CSE 331 HW1

1) A) **Wafer Area:**

Wafer_X = 3.14 × 8 × 8 = 200,96 cm^2

Wafer_Y = 3.14 × 10 × 10 = 314 cm^2

Area of wafer $3.14 \times \frac{Diameter}{2} \times \frac{Diameter}{2}$

Die Area:

Wafer_X = 200,96 / 64 = 3.14

Wafer_Y = 314 / 100 = 3.14

Die Area = $\frac{Wafer\ Area}{Dies\ per\ wafer}$

B) **Yield:**

$$Wafer\_X = \frac{1}{(1+(0.02 \times 3.14/2))^2} = 0,94$$

$$Wafer\_Y = \frac{1}{(1+0.03 \times 3.14/2))^2} = 0,91$$

$$Yield = \frac{1}{\left(1 + defects\ per\ area \times \frac{die\ area}{2}\right)^2}$$

Cost Per Die:

$$Wafer\_X = \frac{15}{64 \times 0,94} = 0,25$$

$$Wafer\_Y = \frac{24}{100 \times 0,91} = 0,26$$

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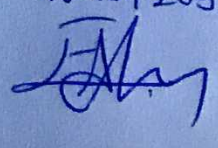

c)

	Diameter	Cost Per wafer	Dies Per wafer	Defects
Wafer-X	16	12	70,4	0,0230
Wafer-Y	20	19,2	110	0,0345

Wafer area:

Wafer-X = 200,96

Wafer-Y = 314

Die Area:

Wafer-X = 200,96 / 70,4 = 2,8545

Wafer-Y = 314 / 110 = 2,8545

Yield:

Wafer-X = 0,93

Wafer-Y = 0,90

Cost Per Die:

$$\text{Wafer-X} = \frac{12}{70,4 \times 0,93} = 0,18$$

$$\text{Wafer-Y} = \frac{19,2}{110 \times 0,9} = 0,19$$

* Calculation of cost per die compared to the previous year.

	Before	Now	
Wafer-X	0,25	0,18	↓ %72
Wafer-Y	0,26	0,19	↓ %73

Compared to the previous year, the die cost decreased by %72 for wafer-x and %73 for wafer-y.

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2)

	%30 R	%50 I	%20 J
P1	2	4	3
P2	3	3	3

Clock Rate

P1 3 GHz

P2 1.5 GHz

A) Instruction count = 1×10^9

Clock cycles$_{P1}$ = $\underbrace{0.3 \times 2}_{0.6} + \underbrace{0.5 \times 4}_{2.0} + \underbrace{0.2 \times 3}_{0.6} = 3.2 \times 10^9$

Clock cycles$_{P2}$ = $\underbrace{0.3 \times 3}_{0.9} + \underbrace{0.5 \times 3}_{1.5} + \underbrace{0.2 \times 3}_{0.6} = 3.0 \times 10^9$

B) Average CPI$_{P1}$ = $\frac{3.2 \times 10^9}{10^9} = 3.2$

Average CPI$_{P2}$ = $\frac{3.0 \times 10^9}{10^9} = 3.0$

C) Execution time$_{P1}$ = $\frac{10^9 \times 3.2}{3 \times 10^9} = 1,067$ sec

Execution time$_{P2}$ = $\frac{10^9 \times 3.0}{1.5 \times 10^9} = 2,0$ sec

D) P1 is 1.87 4x faster than P2.

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