1) $\text{Cost per die} = \frac{\text{Cost per wafer}}{\text{Dies per wafer} \times \text{yield}}$

After 1 year: Cost per wafer $= 10000 - (10000 \times 0{,}20)$
$= 10000 - 2000$
$= 8000$

yield $= 0{,}80 - (0{,}80 \times 0{,}10)$
$= 0{,}80 - 0{,}08$
$= 0{,}72$

Cost per die $= \frac{8000}{120 \times 0{,}72} = \frac{8000}{86{,}4}$

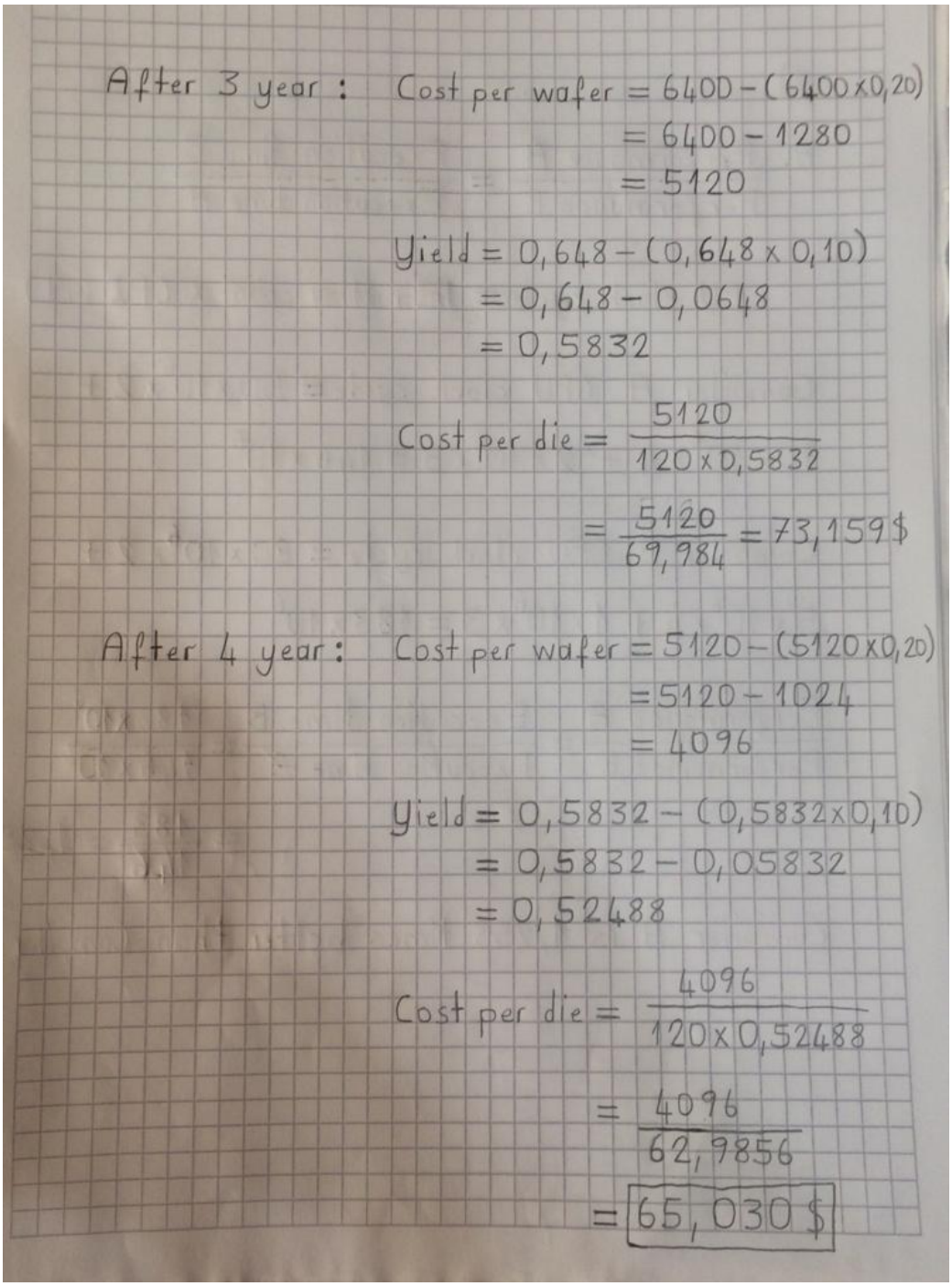
$= 92{,}592\$$

After 2 year: Cost per wafer $= 8000 - (8000 \times 0{,}20)$
$= 8000 - 1600$
$= 6400$

yield $= 0{,}72 - (0{,}72 \times 0{,}10)$
$= 0{,}72 - 0{,}072$
$= 0{,}648$

Cost per die $= \frac{6400}{120 \times 0{,}648} = \frac{6400}{77{,}76}$

$= 82{,}304\$$



After 3 year : Cost per wafer = 6400 − (6400 × 0,20)
= 6400 − 1280
= 5120

yield = 0,648 − (0,648 × 0,10)
= 0,648 − 0,0648
= 0,5832

$$\text{Cost per die} = \frac{5120}{120 \times 0,5832}$$

$$= \frac{5120}{69,984} = 73,159\$$$

After 4 year : Cost per wafer = 5120 − (5120 × 0,20)
= 5120 − 1024
= 4096

yield = 0,5832 − (0,5832 × 0,10)
= 0,5832 − 0,05832
= 0,52488

$$\text{Cost per die} = \frac{4096}{120 \times 0,52488}$$

$$= \frac{4096}{62,9856}$$

$$= \boxed{65,030\$}$$

2)

A. $\frac{\text{Performance A}}{\text{Performance B}} = \frac{\text{Execution time B}}{\text{Execution time A}}$

CPU clock cycles = Instruction count x CPI

Compiler A CPU clock cycle = $50 \times 10^6 \times 2 + 10 \times 10^6 \times 4 + 2 \times 10^6 \times 3 = 146 \times 10^6$

Compiler B CPU clock cycle = $80 \times 10^6 \times 2 + 5 \times 10^6 \times 4 + 1 \times 10^6 \times 3 = 183 \times 10^6$

$$\frac{\text{Performance A}}{\text{Performance B}} = \frac{\text{Execution time B}}{\text{Execution time A}} = \frac{183 \times 10^6}{146 \times 10^6}$$

$$= \frac{183}{146} = 1,253$$

Compiler A is 1,253 times better than Compiler B.

B. Better compiler is A compiler. Therefore,
CPU clock cycle = 146×10^6

$$100\,ms = 146 \times 10^6 \times \frac{1}{f}$$

$$\frac{146 \times 10^6}{f} = 100 \times 10^{-3}\,s$$

$$f = \frac{146 \times 10^6}{100 \times 10^{-3}} = 1{,}46 \times 10^9\,Hz$$

$$= \boxed{1{,}46\,GHz}$$

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