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Programming Assignment 1

① Lineage sequence of multiple frames of e coil-bacteria modeled under the following differential equation model :-

$$\frac{dy}{2^x \log_e(2)} = dx$$

$$dy = 2^x \log_e(2)\, dx$$

$$\int dy = \int 2^x \log_e(2) dx \quad \text{—— ①}$$

$$RHS = \int 2^x \log_e(2) dx$$

$$= \log_e(2) \int 2^x dx$$

$$= \log_e(2) \times \frac{2^x}{\log_e(2)} + C_1$$

$$RHS = 2^x + C_1 \quad \text{—— ②}$$

$$LHS = \int dy$$

$$= y + C_2 \quad \text{—— ③}$$

$$LHS = RHS$$

$$y + C_2 = 2^x + C_1 \quad \text{—— ④}$$

$\because$ initial condition $y(0) = 1$

put $x = 0$ & $y = 1$

$$1 + C_2 = 2^0 + C_1$$

$$1 + C_2 = 1 + C_1$$

$$\therefore C_2 = C_1 \quad \text{—— ⑤}$$

as $C_1 = C_2$ replace the value in eq^n (4)

$$y + C_2 = 2^x + C_1$$
$$y + C_1 = 2^x + C_1$$
$$\therefore \boxed{y = 2^x} \longrightarrow (5)$$

Here, x denotes the time in minutes

$x = 1, 2, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 21, 22$

for every value of x we can find the value of y using the equation :-

$$\boxed{y = 2^x}$$

we can find these values ~~by~~ using python programming and plot the histogram.

Number of bins for Histogram.

$n = 16$

Sturge's Formula :- $\log_2(n) + 1$

$= \log_2(16) + 1$

$= 4 + 1$

$= 5$