permute (10, 20, 30, 40, 50)

k=5 ① U→[1.5] U=3 30⟺50 [10 20 50 40 30]

k=4 ② U→[1,4] U=4 40⟺40 [10 20 50 40 30]

k=3 ③ U→[1.3] U=1 10⟺50 [50 20 10 40 30]

k=2 ④ U→[1,2] U=1 50⟺20 [20 50 10 40 30]

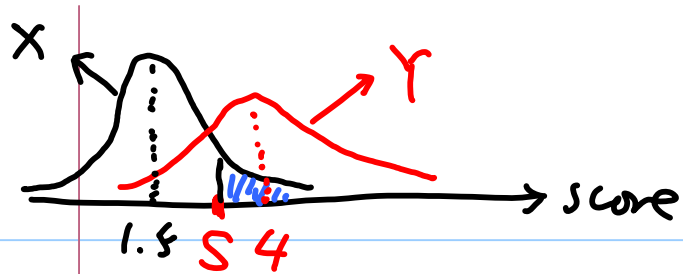Router   2sec

① → target

② ↻ 3 sec

5 sec

③
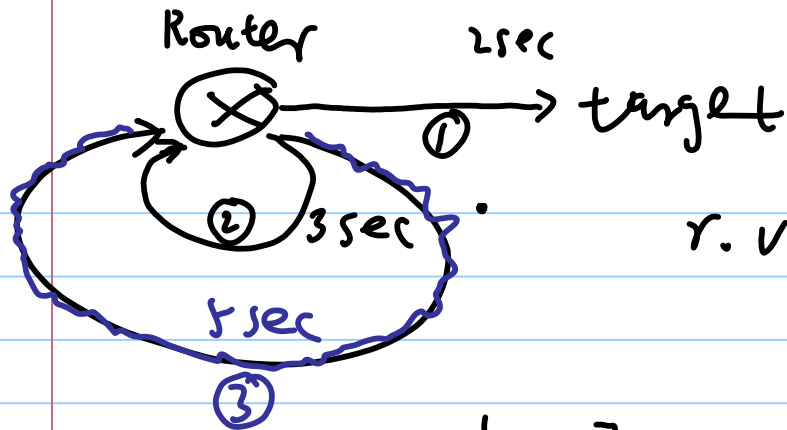
r.v. T : time to reach target

Q: $E[T]$?

r.v. F : path of packet at first step

$\{1, 2, 3\}$

$E[T|F=1] = 2 \text{ sec}, \quad \begin{cases} E[T|F=2] = 3 + E[T] \\ E[T|F=3] = 5 + E[T] \end{cases}$

$E[T] = E[T|F=1] \cdot P(F=1) + E[T|F=2] \cdot P(F=2) + E[T|F=3] \cdot P(F=3)$

$= \dfrac{2 + 3 + E[T] + 5 + E[T]}{3} \quad \Rightarrow \quad E[T] = 10 \text{ sec}$
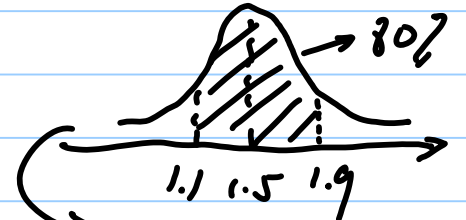
r.v. X: score of normal Y: score of spam

$$Y \sim N(4, 1^2) \qquad X \sim N(1.5, \sigma^2)$$

$$Z = \frac{X - 1.5}{\sigma} \sim N(0,1)$$

$$P(X \le 1.9) = 0.9$$

$$P(\sigma Z + 1.5 \le 1.9) = 0.9 \implies P\left(Z \le \frac{0.4}{\sigma}\right) = 0.9 \qquad P(X \le 1.9) = 0.9$$

from table, we know $\frac{0.4}{\sigma} = 1.3 \implies \sigma = \frac{1.3}{0.4} = 3.25$

value S such that $P(Y > S) = 0.95$?

$$Z = \frac{Y - 4}{1} \sim N(0,1) \qquad \longrightarrow \qquad P(Z > S - 4) = 0.95$$

$$\implies P(Z \le S - 4) = 0.05$$

table $\implies$ $S - 4 = -1.65 \implies S = 2.35$

Q2: $P(X > s)$?