

Lecture - 9

(*) Arithmetic Operation For Computer

→ Computer ଏହି ମାତ୍ରିକ୍ ମାଶିନେ
 Language (Binary) ଦେବାରେ, ଏଟା
 ଆଧୁନିକ Arithmetic ଦୟେ operation କୁଣ୍ଡା
 ଏହି ମେଟ୍ସଜଳ୍ଲ ଅମାଦକୁ ଧାନ୍ତର । :-

□ Addition: Normal Binary Addition

$$\begin{array}{r}
 & & 1 & 0 & 1 \\
 & & + & 1 & 1 & 1 \\
 \hline
 & & 0 & 1 & 0 & 0
 \end{array}$$

carry

□ Subtraction: Computer Subtraction

ଶଳିତ 2's complement ଏହି ମାଧ୍ୟମରେ ହେବ ।

$$\begin{array}{ccc}
 -5 & \xrightarrow{\text{5 ଗୁଡ଼ିକ 2's complement}} & (-5) \\
 & \xrightarrow{\text{5}} &
 \end{array}$$

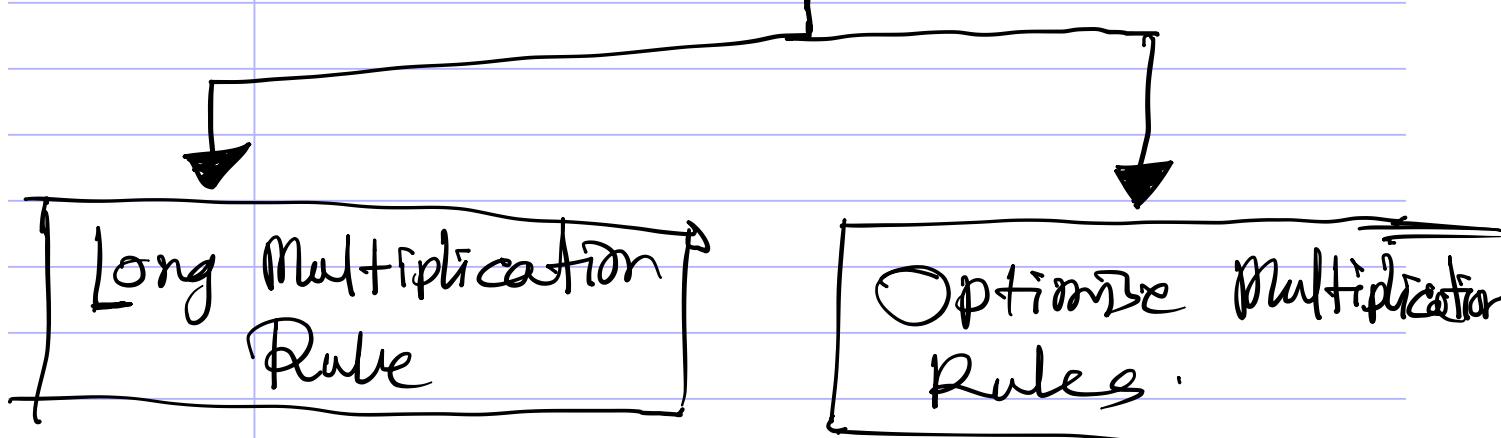
then addition.

Multiplication

* आणी दोन्हा computer ने 2 कैरेन्ट

Multiplication रूपे 2x2x3।

Multiplication



Long Multiplication Rule

* Multiplication ने आणी दोन्हा 2 ft विनिय

मात्रके :- ① Multiplicand ② Multiplier

① Multiplicand: याचे मात्र सर्व वस्तु

ने रूपे Multiplicand.

* Multiplier :- যাকে গুণ করব মেঝে

Multipliers.

$(M \cdot N) \rightarrow$ Multiplicand \rightarrow x

$(M \cdot R) \rightarrow$ Multiplier \rightarrow y

product result

Multiplicand \times multiplier

$\Rightarrow a \times b$

x by y
Multiplicand Multiplier
 $(M \cdot N)$ by $(M \cdot R)$

* Product variable p :- জটিল variable

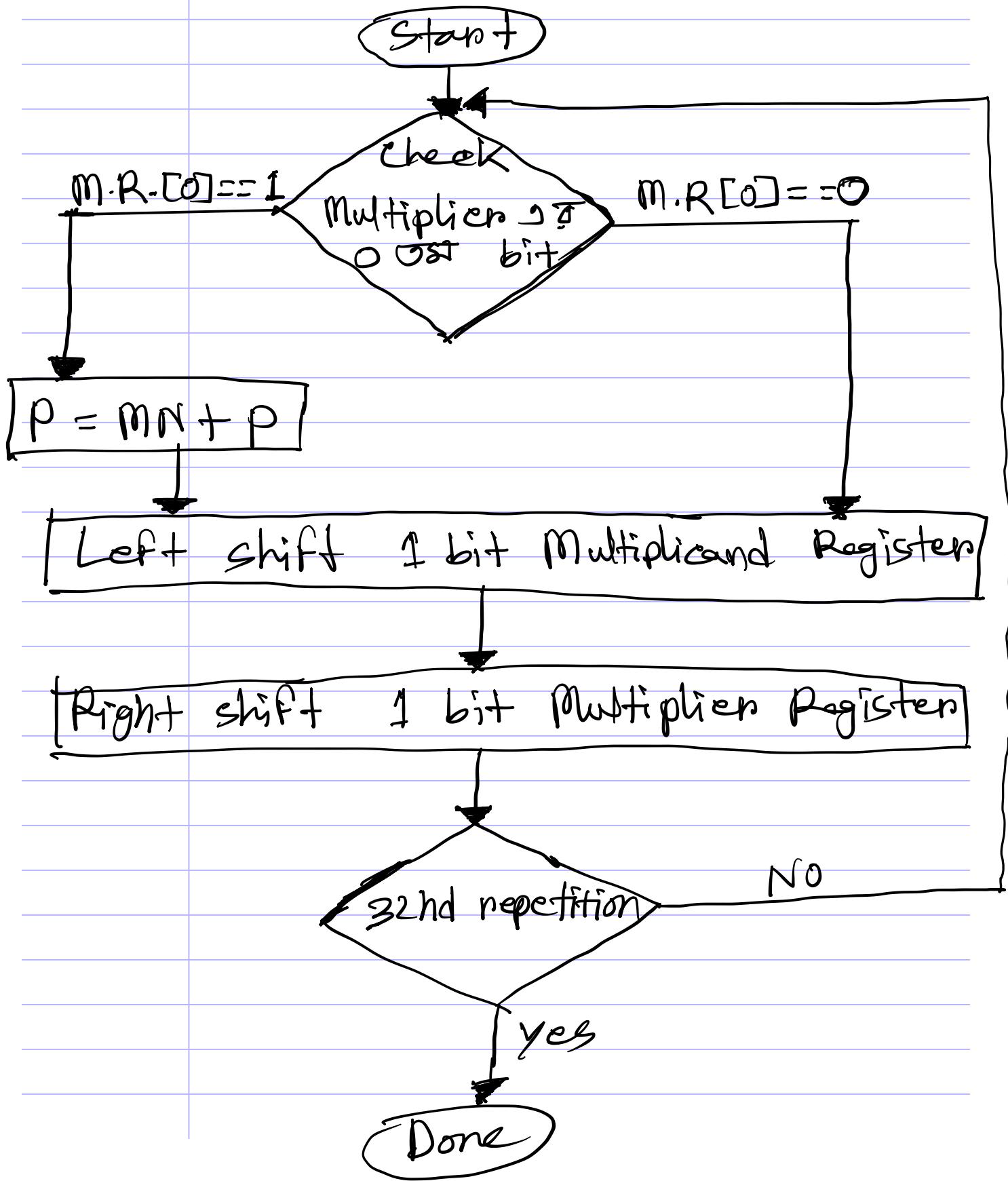
যাদের মূলত product এর value
বাস্তব হয়,

equation :-

multiplication

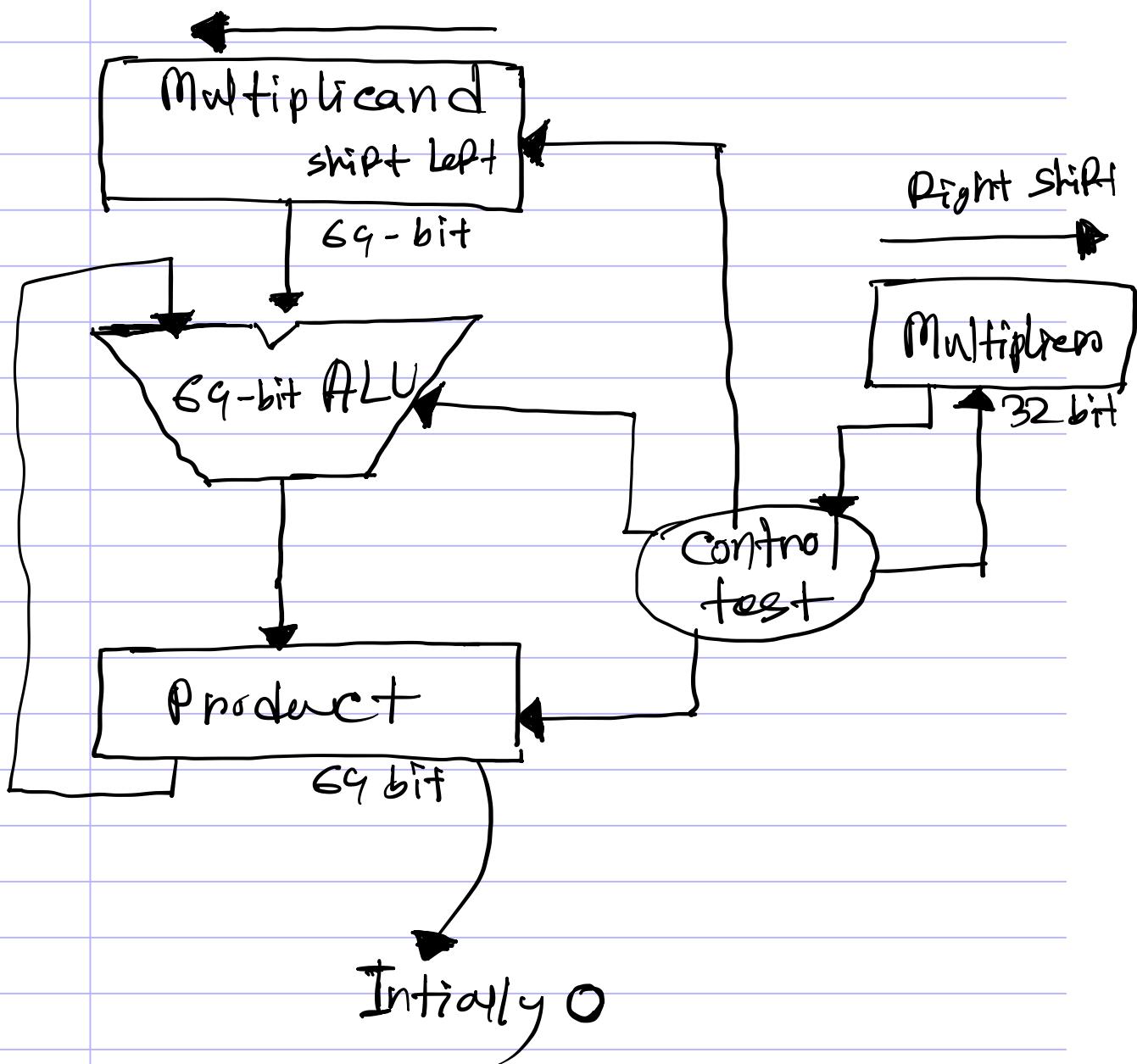
$$\text{New Product} \rightarrow P = M \cdot N + P \rightarrow \text{Current Product}$$

* Now lets see the Algorithmic Flowchart of Long Multiplication:



* M.R. पर यह bit के लिए repetition करेंगे।
MN के 64 bit पर size का 2 32-bit.

Long Multiplication Hardware



Example:

Use Long Multiplication on n by y .

where,

$$n = 4 \text{ and } y = 3.$$

Solution:

Hence,

$$n = 4 = 0100 \text{ (M.N.)}$$

$$y = 3 = 0011 \text{ (M.R)}$$

Initially

$$P = 0000 \quad 0000$$

$$MN = 0000 \quad 0100$$

$$MR = 001\underline{1}$$

Step1: $MR[0] == 1$

So,

$$P = MN + P$$

$$\therefore P = 0000 \quad 0100$$

$$MN = 0000 \quad 100\underline{0} \quad \leftarrow \text{left shift}$$

$$MR = \underline{0}00\underline{1} \rightarrow \text{Right shift}$$

Step2: $MR[0] == 1 :-$

$$P = 0000 \quad 1100$$

MN = 000 | 000 0

MR = 0000

Step 3: $MR[0] = 0$

MN: 0010 0000

MR: 0000

Step 4: $MR[0] = 0$

MN: 0100 0000

MR: 0000

end

\therefore Ans; $P = 0000 \ 1100 \underset{\downarrow}{(12)}$

Decimal

Ans