Q1

1. Given that a die has 0.2 defects on average, Defects per area × Die area = defects = 0.2

$$\text{Yield1} = \frac{1}{\left[1 + \left(\frac{\text{Defects per area} \times \text{Die area}}{2}\right)\right]^2} = \frac{1}{\left(1 + \frac{0.2}{2}\right)^2} = 0.826$$

2. If the average defects of a die is reduced to 0.1,

$$\text{Yield} = \frac{1}{\left(1 + \frac{0.1}{2}\right)^2} = 0.9070$$

$$\text{Cost per die} = \frac{\text{Cost per wafer}}{\text{Dies per wafer} \times \text{Yield1}} = \frac{\text{Cost per wafer}}{\text{Dies per wafer} \times 0.826}$$

$$\text{New cost per die} = \frac{\text{Cost per wafer}}{\text{Dies per wafer} \times \text{Yield}} = \frac{\text{Cost per wafer}}{\text{Dies per wafer} \times 0.9070}$$

$$\text{Ratio} = \frac{\text{New cost per die} - \text{Cost per die}}{\text{Cost per die}} = \frac{\text{New cost per die}}{\text{Cost per die}} - 1 = 0.09753$$

$$\text{Money saved} = 10,000,000 \times 0.09753 = 975,300\text{HKD}$$

Therefore, HKD$975300 could be saved.

Q2

$$\frac{\text{Power}_{\text{new}}}{\text{Power}_{\text{old}}} = \frac{75\% \times (80\%)^2 \times (90\%)}{1} = 0.432$$

Since the ratio is less than 1, it indicates that less power will be required to perform the same task.

Q3

1.

```
lw a1, 12(a0)
```

2.

```
addi a2, a1, -32
```

3. For `t2`/32, we can use

```
srli t3, t2, 5
```

For `t2`%32, we can use

```
andi t4, t2, 0x1F
```

Q4

1.

```
slli t3, t1, 8 # t3 = 0xABCDEF00
srli t3, t3, 8 # t3 = 0x00ABCDEF
```

Value of `t3 = 0x00ABCDEF`

2.

```
slli t3, t2, 8 # t3 = 0xA0000000
srai t3, t3, 8 # t3 = 0xFFA00000
```

Value of `t3 = 0xFFA00000`

3.

```
xor t3, t1, t2
sw t3, 0(a0)
sb t3, 8(a0)
```

Q5

1. 4 times
2. `4 12 24 24`
3. It finds the factorial of `t1`

Q6

```
addi sp, sp, -16 # assign 4 words of data
...
sw ra, 12(sp) # save return address in ra
sw a0, 8(sp) # save a0 to stack
sw a1, 4(sp) # save a1 to stack
...
lw a1, 4(sp) # restore a1 from stack
lw a0, 8(sp) # restore a0 from stack
lw ra, 12(sp) # restore ra from stack
...
addi sp, sp, 16 # free the stack
```

- END -