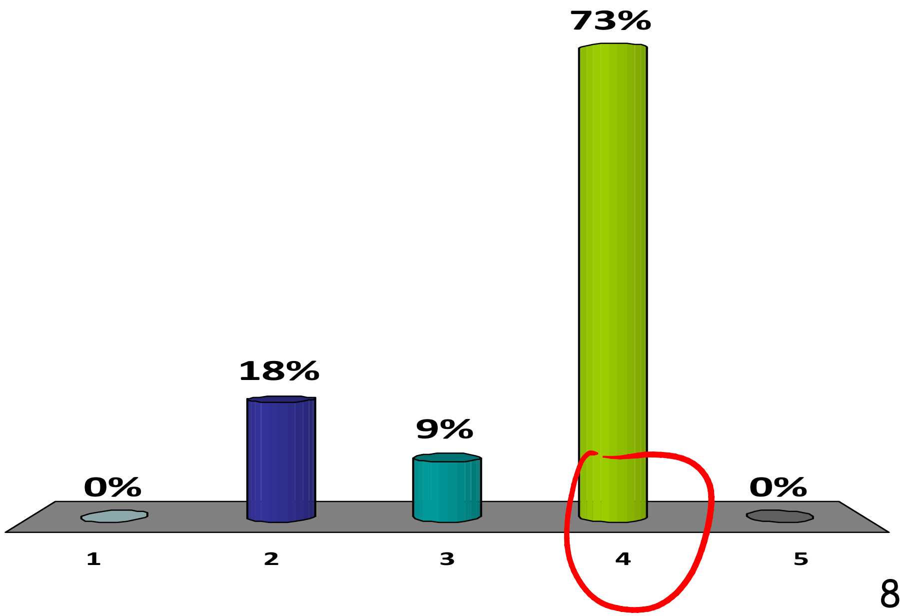


A function is defined by

```
COIN(p)=
  if rand()<p
    0
  else
    1
```

What does it compute ?

1. A sample of a geometric random variable with mean $\frac{1}{p}$
2. A sample of a geometric random variable with mean $\frac{1}{1-p}$
3. A sample of a Bernoulli random variable with mean p
4. A sample of a Bernoulli random variable with mean $1-p$
5. I don't know



A function is defined by

myfun(λ)=
randexp()/λ

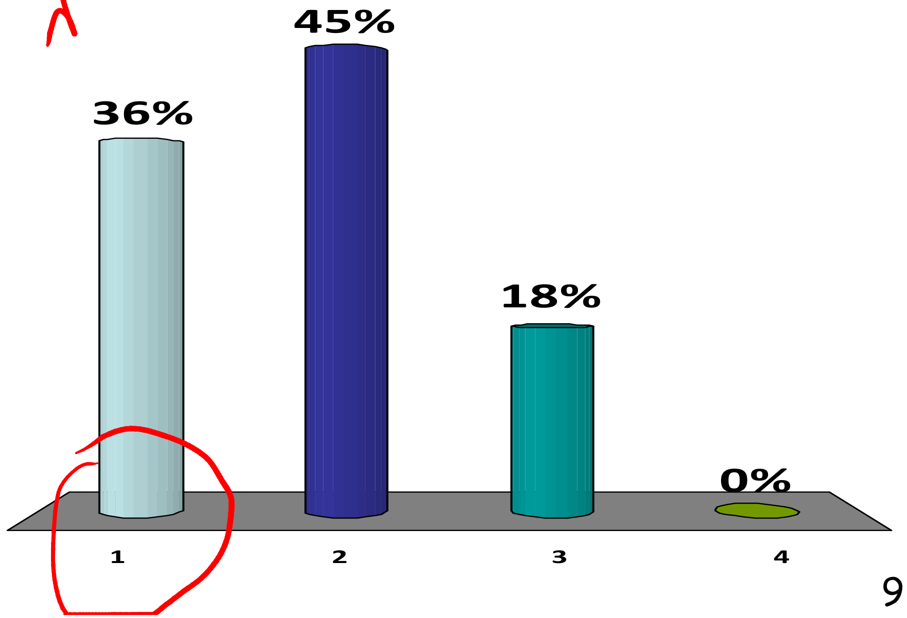
where randexp() returns a sample of the exponential distribution with mean 1.

What does it compute ?

1. A sample of an exponential random variable with parameter λ
2. A sample of an exponential random variable with parameter $\frac{1}{\lambda}$
3. None of the above
4. I don't know

randexp() $\rightarrow$ $-\ln u$

$\dfrac{-\ln u}{\lambda}$



Solution

A sample of the exponential distribution is obtained by using the CDF inversion method:

$$X = -\frac{\log(U)}{\lambda}$$

randexp() returns $-\log(U)$

myfun(λ) returns X

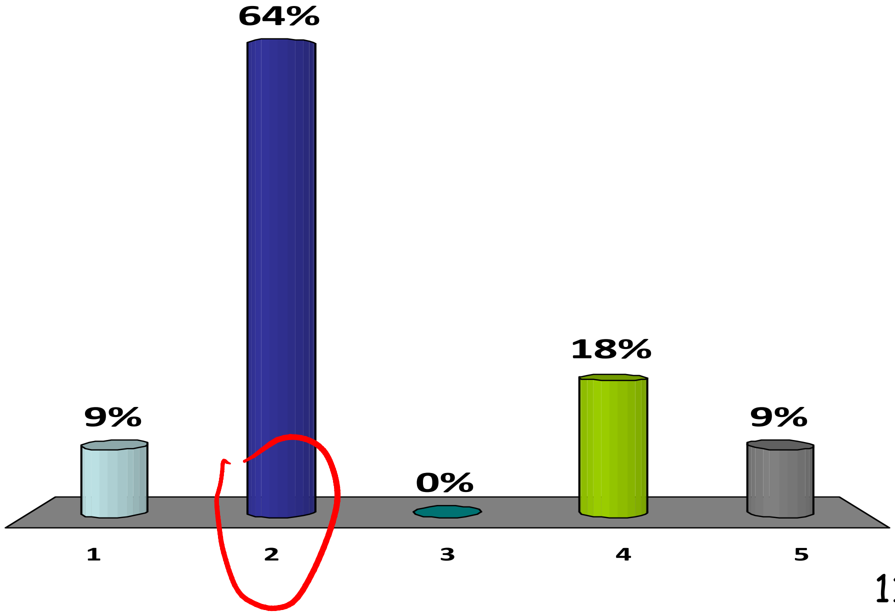
A function is defined by

myfun()=

$$\lfloor -\log \left(\mathrm{rand}() \right) \rfloor$$

What does it compute ?

1. A sample of an exponential random variable
2. A sample of a geometric random variable
3. A sample of a Bernoulli random variable
4. None of the above
5. I don't know



Solution

A sample of the geometric distribution is obtained by using the CDF inversion method:

$$X = \left\lfloor \frac{\log(U)}{\log(1-\theta)} \right\rfloor$$

set $\log(1-\theta) = -1$

myfun() returns X

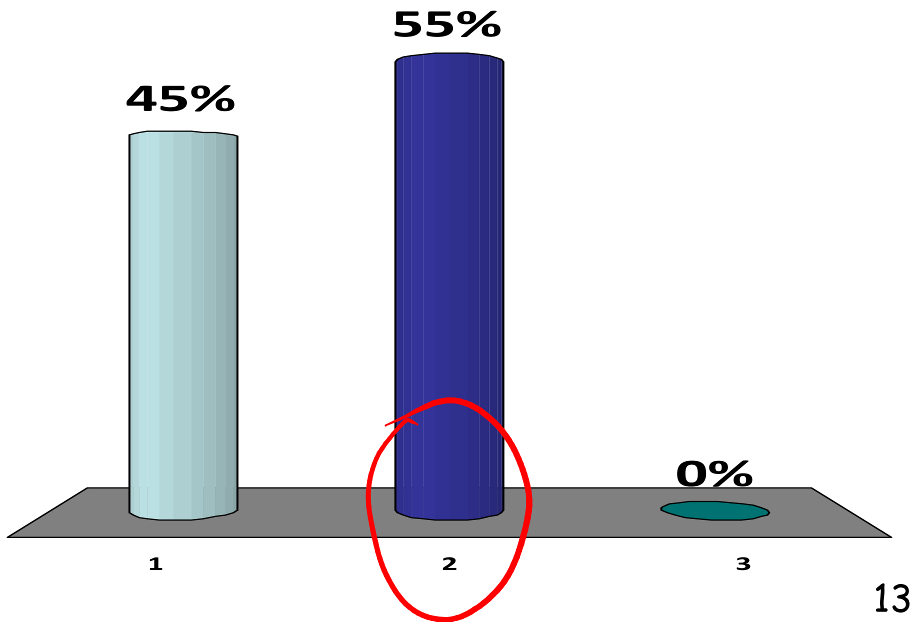
myfun() returns a sample of the geometric distribution with $\theta = 1 - e^{-1}$

A function is defined by

myfun()=
do
$X := \text{randn}(1,1)$
until $X > 0$
return(X)

What does it compute ?

1. A sample of a gaussian random variable
2. A sample of a random variable that is not gaussian
3. I don't know



Solution

$$\mathbb{P}(X = x \mid X > 0)$$

$$= \frac{\mathbb{P}(X = x \text{ and } X > 0)}{\mathbb{P}(X > 0)}$$

$$= \frac{\mathbb{P}(X = x \text{ and } x > 0)}{}$$

$p \to \mathbb{P}(X > 0)$

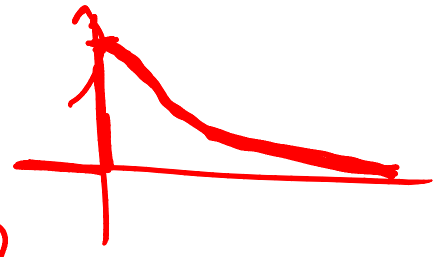
$=$

This is rejection sampling. The output is a sample of the conditional distribution of a gaussian random variable, given that it is > 0.

The pdf is such that

$$f_X(x) = \frac{N(x)}{p} \text{ if } x > 0$$

$$f_X(x) = 0 \text{ if } x \leq 0$$



Where $N(x)$ is the pdf of a standard gaussian RV and p is the proba that a standard gaussian RV is > 0

$(p = 0.5)$

This is not a gaussian RV

Independent output of a simulation are obtained by...

A. using the last RNG state of one run as seed to the next run

~~B.~~ executing the runs in parallel on parallel processors using the same seed for all runs

C. executing the runs in parallel on different processors and using truly random seeds for all runs

1. None
2. A
3. B
4. C
5. A and B
6. A and C
7. B and C
8. All
9. I don't know