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① Prefix Sum on a Hypercube for each processor

```
PREFIX (my_id, my_number, d, result)
Begin
  result = my_number
  msg = result
  for i=0 to d do
    begin
      partner = my_id XOR 2^i
      send msg to partner
      recieve number from patner
      msg = msg + numb
      if (partner < my_id) then result = result + numb
  end for
end
```

assuming that communication is constant

then each processor will take O(N)

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② a) Amdahl's law:

10 = Speedup

n = 16 = sixteen processors

$$Speedup = \frac{1}{(1-P)+\frac{P}{n}}$$

$$10 = \frac{1}{(1-P)+\frac{P}{16}}$$

$$(1-P)+\frac{P}{16} = \frac{1}{10} \times 16$$

$$16(1-P) + P = \frac{16}{10}$$

$$16 - 16P + P = \frac{16}{10}$$

$$P = 0.96$$

#

6) Gustafson's law

$$S = N + (1 - N) \times S$$

$$10 = 16 + (1 - 16) \times S$$

$$-6 = (1 - 16) \times S$$

$$S = 0.4 \quad \#$$

$$P = 0.6 \quad \#$$

Nile STATIONERIES

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