

1) switch can be either open or closed

a) $P(S_1) = P$
 $P(S_2) = P$
 $P(S_3) = P$
 so $P(A \cap B)$
 $P(A \cap B \cap C)$
 maybe take the inverse so $1 - P(A \cap B \cap C)$
 $P(t) = 1 - P(P(S_1) \cap P(S_2) \cap P(S_3))$

condition probability

b) $\frac{P(S_2)P(S_3)}{P(S_1)}$?

2) a) $X_u = X$ for $u=0.1, \dots, 1$

$F(u) = u$?

b) What does the question want there is no question being asked just a statement.

3) $L(\theta) = \prod_{i=1}^n f(x_i; \theta)$ max likelihood ML

$L(\theta) = \log \prod_{i=1}^n f(x_i; \theta)$ log likelihood

Yeah IDK

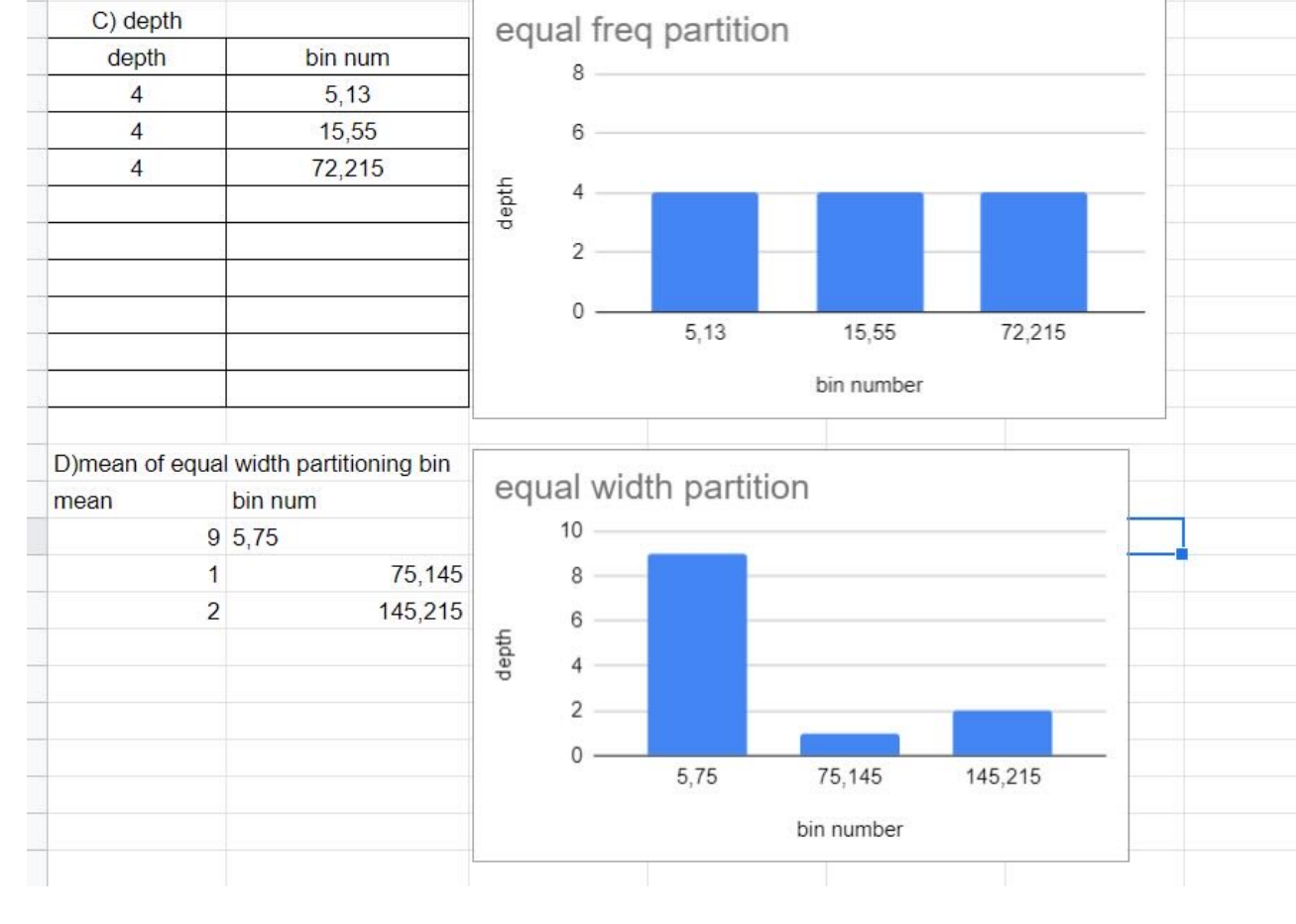
4) 5, 10, 11, 13, 15, 35, 50, 55, 72, 92, 204, 215

a) $\frac{12}{4} = 3$

Bin 1: 5, 10, 11, 13
 Bin 2: 15, 35, 50, 55
 Bin 3: 72, 92, 204, 215

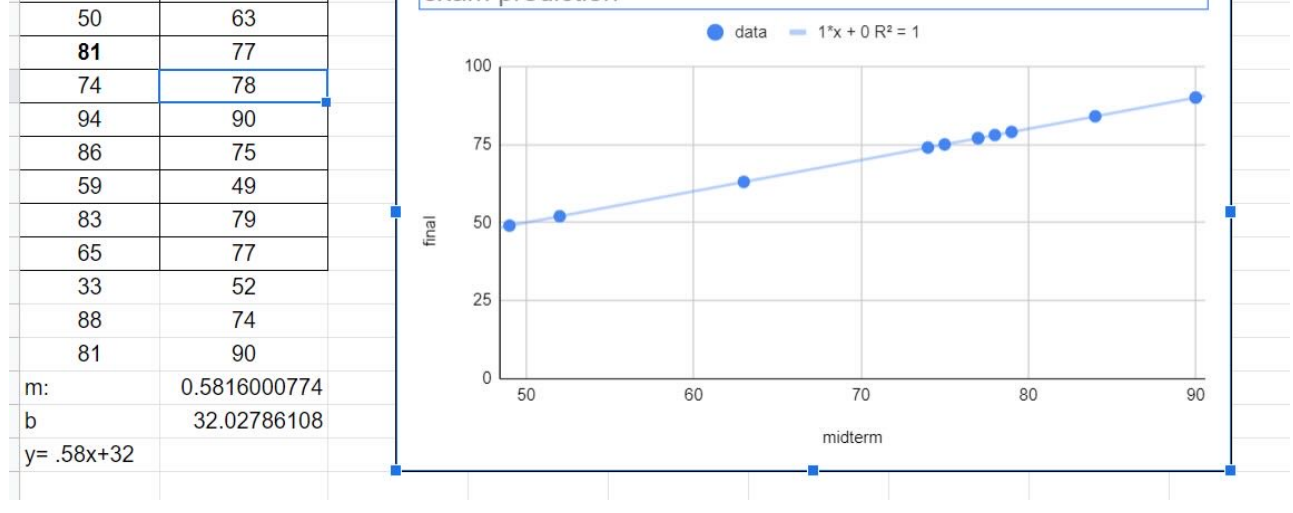
b) Equal width $215 - 5 = \frac{210}{3} = 70$

Bin 1 (5, 75): 5, 10, 11, 13, 15, 35, 50, 55, 72
 Bin 2 (75, 145): 92
 Bin 3 (145, 215): 204, 215



5) a), b) images

c) $.58 \cdot 86 + 32 = 81.28$



6) $x_1 = \begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$, $x_2 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$, $y = \begin{bmatrix} 0 \\ 7 \\ 11 \end{bmatrix}$

$\sum x_1 = 7$, $\frac{1}{3} \sum x_1 = \frac{7}{3} = 2.33$
 $\sum x_2 = 3$, $\frac{1}{3} \sum x_2 = 1$
 $\sum y = 11$, $\frac{1}{3} \sum y = \frac{11}{3} = 3.66$

$\sum x_1^2 = 1 + 4 + 16 = 21$, $\frac{1}{3} \sum x_1^2 = 7$
 $\sum x_2^2 = 3$, $\frac{1}{3} \sum x_2^2 = 1$
 $\sum y^2 = 16 + 49 = 65$, $\frac{1}{3} \sum y^2 = \frac{65}{3} = 21.66$

$\frac{1}{3} \sum x_1 y = \frac{1}{3} (0 + 8 + 28) = \frac{36}{3} = 12$
 $\frac{1}{3} \sum x_2 y = \frac{1}{3} (0 + 4 + 7) = \frac{11}{3} = 3.66$
 $\frac{1}{3} \sum x_1 x_2 = \frac{1}{3} (1 + 2 + 4) = \frac{7}{3} = 2.33$

$\beta_1 = \frac{12 \cdot 1 - (2.33)(3.66)}{7 \cdot 1 - (2.33)(2.33)} = 2.21385$

$\beta_2 = \frac{(3.66)(7) - (2.33)(11)}{(3.66) \cdot 1 - (2.33)^2} = 1.32285$

$\beta_0 = \frac{1}{3} \sum y - \beta_1 \frac{1}{3} \sum x_1 - \beta_2 \frac{1}{3} \sum x_2$

$21.66 - 2.21385 \cdot 7 - 1.32285 \cdot 1 = 14.9544$

$y = 2.21385x_1 + 1.32285x_2 + 14.9544$

7) a) Coins tossed 10 times \Rightarrow Sample Space

$S = \sum$ All possible outcomes of heads and tails

$P(X=i) = \frac{n C_i}{2^n}$

$P(X=0) = \frac{1 C_0}{1024} = \frac{10 C_0}{1024} = \frac{1}{1024}$

$P(X=1) = \frac{10 C_1}{1024} = \frac{10}{1024}$

$P(X=2) = \frac{45}{1024}$

$X=3$, $10 C_3 = 120$

$X=4$, $10 C_4 = 210$

$X=5$, $10 C_5 = 252$

$X=6$, 210

$X=7$, 120

$X=8$, 45

$X=9$, 10

$X=10$, 1

$f_X(x) = \begin{cases} \frac{1}{1024} & 0 \leq x \leq 1 \\ \frac{10}{1024} & 1 \leq x \leq 2 \\ \frac{45}{1024} & 2 \leq x \leq 3 \\ \frac{120}{1024} & 3 \leq x \leq 4 \\ \frac{210}{1024} & 4 \leq x \leq 5 \\ \frac{252}{1024} & 5 \leq x \leq 6 \\ \frac{210}{1024} & 6 \leq x \leq 7 \\ \frac{120}{1024} & 7 \leq x \leq 8 \\ \frac{45}{1024} & 8 \leq x \leq 9 \\ \frac{10}{1024} & 9 \leq x \leq 10 \\ \frac{1}{1024} & x = 10 \end{cases}$

b)