1)

A) Wafer area

Wafer_X's wafer area:

Radius $= 16/2 = 8$ cm

$\boxed{\text{Wafer area} = \pi r^2 = 3.14 \times 8^2 = 200.96\ cm^2}$

Die area:

dies per wafer $= 64$

$\boxed{\text{die area} = \frac{200.96}{64} = 3.14\ cm^2}$

Wafer_Y's wafer area:

Radius $= 20/2 = 10$ cm

$\boxed{\text{Wafer Area} = \pi r^2 = 3.14 \times 10^2 = 314\ cm^2}$

Die Area:

dies per Wafer $= 100$

$\boxed{\text{die Area}: \frac{314}{100} = 3.14\ cm^2}$

B) $\text{yield} = \frac{1}{(1 + (\text{Defects per Area} \times \frac{\text{Die Area}}{2}))^2}$

$= \frac{1}{(1 + (0.02 \times \frac{3.14}{2}))^2}$

yield $= 0.94$

$$\text{cost per die} = \frac{\text{Cost per wafer}}{\text{Dies per wafer} \times \text{Yield}} = \frac{15}{64 \times 0.94} = 0.249$$

B) $\text{yield} = \frac{1}{(1 + (0.03 \times \frac{3.14}{2}))^2}$

yield $= 0.91$

$$\text{Cost per die} = \frac{24}{100 \times 0.91} = 0.26$$

CamScanner ile tarandı

C) Wafer cost decreases by 20%

We are calculating again for previous year.

WaferX's wafer cost $= 15 \times \frac{5}{4} = 18.75$

WaferY's wafer cost $= 24 \times \frac{5}{4} = 30$

Dies per wafer is increased by 10%

$64 \times \frac{100}{110} = 58.18$ = Wafer_X's dies per wafer

WaferY's dies per wafer $= 100 \times \frac{10}{11} = 90.9$

Defects per area unit increases by 15%

$0.02 \times \frac{100}{115} = 0.017$ = WaferX's defects

Wafer Y's defects $= 0.03 \times \frac{100}{115} = 0.026$

A)

WaferX:

Wafer Area $= 3.14 \times 8^2 = 200.96\,cm^2$

Die Area: $\frac{\text{Wafer Area}}{\text{Dies per wafer}} = \frac{200.96}{58.18} = 3.45\,cm^2$

B)

Yield: $\frac{1}{(1+(0.017 \times \frac{3.45}{2}))^2} = 0.943$

Cost per die in previous year: $\frac{18.75}{58.18 \times 0.943} = 0.341$

Wafer Y:

Wafer area: $3.14 \times 10^2 = 314\,cm^2$

Die Area: $\frac{314}{90.9} = 3.45\,cm^2$

Yield: $\frac{1}{(1+(0.026 \times \frac{3.45}{2}))^2} = 0.916$

Cost per die in previous year: $\frac{30}{90.9 \times 0.916} = 0{,}36$

Cost per die this year: 0.249

$\frac{0{,}249}{0.341} = 0.73$

This year cost per die is %27 cheaper than previous year

Cost per die this year: 0,26

$\frac{0{,}26}{0{,}36} = 0.7\bar{2}$

This year cost per die is %27,$\bar{7}$ cheaper than previous year

2) P1's clock rate = 3 GHz

P2's clock rate = 1.5 GHz

1 billion instructions = 10^9 instructions,

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

A) Find clock cycles

$$P_1 \Rightarrow \left(\frac{30}{100}\times 2+\frac{50}{100}\times 4+\frac{20}{100}\times 3\right)\times 10^9$$

$$\left(\frac{60+200+60}{100}\right)\times 10^9 = \boxed{3{,}2\times 10^9 \text{ clock cycle}}$$

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

$$\left(\frac{90+150+60}{100}\right)\times 10^9 = \boxed{3\times 10^9 \text{ clock cycle}}$$

B) Average clock cycle per instructions:

$$P_1 \Rightarrow \frac{3{,}2\times 10^9}{10^9} = 3{,}2 \text{ clock cycle per instruction}$$

$$P_2 \Rightarrow \frac{3\times 10^9}{10^9} = 3 \text{ clock cycle per instructions}$$

C) Execution time:

$$P_1 \Rightarrow \text{Execution time} = \frac{\text{clock cycle}}{\text{clock rate}} = \frac{3{,}2\times 10^9}{3\times 10^9} = 1{,}06 \text{ seconds}$$

$$P_2 = \frac{3\times 10^9}{1.5\times 10^9} = 2 \text{ seconds}$$

D) $$\frac{2}{1{,}06} = 1{,}88 \Rightarrow$$ P_1 is 1.88 times faster than P_2