Johnny - Multiplication Program
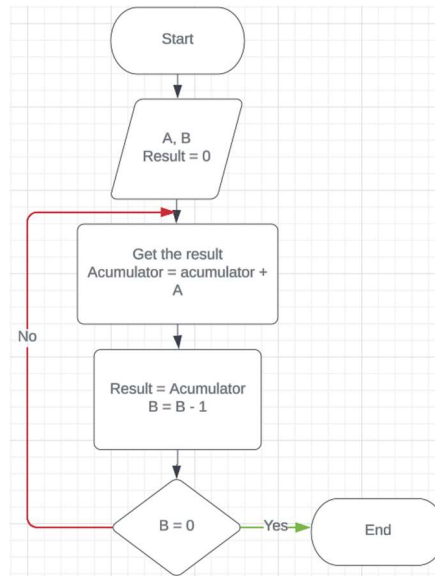
Wiktor Zmiendak

1. **Task:**

   Create a program in Johnny to do Multiplication of two numbers.

2. **Flowchart:**

3. **Solution:**

   To start, we initialize the result as 0 and set two operands, A and B. We then proceed to retrieve the value of the result, initially 0, and add the value of A to it. This marks the beginning of our loop. Within the loop, we update the result by assigning the value of the accumulator to it, and decrement B. We then check if B equals 0. If it does not, we return to the beginning of the loop and repeat the previous instructions. If B equals 0, the program terminates.

   Steps:

   - Set the result to 5

- Retrieve the value of the result.

012

Adr	Hi	Lo	Asm	Opnd
000:	09	012	NULL	012
001:	01	012	TAKE	012
002:	02	010	ADD	010
003:	04	012	SAVE	012
004:	08	011	DEC	011
005:	06	011	TST	011
006:	05	001	JMP	001
007:	10	000	HLT	000

009:	00	000
010:	00	005
011:	00	003
012:	00	000
013:	00	000

00 000

- Add A and save the result in the result address.

010

Adr	Hi	Lo	Asm	Opnd
000:	09	012	NULL	012
001:	01	012	TAKE	012
002:	02	010	ADD	010
003:	04	012	SAVE	012
004:	08	011	DEC	011
005:	06	011	TST	011
006:	05	001	JMP	001
007:	10	000	HLT	000

009:	00	000
010:	00	005
011:	00	003
012:	00	000
013:	00	000

00 005

- Decrement B and check if it equals 0.

011

Adr	Hi	Lo	Asm	Opnd
000:	09	012	NULL	012
001:	01	012	TAKE	012
002:	02	010	ADD	010
003:	04	012	SAVE	012
004:	08	011	DEC	011
005:	06	011	TST	011
006:	05	001	JMP	001
007:	10	000	HLT	000

009:	00	000
010:	00	005
011:	00	002
012:	00	005
013:	00	000

00 002

- If B is 0, end the program; otherwise, jump back to step 2 and repeat the previous instructions. Make note that it isn't the best solution.

011

Adr	Hi	Lo	Asm	Opnd
000:	09	012	NULL	012
001:	01	012	TAKE	012
002:	02	010	ADD	010
003:	04	012	SAVE	012
004:	08	011	DEC	011
005:	06	011	TST	011
006:	05	001	JMP	001
007:	10	000	HLT	000

009:	00	000
010:	00	005
011:	00	000
012:	00	015
013:	00	000

00 000