

1)

$$a) x \Rightarrow \pi \cdot \left(\frac{16}{2}\right)^2 = 201 \text{ cm}^2 \text{ wafer area}$$

$$\frac{\text{wafer area}}{\text{dies per wafer}} = \text{die area} = \frac{201}{64} = 3.14 \text{ cm}^2$$

$$y \Rightarrow \pi \left(\frac{20}{2}\right)^2 = 314 \text{ cm}^2$$

$$\frac{314}{100} = 3.14 \text{ cm}^2$$

$$b) \text{ yield} = \frac{1}{\left(1 + \text{defects per area} \times \frac{\text{Die area}}{2}\right)}^2$$

$$x \Rightarrow \frac{1}{\left(1 + \left(0.02 \times \frac{3.14}{2}\right)\right)}^2 = 0.94$$

$$\text{cost per die} = \frac{15}{64 \times 0.94} = 0.25$$

$$y \Rightarrow \frac{1}{\left(1 + \left(0.03 \times \frac{3.14}{2}\right)\right)}^2 = 0.90$$

$$\text{cost per die} = \frac{24}{100 \times 0.90} = 0.27$$

$$c) x \Rightarrow 15 - (15 \times 0.2) = 12 \Rightarrow \text{cost per wafer}$$

$$64 + (64 \times 0.1) = 70.4 \approx 70 \Rightarrow \text{dies per wafer}$$

$$0.02 + (0.02 \times 0.15) = 0.023 \Rightarrow \text{defects}$$

$$\frac{201}{70} = 2.87 \Rightarrow \text{new die area for wafer-x}$$

$$\frac{1}{\left(1 + \left(0.023 \times \frac{2.87}{2}\right)\right)}^2 = 0.94 \Rightarrow \text{new yield}$$

$$\frac{12}{70 \times 0.94} = 0.18 \Rightarrow \text{new cost per die}$$

$$y \Rightarrow 24 - (24 \times 0.2) = 19.2 \Rightarrow \text{cost per wafer}$$

$$100 + (100 \times 0.1) = 110 \Rightarrow \text{dies per wafer}$$

$$0.03 + (0.03 \times 0.15) = 0.0345 \Rightarrow \text{defects}$$

$$\frac{314}{110} = 2.85 \Rightarrow \text{new die area for wafer-y}$$

$$\frac{1}{\left(1 + \left(0.0345 \times \frac{2.85}{2}\right)\right)}^2 = 0.90 = \text{new yield}$$

$$2) a) P_1 = \left( \frac{2 \times 30 + 4 \times 50 + 3 \times 20}{100} \right) \times 10^9 = 3,2 \times 10^9 \text{ cycles}$$

$$P_2 = \left( \frac{3 \times 30 + 3 \times 50 + 3 \times 20}{100} \right) \times 10^9 = 3 \times 10^9 \text{ cycles}$$

$$b) P_1 \Rightarrow \frac{3,2 \times 10^9}{10^9} = 3,2$$

$$P_2 \Rightarrow \frac{3 \times 10^9}{10^9} = 3$$

$$c) P_1 \Rightarrow \frac{3,2}{3} = 1,067 \text{ s}$$

$$P_2 \Rightarrow \frac{3}{1,5} = 2 \text{ s}$$

d)  $P_1$  is faster than  $P_2$  by 1,89 times

Yunus Emre Yumsak

1801042659