Palm Calculus
Bonus

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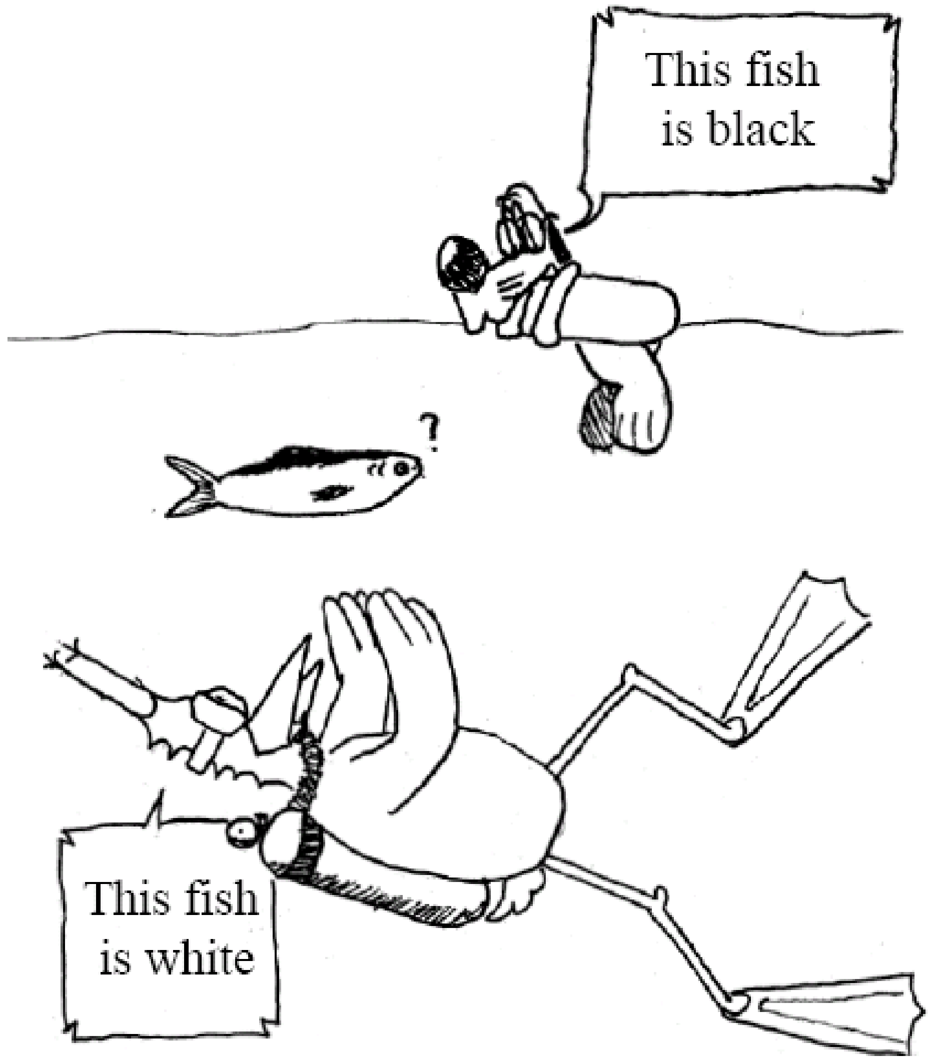
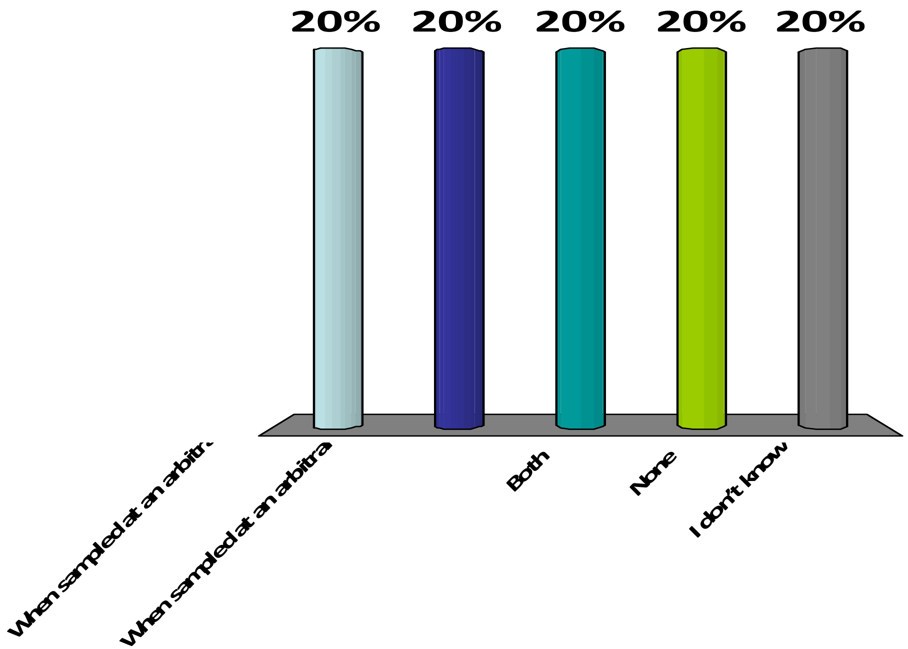


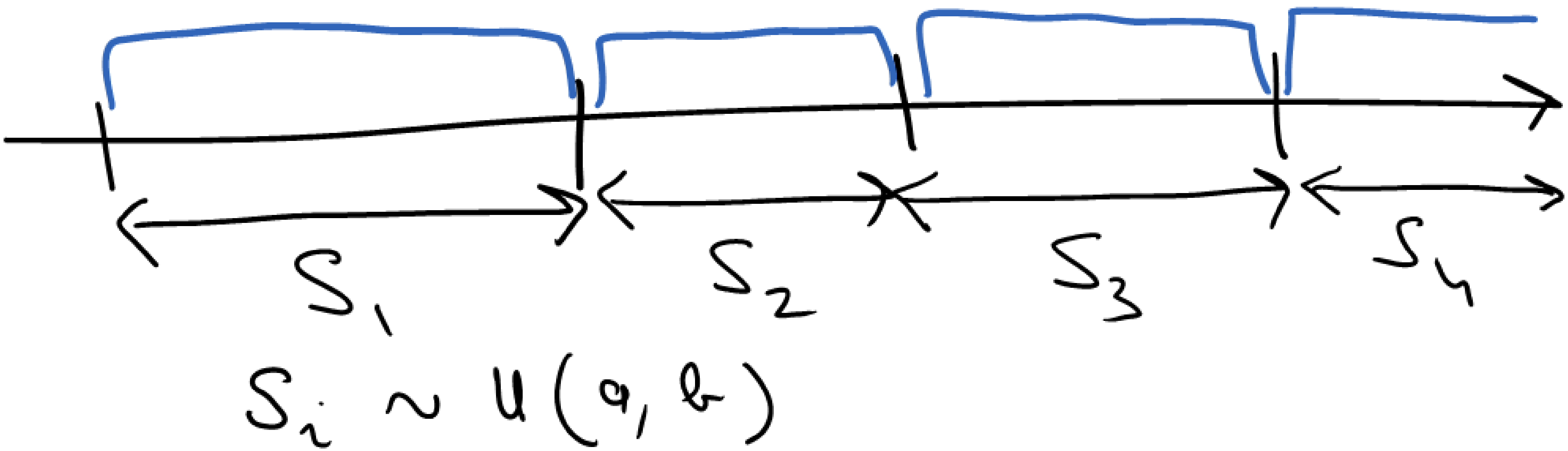
For the random waypoint model, the distribution of the next waypoint is uniform…

A. When sampled at an arbitrary waypoint
B. When sampled at an arbitrary point in time
C. Both
D. None
E. I don't know



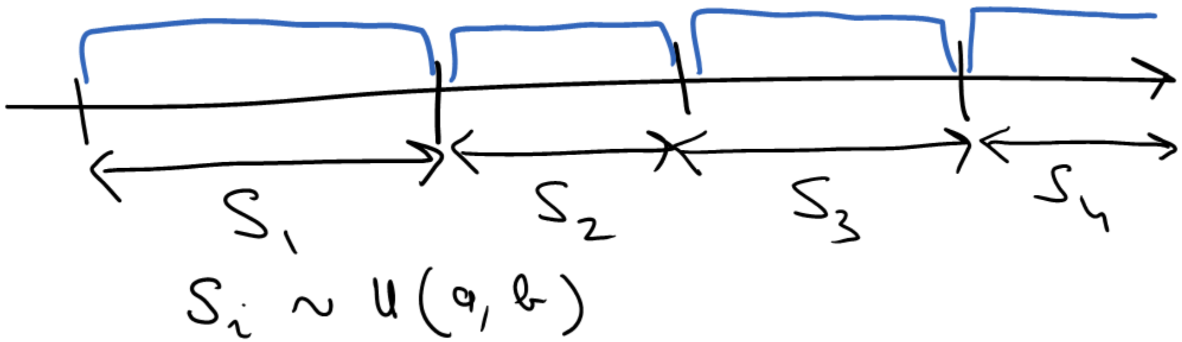
Devices run in a cycle of duration $\sim U\,(a, b)$

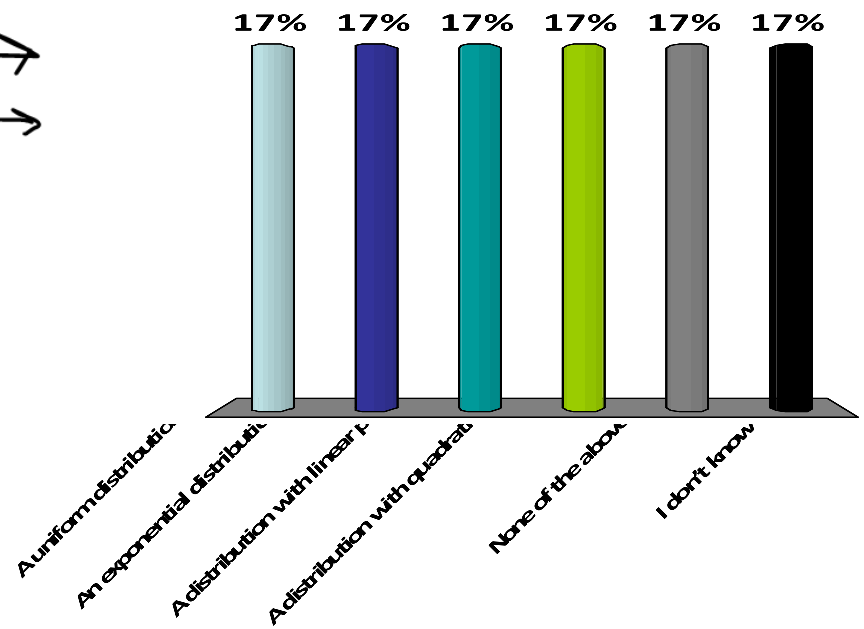
We simulate a number of devices. We want to avoid removing transients and start the simulation by sampling the residual times . From which distribution should we sample the residual cycle times ?



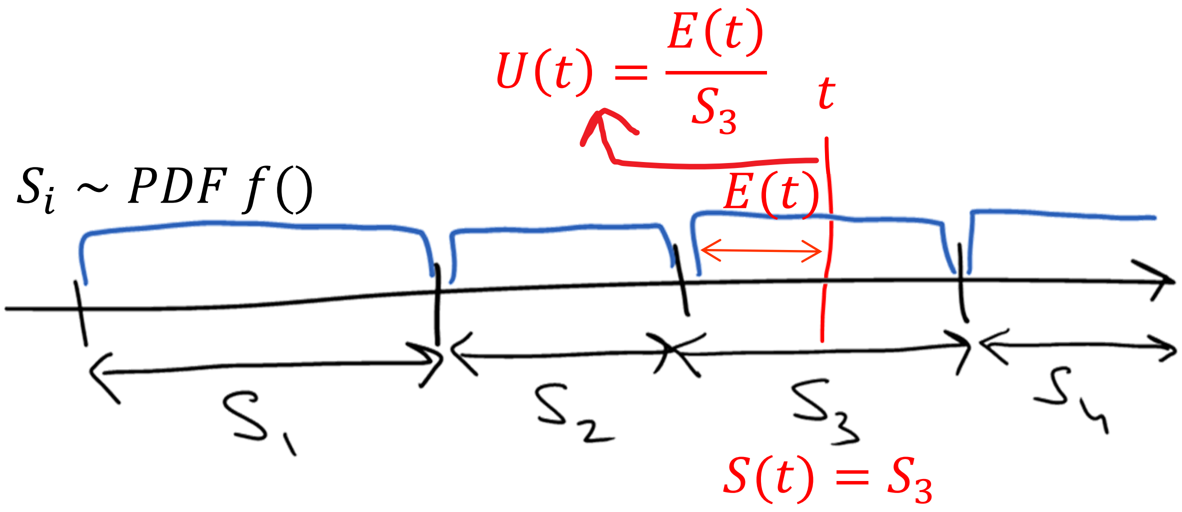
From which distribution should we sample the residual cycle time ?

A. A uniform distribution
B. An exponential distribution
C. A distribution with linear pdf
D. A distribution with quadratic pdf
E. None of the above
F. I don't know





$U(t)$ is the fraction of the current interval that has elapsed at time t.
The current interval is $S(t)$



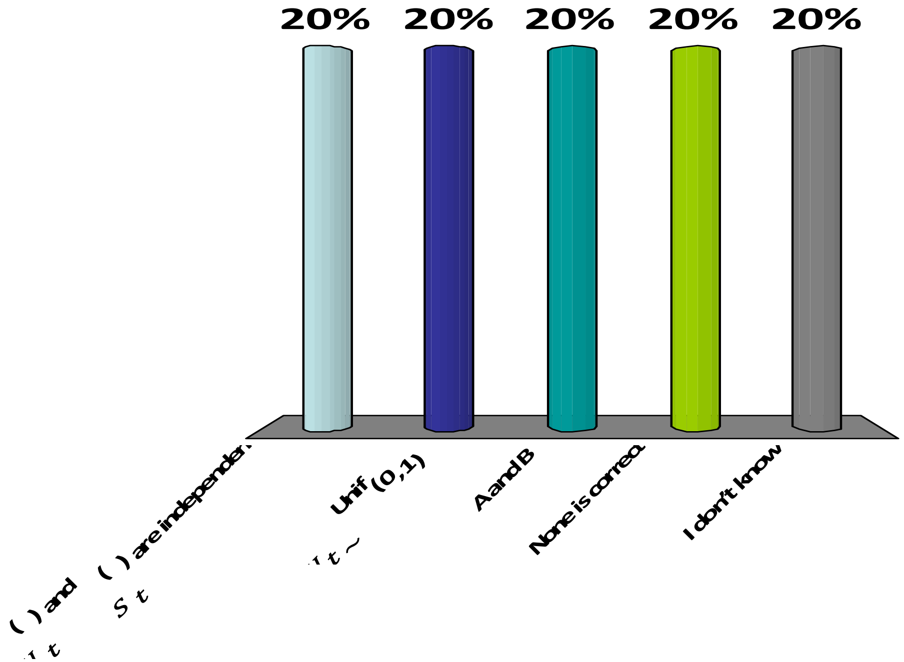
A. $U(t)$ and $S(t)$ are independent

B. $U(t) \sim \text{Unif}(0,1)$

C. A and B

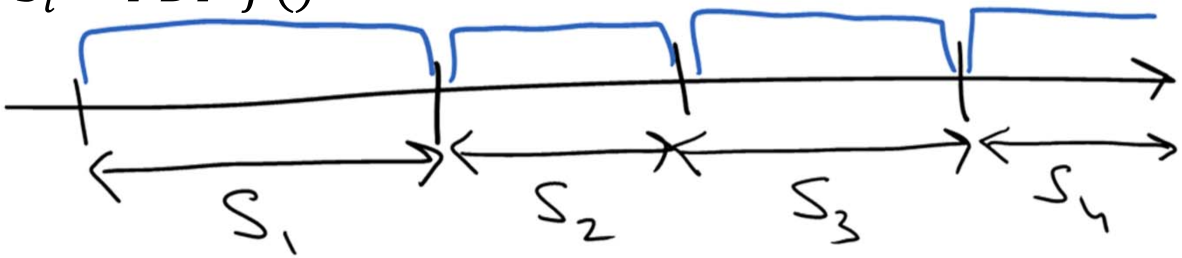
D. None is correct

E. I don't know



An algorithm for the perfect simulation of a device is returning the duration of the current interval S and the residual time R until end of current interval.

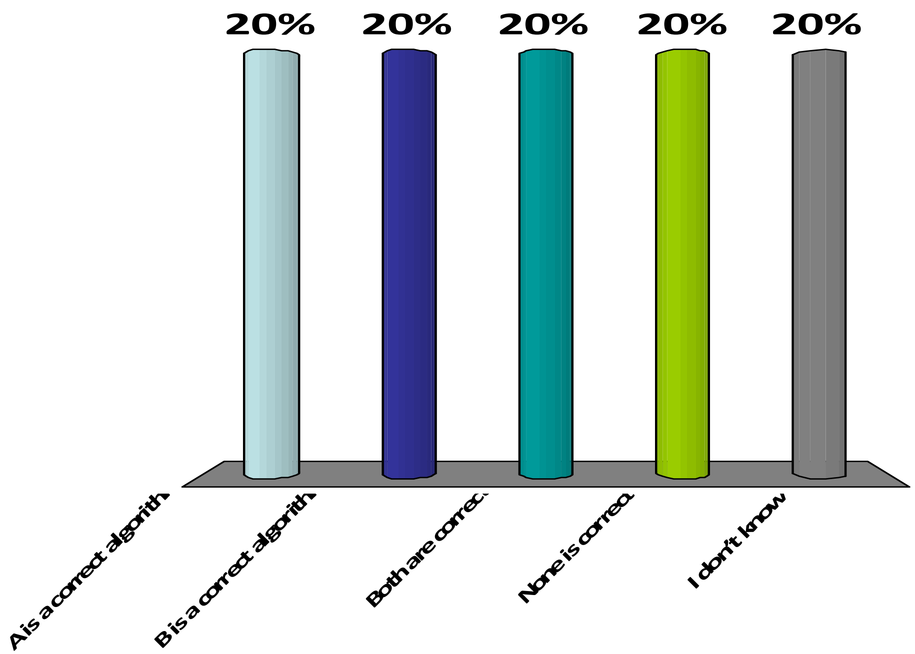
$S_i \sim PDF\ f()$



A
1. Draw S from distribution with pdf $g(s) = Ksf(s)$ where K is a constant
2. Draw $U \sim$ Unif(0,1)
3. $R = US$

B
1. Draw S from distribution with pdf $f(s)$
2. Draw $U \sim$ Unif(0,1)
3. $R = US$

A. A is a correct algorithm
B. B is a correct algorithm
C. Both are correct
D. None is correct
E. I don't know

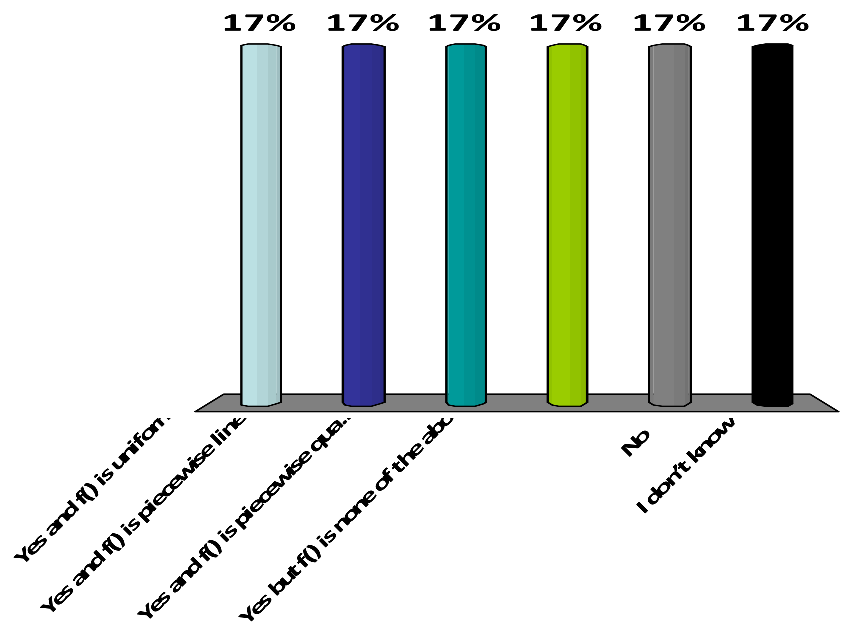


Consider the random waypoint model, where the speed chosen at a waypoint is sampled from the pdf f(). Can we choose f() such that

1. the model has a stationary regime and

2. the distribution of speed sampled at an arbitrary point in time is uniform ?

A. Yes and f() is uniform
B. Yes and f() is piecewise linear
C. Yes and f() is piecewise quadratic
D. Yes but f() is none of the above
E. No
F. I don't know



A wireless channel has a fluctuating rate $r(t)$. A system sends data over this channel in rounds, of average duration $\bar{T}$. The average amount of data transferred in one round is $\bar{B}$.

We sample the channel using a Poisson process of rate λ and find a sampled rate $\bar{r}$

A. $\bar{r} = \frac{\bar{T}}{\bar{B}}$

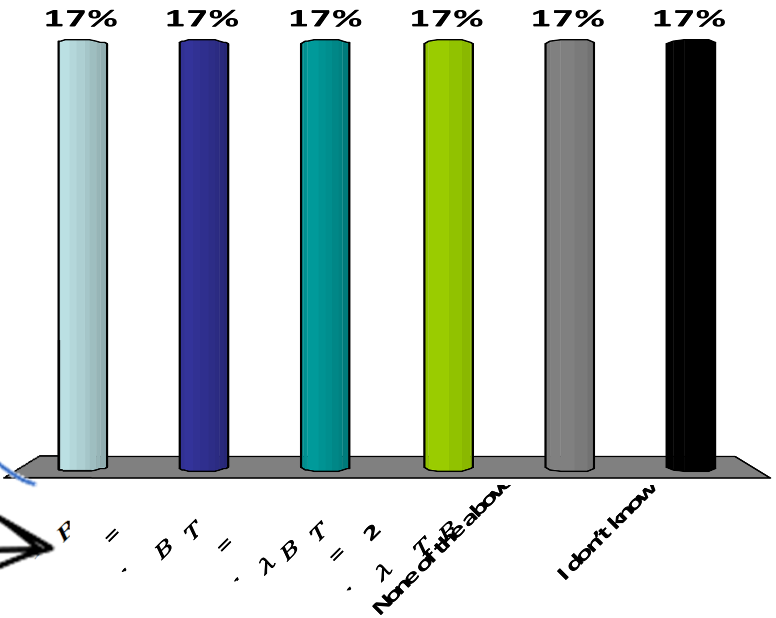
B. $\bar{r} = \frac{\bar{B}}{\bar{T}}$

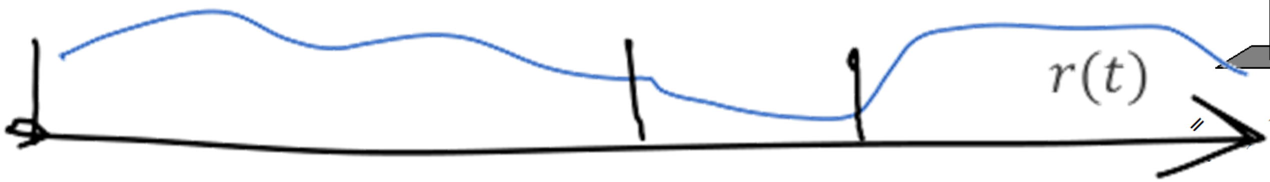
C. $\bar{r} = \lambda\frac{\bar{B}}{\bar{T}}$

D. $\bar{r} = \lambda^2\bar{T}\bar{B}$

E. None of the above

F. I don't know



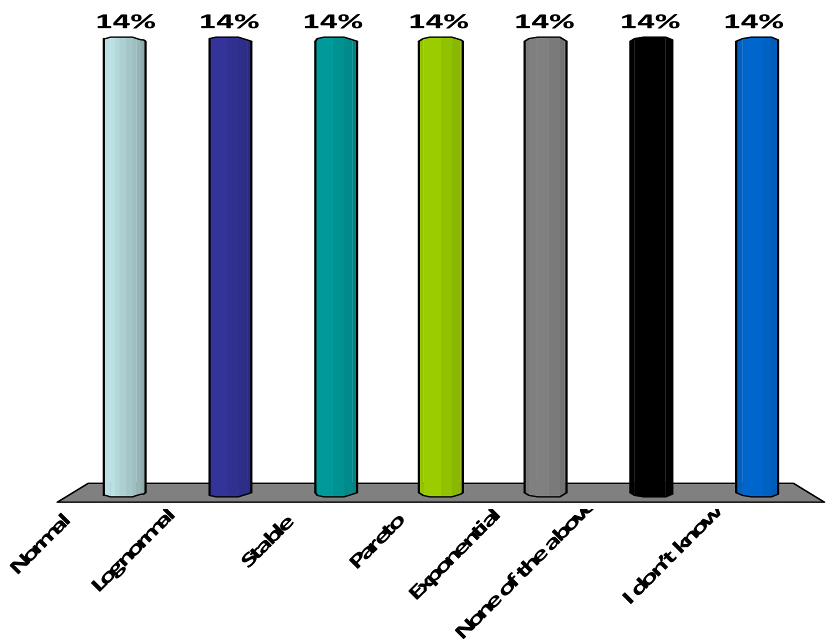


We measure the distribution of flow sizes, in packets, transferred from a server. We find standard Pareto(p) with $p > 1$. i.e. with PDF

$$f(x) = \frac{p}{x^{p+1}} 1_{x \geq 1}$$

What is the pdf of the size of a flow seen by an arbitrary packet?

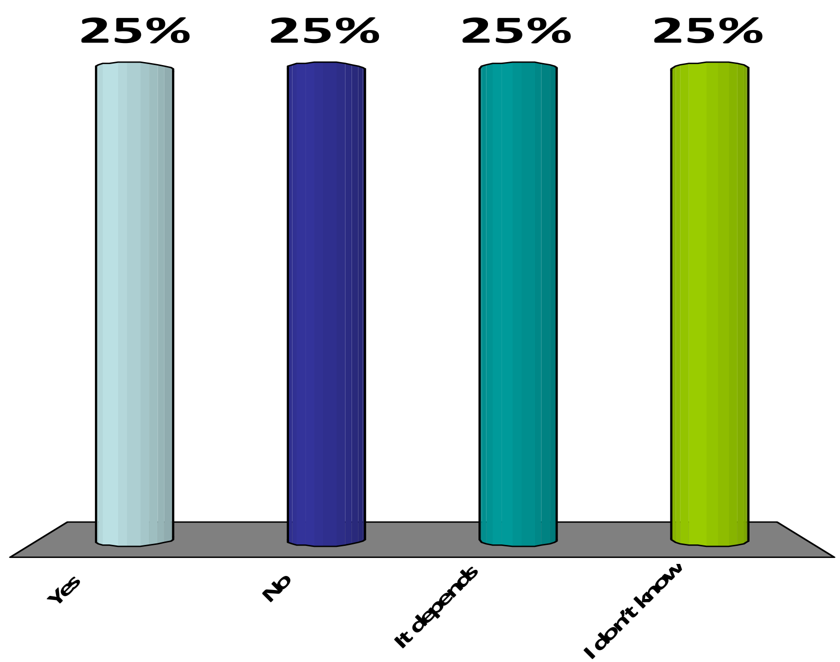
A. Normal
B. Lognormal
C. Stable
D. Pareto
E. Exponential
F. None of the above
G. I don't know

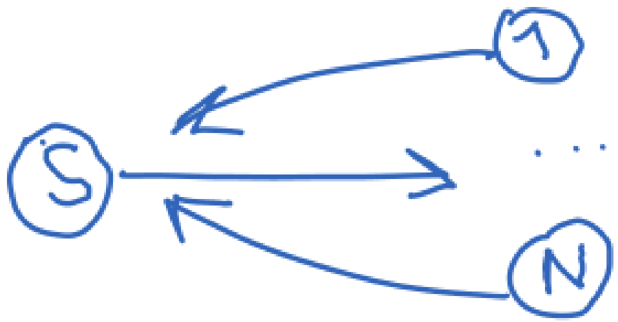


The distribution of flow sizes in packet, seen by packets, is heavy tailed.

Therefore the distribution of flow sizes is heavy tailed.

A. Yes
B. No
C. It depends
D. I don't know





A server sends a broadcast poll and waits for all clients to ACK.

The round trip times $S \to i \to S$ for clients i are iid $\sim \mathrm{Exp}(1)$

How many polls per time unit are sent ?

A. $\lambda \approx \frac{1}{\log N}$

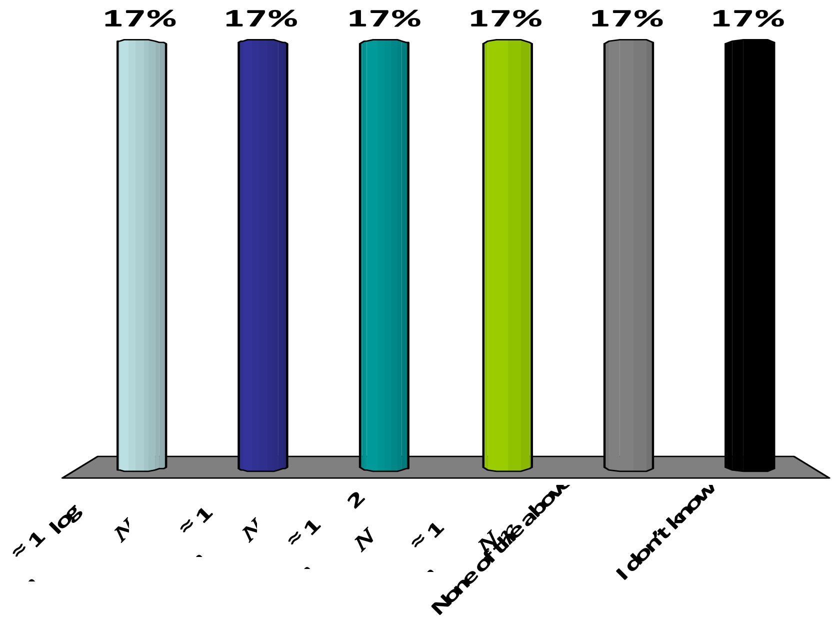
B. $\lambda \approx \frac{1}{N}$

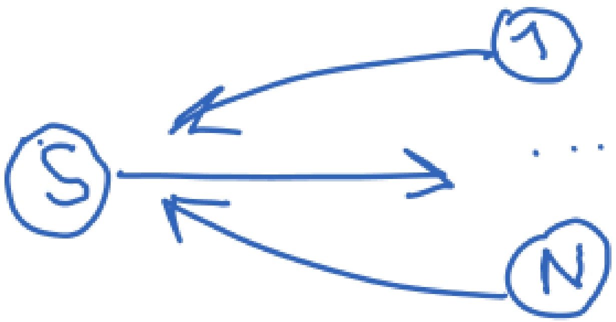
C. $\lambda \approx \frac{1}{N^2}$

D. $\lambda \approx \frac{1}{N^p}$

E. None of the above

F. I don't know





A server sends a broadcast poll and waits for all clients to ACK.

The round trip times $S \to i \to S$ for clients i are iid $\sim \text{Pareto}(p)$ with $p > 1$. How many polls per time unit are sent ?

A. $\lambda \approx \frac{1}{\log N}$

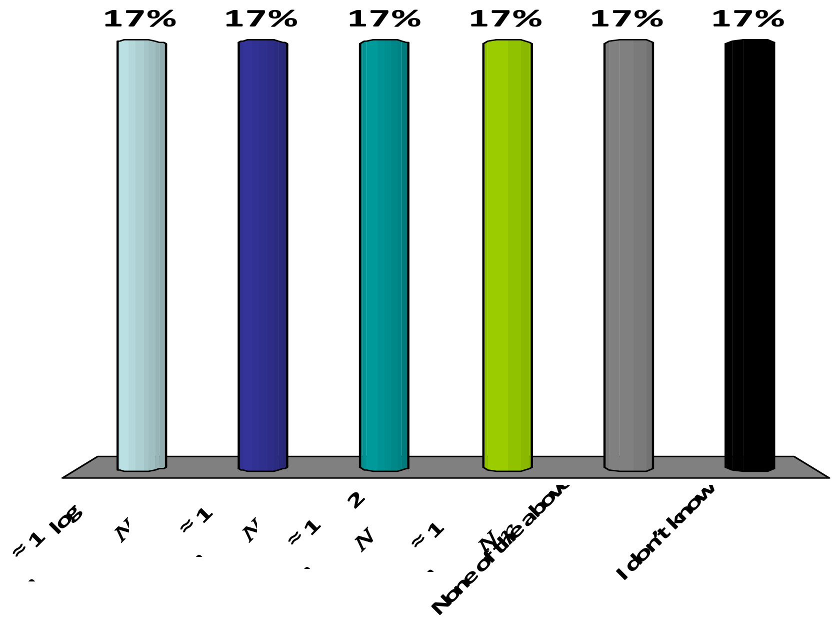
B. $\lambda \approx \frac{1}{N}$

C. $\lambda \approx \frac{1}{N^2}$

D. $\lambda \approx \frac{1}{N^p}$

E. None of the above

F. I don't know



Devices follow an ON/OFF cycle. The mean ON and OFF times are $\bar{S}$ and $\bar{T}$.

The probability that the device is ON at an arbitrary point in time is…

A. $\frac{\bar{S}}{\bar{T}}$

B. $\frac{\bar{S}\bar{T}}{(\bar{S}+\bar{T})^2}$

C. $\frac{e^{-\bar{S}}}{e^{-\bar{S}}+e^{-\bar{T}}}$

D. $\frac{\bar{S}}{\bar{S}+\bar{T}}$

E. None of the above

F. I don’t know