

ASSIGNMENT TO PIPELINING QUESTION

NOTE: From the slide it was mentioned that a single floating point addition will take **7 nanoseconds**.

Therefore: $1000 = \text{Number of floating point additions to perform}$

$7\text{ns} = \text{time per addition}$

Resulting To:

$$1000 * 7 = 7000 \text{ ns (in no Pipelining)}$$

PIPELINING

In pipelining, once the first addition has passed through Stage 1, we can begin the second addition immediately.

Therefore:

$$\text{Total Time} = 7 + (N - 1) * 1$$

$$= 7 + (1000 - 1) * 1$$

$$= 7 + 999 = 1006\text{ns}$$

MULTIPLE ISSUE

We have 2 floating-point adders, therefore we can process 2 additions per cycle.

$$\text{Total Time For Multiple Issue} = 7 + ((1000 - 1) / 2) * 1$$

$$= 7 + 499.5 = 506\text{ns}$$

CONCLUSIVELY:

In our example with 1000 additions, dual-issue pipelining completed the task nearly $14\times$ faster than non-pipelined execution and about $2\times$ faster than single-issue pipelining.

Therefore Multiple Issue Is More Efficient