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① A)

$$wafer\_X\ Area = 8^2 \cdot 3{,}14\ cm^2 = 200{,}96\ cm^2$$

$$wafer\_y\ Area = 10^2 \cdot 3{,}14\ cm^2 = 314\ cm^2$$

$$64 = \frac{200{,}96}{dieArea\_X} \Rightarrow \boxed{dieArea\_X = 3{,}14\ cm^2}$$

$$100 = \frac{314}{dieArea\_y} \Rightarrow \boxed{dieArea\_y = 3{,}14\ cm^2}$$

B)

$$yield\_X = \frac{1}{\left(1+\left(0{,}02 \cdot \frac{3{,}14}{2}\right)\right)^2} \Rightarrow \boxed{yield\_X = 0{,}94}$$

$$yield\_y = \frac{1}{\left(1+\left(0{,}03 \cdot \frac{3{,}14}{2}\right)\right)^2} \Rightarrow \boxed{yield\_y = 0{,}912}$$

$$Cost\_Per\_die\_X = \frac{15}{64 \cdot 0{,}96} = \boxed{0{,}249}$$

$$Cost\_Per\_die\_y = \frac{24}{100 \cdot 0{,}912} = \boxed{0{,}263}$$

c) wafer Areas are same so
↳ wafer_X Area = 200,96 cm²
↳ wafer_Y Area = 314 cm²

new $\underline{\text{Die Area\_X}} = \frac{200,96}{70,4} = \boxed{2,855\ cm^2}$

new $\underline{\text{Die Area\_Y}} = \frac{314}{110} = \boxed{2,855\ cm^2}$

new $\underline{\text{Yield\_X}} = \frac{1}{\left(1+\left(0,023 \cdot \frac{2,855}{2}\right)\right)^2} = \boxed{0,937}$

new $\underline{\text{Yield\_Y}} = \frac{1}{\left(1+\left(0,0345 \cdot \frac{2,855}{2}\right)\right)^2} = \boxed{0,908}$

new $\underline{\text{cost\_Per\_Die\_X}} = \frac{12}{70,4 \cdot 0,937} = \boxed{0,182}$

new $\text{cost\_Per\_Die\_Y} = \frac{19,2}{110 \cdot 0,908} = \boxed{0,192}$

Conclusion:

X → $\frac{0,249}{0,182} = \boxed{1,368}$ times <u>less than</u> previous year

Y → $\frac{0,263}{0,192} = \boxed{1,369}$ times <u>less than</u> preious year

②

Required cycles	R type (300M)	I type (500M)	J type (200M instructions)
(3 GH) P_1	2	4	3
(1,5 GH) P_2	3	3	3

A) $P_1 = 300 \times 2 + 4 \times 500 + 200 \times 3 = \boxed{3{,}2\ B}$ clock cycles of P_1

$P_2 = 300 \times 3 + 500 \times 3 + 200 \times 3 = \boxed{3\ \text{Billion}}$ clock cycles of P_2

B) $P_1 \rightarrow \frac{3.2}{1} = \boxed{3.2\ \text{cpi}}$ $P_2 \rightarrow \frac{3}{1} = \boxed{3\ \text{cpi}}$

C) $P_1 \rightarrow 3{,}2 \cdot 10^9 \cdot \frac{1}{3 \cdot 10^9} = \frac{3{,}2}{3} = \boxed{1{,}066\ \text{second}}$ execution time for P_1

$P_2 \rightarrow 3 \cdot 10^9 \cdot \frac{1}{1{,}5 \cdot 10^9} = \frac{3}{1{,}5} = \boxed{2\ \text{second}}$ execution time for P_2

D) $\frac{2}{1{,}066} = 1{,}876$ P_1 is $\boxed{1{,}876}$ times faster than P_2