1-A) Water-x Area $\Rightarrow \pi r^2 \Rightarrow 3.14 \cdot 8^2 = 200{,}96\ cm^2$

$$\text{Die Area} = \frac{\text{Water area}}{\text{Dies Per water}} = \frac{200{,}96}{64} = 3{,}14$$

Water-y Area $\Rightarrow \pi r^2 \Rightarrow 3{,}14 \cdot 10^2 = 314\ cm^2$

$$\text{Die Area} = \frac{314}{100} = 3{,}14$$

1-B) <u>For water-x</u>

$$\text{Yield} = \frac{1}{\left(1+\left(0{,}02 \cdot \frac{3{,}14}{2}\right)\right)^2} = 0{,}94$$

$$\text{Cost Per die} = \frac{15}{64 \cdot 0{,}94} = 0{,}249$$

<u>For water-y</u>

$$\text{yield} = \frac{1}{\left(1+\left(0{,}03 \cdot \frac{3{,}14}{2}\right)\right)^2} = 0{,}91$$

$$\text{Cost Per die} = \frac{24}{100 \cdot 0{,}91} = 0{,}263$$

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1-c) Cost per Wafer ↓ %20

dies per Wafer ↑ %10

Defects per area ↑ %15

	diameter	cost per wafer	Dies per wafer	Defects/cm^2
Wafer_x	16cm	12	70,4	0,023
Wafer_y	20cm	19,2	110	0,034

Wafer areas are same in A

For Wafer_x

$$\text{Die Area} = \frac{200,96}{70,4} = 2,85$$

$$\text{Yield} = \frac{1}{\left(1+\left(0,023 \cdot \frac{2,85}{2}\right)\right)^2} = 0,937$$

$$\text{Cost per die} = \frac{12}{70,4 \cdot 0,937} = 0,181$$

* Cost per die decreased.

* Yield is almost the same.

* Die areas decreased.

For wafer_y

$$\text{Die Area} = \frac{314}{110} = 2,85$$

$$\text{Yield} = \frac{1}{\left(1+\left(0,034 \cdot \frac{2,85}{2}\right)\right)^2} = 0,90$$

$$\text{Cost per die} = \frac{19,2}{110 \cdot 0,90} = 0,19$$

2-A)

$$\left.\begin{array}{l} P_1 = 0{,}3 . 2 . 10^9 + 0{,}5 . 4 . 10^9 + 0{,}2 . 3 . 10^9 = 3{,}2 . 10^9 \\ P_2 = 0{,}3 . 3 . 10^9 + 0{,}5 . 3 . 10^9 + 0{,}2 . 3 . 10^9 = 3 . 10^9 \end{array}\right\} \text{clock cycles}$$

2-B)

$$\left.\begin{array}{l} \text{For } P_1 \Rightarrow \begin{array}{cc} 10^9 & 3{,}2 . 10^9 \\ 1 & x \end{array} \Rightarrow \dfrac{3{,}2 . 10^9}{10^9} = 3{,}2 \\ \text{For } P_2 \Rightarrow \begin{array}{cc} 10^9 & 3 . 10^9 \\ 1 & x \end{array} \Rightarrow \dfrac{3 . 10^9}{10^9} = 3 \end{array}\right\} CPI$$

2-C) $\text{Execution Time} = \dfrac{\text{Instruction} \times CPI}{\text{Clock Rate}}$ clock cycle

For $P_1 \Rightarrow \dfrac{3{,}2 . 10^9}{3 . 10^9} = 1{,}06$

For $P_2 \Rightarrow \dfrac{3 . 10^9}{1{,}5 . 10^9} = 2$

2-D) $\dfrac{\text{Ex. time}_{P_1}}{\text{Ex. time}_{P_2}} = \dfrac{\text{Performance}_{P_2}}{\text{Performance}_{P_1}} \Rightarrow \dfrac{2}{1{,}06} = 1{,}89$

P_1 faster than P_2

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CamScanner ile tarandı