(A) 35 ~ PCR Positive

0,938 = Sensitivity (S)

(i) $S = \dfrac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}}$

$FN = (1 - 0{,}938) \cdot 35 = 2{,}17$

→ round the number ⇒ 2

(ii)

uncertainty $\sqrt{N_i}$

$2 \pm 1{,}41$

(iii) → Standart error of a proportion

$\sigma = \sqrt{\dfrac{p(1-p)}{n}} \Rightarrow n = \dfrac{p(1-p)}{\sigma^2}$

↳ $s = \dfrac{x}{n}$

$$\rho^E(t) = \frac{\sum_{i=1}^{N-t} (x_j - \overline{x}(t))(y_j - \overline{y}(t))}{\sqrt{\sum_{i=1}^{N-t} (x_i - \overline{x}(t))^2 \sum_{j=1}^{N-t} (y_j - \overline{y}(t))^2}}$$

(B)

$$S(t) = \sum_{j=1}^{N-t} x_j \quad \& \quad C(t) = \sum_{j=1}^{N-t} x_j x_{j+t}$$

$t = 0, .., N-1$

$i = 0, .., N$

$$\rho(t) = \frac{\sum_{j=1}^{N-\tau} (x_j - \bar{x})(x_{j+1} - \bar{x})}{\sum_{j=1}^{N-\tau} (x_j - \bar{x})^2}$$

$$= \frac{\sum_{j=1}^{N-t} x_j x_{j+t} - \sum_{j=1}^{N-t} x_j \bar{x} - \sum_{j=1}^{N-t} x_{j+t} \bar{x} + (N-t)\bar{x}^2}{\sum_{j=1}^{N-t} x_j^2 - 2 \sum_{j=1} x_j \bar{x} + (N-t)\bar{x}^2}$$

$$= \frac{C(t) - \bar{x}(S(t)_j + S(t)_{j+t}) + (N-t)\bar{x}^2}{\sum_{j=1}^{N-t} x_j^2 - 2\bar{x} S(t)_j + (N-t)\bar{x}^2}$$

a) $S(t) = \sum_{j=i}^{N-t} x_j \Rightarrow$

```
for t in range(0,T):
    S_t = 0
    for i in range(0, N-t):
        S_t += i
S.append(S_t)
```

$O(N^2)$

$t = 0$

$\downarrow$

does the whole sum

$t = 1$

does the sum until N-1

$S_1 = S_0 - x_{N-1}$

$$S_0 = \sum_{j=1}^{N} x_j$$

$$S_{t+1} = S_t - X_{N-t}$$

$$S_1 = S_0 - x_{N-1}$$

$$S_2 = S_1 - x_{N-2}$$

```
S[0] = np.sum(X)
for i in range(1, len(S)):
    S[i] = S[i-1] - X[N-i]
```

(c)

$$S(0) = 1+2+3 = 6 = \sum_{j=1}^{N} X_j$$

$$S(1) = S(0) - X_2 = 6-2 = 4$$

$$S = [6,4] \checkmark$$